



A PRACTICAL GUIDE TO ENERGY EFFICIENCY

*Designing successful energy efficiency
programs*

January 2010



Global Energy Partners, LLC

500 Ygnacio Valley Road, Suite 450

Walnut Creek, CA 94596

P: 925.482.2000

F: 925.284.3147

E: globalhq@gepllc.com

DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITIES

This document was prepared by **Global Energy Partners, LLC (Global)**, a privately-held, employee-owned company. Neither **Global** nor any person acting on its behalf:

- (a) Makes any warranty or representation whatsoever express or implied,
 - (i) With respect to the use of any information, apparatus, method, process, or similar item disclosed in this document, including merchantability and fitness for a particular purpose, or
 - (ii) That such use does not infringe on or interfere with privately owned rights, including any party's intellectual property, or
 - (iii) That this document is suitable to any particular user's circumstance; or
- (b) Assumes responsibility for any damages or other liability whatsoever (including any consequential damages, even if **Global** or any **Global** representative has been advised of the possibility of such damages) resulting from your selection or use of this document or any information, apparatus, method, process, or similar item disclosed in this document.

This report was prepared by

Global Energy Partners, LLC
500 Ygnacio Valley Blvd., Suite 450
Walnut Creek, CA 94596

Project Manager
P. Hurtado

Principal Investigator(s):
C. Arzbaecher
K. Parmenter

The report is a corporate document that should be cited in the literature in the following manner:

A Practical Guide to Energy Efficiency: Designing Successful Energy Efficiency Programs, Global Energy Partners, LLC, Walnut Creek, CA: 2010.

Copyright © 2010 Global Energy Partners, LLC. All rights reserved.

CONTENTS

1	INTRODUCTION.....	1-1
1.1	Purpose of Report.....	1-1
1.2	Approach	1-1
1.3	Overview of Report.....	1-2
2	ENERGY EFFICIENCY AS AN ENERGY RESOURCE	2-1
2.1	Types of Energy Resources	2-1
2.2	Drivers for Energy Efficiency as an Energy Resource.....	2-1
2.3	Energy Efficiency Resource Standard.....	2-2
3	THE COMPLETE ENERGY EFFICIENCY PROGRAM PROCESS.....	3-1
3.1	Energy Efficiency Objectives	3-2
3.2	Baseline Forecasting	3-3
3.3	Screening Energy Efficiency Measures	3-5
3.4	Customer Response	3-6
3.5	Estimating Potential.....	3-7
3.6	Designing Programs.....	3-8
3.7	Cost-Benefit Analysis	3-9
3.8	Implementation and Monitoring	3-9
3.9	Evaluation, Measurement, and Verification	3-10
4	DESIGNING PROGRAMS.....	4-1
4.1	Simplified Program Planning and Design	4-1
4.2	Key Characteristics of Successful Program Designs.....	4-3
4.3	Basic Elements of Program Design	4-5
4.3.1	Identifying Target Markets and Customer Needs	4-5
4.3.2	Designing Program Features to Meet Customer and Utility Needs..	4-7
4.3.3	Developing Marketing Strategies and Methods	4-10
4.3.4	Developing Indicators of Program Impacts	4-11
4.4	Designing Programs for Specific Markets.....	4-12
5	IMPLEMENTING PROGRAMS	5-1
5.1	Key Elements of Program Implementation.....	5-1
5.2	Pilot Versus Full-Scale Programs	5-1
5.3	Resource Needs	5-4
5.3.1	Human Resources.....	5-4
5.3.2	Financial Resources	5-4

5.3.3	Trade Allies	5-5
5.4	Case Studies	5-6
5.4.1	Case Study 1: Full-Scale Implementation of Energy Efficiency in the Agriculture Sector	5-6
5.4.2	Case Study 2: Pilot Scale Implementation of Auto-DR in the Commercial and Industrial Sectors.....	5-9
6	CONCLUSIONS	6-1
6.1	Energy Efficiency as a Resource.....	6-1
6.2	Formal Planning	6-1
6.3	Practical Program Design.....	6-1
6.4	Implementing Programs	6-2

INTRODUCTION

1.1 PURPOSE OF REPORT

Energy efficiency is emerging as an important tool to individual utilities and entire US states in meeting increases in energy demands as well as in addressing climate change issues. Indeed, many utilities are currently designing and implementing energy efficiency measures and programs to meet a growing consumer demand for low-cost and more environmentally-friendly energy.

In the past, utility energy efficiency programs typically evolved and improved through trial-and-error and the application of lessons learned. However, energy planning experts increasingly recommend that utilities follow a systematic approach to plan energy efficiency programs. For example, Global and The Brattle Group recently developed a guidebook for EPRI that details such a systematic process.¹ Though formal planning of energy efficiency programs has its place, Global's vast experience in working with energy efficiency programs has shown that it is often wise for utilities new to energy efficiency to start with simpler approaches to program planning and implementation. Therefore, the present report strives to provide a practical guide for developing successful programs to utilities just beginning to initiate energy efficiency programs. In the context of this report, energy efficiency measures and programs also comprise demand response measures and programs.

1.2 APPROACH

For the development of this practical guide, the project team leveraged Global's in-house experience acquired from working with many utility clients. For example, Global has conducted numerous energy efficiency potential studies for US utilities, including Hawaiian Electric Company (HECO), Ameren, and Consolidated Edison of New York. Global has also acquired extensive experience from the day-to-day operation of third-party energy efficiency implementation programs for Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) in California. Global has also built a vast knowledgebase on the demand response potential for various technologies in working with the Federal Energy Regulatory Committee's National Demand Response Action Plan, Portland General Electric's (PGE's) 2009 Integrated Resource Plan (IRP) and Resource Action Plan, and Bonneville Power Administration's (BPA's) 2008 Resource Program. Through its implementation of energy efficiency and demand response programs, Global has helped achieve annual energy savings of over 213,000 MWh and demand reductions of more than 177 MW.

¹ *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

Additionally, the project team utilized two recently published documents while developing this report:

- *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.
- *Best Practices in Energy Efficiency and Load Management Programs*. EPRI, Palo Alto, CA 2008. 1016383.

These documents compiled by Global for EPRI provide a substantial amount of detailed information and should be considered as additional resources to complement the present report.

1.3 OVERVIEW OF REPORT

Chapter 2 begins by discussing energy efficiency as a critical energy resource for utilities to conserve energy, reduce peak demand, increase system reliability, and reduce greenhouse gas (GHG) emissions. Several examples are presented in Chapter 2 to highlight how individual utilities, states, and entire US regions are utilizing energy efficiency measures and programs to meet energy and climate change goals such as Energy Efficiency Resource Standards and GHG emission reduction targets. Chapter 3 describes a systematic approach to plan energy efficiency programs in an effort to maximize energy savings and peak demand reductions. The systematic approach consists of nine steps: 1) establishing objectives; 2) baseline forecasting; 3) screening measures; 4) sizing up customer acceptance and response; 5) estimating savings potentials; 6) designing programs; 7) measuring cost-effectiveness of programs; 8) implementing and monitoring programs; and 9) evaluating, measuring, and verifying program impacts. In practicality, several of the steps can be conducted in parallel or skipped altogether depending on the utility's resources and their customer base. Because it is often wise for utilities that are just beginning to initiate energy efficiency programs to start with a simplified program planning and implementation process, Chapters 4 and 5 provide practical strategies for utilities new to the energy efficiency business. Specifically, Chapter 4 presents practical strategies for program design and Chapter 5 discusses how to successfully implement programs. The report concludes in Chapter 6 with a few recommendations for utilities to consider when planning energy efficiency activities.

ENERGY EFFICIENCY AS AN ENERGY RESOURCE

Integrated resource planning is re-emerging as an important tool for individual utilities, entire states, and greater US regions when assessing current and future energy supply and demand. Integrated resource planning has also become critical in addressing goals to reduce greenhouse gas emissions. Though integrated resource planning includes numerous supply-side and demand-side resources, energy efficiency has moved to the forefront because of its significant economical and environmental potential. Consequently, energy efficiency is currently experiencing a major resurgence in the US as utilities are increasingly designing and implementing energy efficiency programs to meet growing consumer demand for low-cost and more environmentally-friendly energy. This chapter discusses the primary drivers and benefits associated with energy efficiency as an energy resource. Several examples are presented to highlight how energy efficiency is used by individual utilities, states, and entire US regions as a cost-effective resource to meet specific energy and greenhouse gas reduction targets.

2.1 TYPES OF ENERGY RESOURCES

Through various planning processes, utilities analyze how to meet demand for energy and capacity using supply-side and demand-side resources. Typical supply-side resources include construction of new central power plants, fuel supply contracts, wholesale energy procurement, distributed generation, and transmission and distribution capacity expansion. Examples of demand-side resources include demand response and energy efficiency. Based on area-specific needs and policy directions, the value of each resource often varies from region to region. However, energy efficiency is increasingly emerging as the lowest-cost energy resource. Indeed, many utilities, states and regions have identified energy efficiency as the highest-priority resource for both energy-related (MWh) and capacity-related demand (MW). Energy efficiency also has significant environmental benefits since saving energy avoids the combustion of fossil fuels. Therefore, when cost-effective, energy efficiency measures should be implemented ahead of other resource planning activities such as power plant construction, infrastructure upgrade, and distributed generation.

2.2 DRIVERS FOR ENERGY EFFICIENCY AS AN ENERGY RESOURCE

There are numerous drivers for energy efficiency, some of which are pushing energy efficiency in new directions. Though energy efficiency has played a critical role for many years in reducing peak demand and energy use, it has now moved to the forefront as a method to reduce greenhouse gas emissions for utilities and end-users alike. Energy efficiency is also instrumental in relieving constraints in aging transmission and distribution infrastructure. Furthermore, states increasingly are adopting energy codes and standards that are much more stringent than federal requirements in an effort to achieve additional energy efficiency gains. One such example is the adoption of the Title 24 building code in California, which has resulted in substantial energy efficiency gains in the residential and commercial building sectors.

Table 2-1 summarizes the primary drivers for energy efficiency, with a brief explanation of each driver. Table 2-1 also provides examples of how utilities and states are relying on energy efficiency as an important energy resource. The primary drivers for energy efficiency include:

- Meeting increasing demand for energy;
- Controlling energy costs;

- Transforming aging transmission and distribution infrastructure;
- Reducing peak energy demand;
- Reducing air pollution;
- Reducing greenhouse gas emissions;
- Complying with federal energy legislation, standards and codes;
- Meeting state regulations and target goals for energy efficiency; and
- Achieving end-user efficiency and profitability gains and, in turn, local development.

The next section discusses in more detail the use of Energy Efficiency Resource Standards (EERSs) at the federal and state levels to advance energy efficiency.

2.3 ENERGY EFFICIENCY RESOURCE STANDARD

Many utilities and states have adopted an EERS. An EERS is similar in concept to a Renewable Energy Standard (RES). Where an RES dictates a certain percentage of energy generation from renewable sources, an EERS requires a quantitative, long-term percentage reduction in projected energy load or load growth for utilities. The reduction is typically achieved through utility or third-party-operated energy efficiency programs targeting end-users.

As illustrated in Figure 2-1, 20 US states currently have an EERS. Most states with an EERS are located in the Northeast and Southwest. Texas was the first US state to adopt an EERS (Texas adopted it in 1999), followed by Vermont (2000), Hawaii (2004) and California (2004).² The remaining 16 states have adopted EERSs in the last four years. Two additional states—Rhode Island and Maine—have pending EERS legislation; however they have already mandated energy efficiency as a first priority resource in utility resource planning. Several other states including California, Connecticut, Delaware, Massachusetts, and Washington have established energy efficiency as the first priority resource in the “loading order” before new generation sources.

² American Council for an Energy-Efficient Economy (ACEEE), *2009 State Energy Efficiency Scorecard*, October 2009.

Table 2-1 Primary Drivers for End-Use Energy Efficiency

Driver	Brief Description	Examples
Meeting increasing demand for energy	The Energy Information Administration (EIA) projects primary energy consumption will increase in the US from 100 quadrillion Btu in 2005 to about 130 quadrillion Btu in 2030. Energy efficiency gains in production, delivery and end-use are required to help meet future demand. In particular, end-use energy efficiency gains are critical in meeting the increase in energy demand.	As one of the fastest growing counties in Washington State, Snohomish County's electric demand is expected to increase by 25% by 2020. ¹ The Snohomish Public Utility District (PUD) is planning to meet this growth through energy efficiency and renewable energy resources. PUD's Integrated Resources Plan calls for 96 MW of new cost-effective energy conservation or 46% of all load growth. The levelized cost for the achievable conservation potential is about \$0.03 per kWh saved. Residential energy efficiency gains account for half of the energy savings. The IRP also establishes stretch goals of 5% in additional energy efficiency achieved through advanced heat pumps, lighting, and power supplies.
Controlling energy costs	Most US utilities depend on fossil energy resources to meet end-use demand. However, fossil energy resources are in finite supply and the cost to extract them is increasing. Additionally, it is costly to construct new power plants. In the US, electric and natural gas efficiency measures cost \$0.025 per kWh and \$0.37 per therm saved on average respectively. ² This can be compared to the cost of recent conventional energy-supply resources ranging from \$0.07 to \$0.15 per kWh depending on type of fuel. ² Because it is much less expensive to implement energy efficiency measures than to build new power plants, utilities are increasingly using energy efficiency as a means to meet consumer requirements for less costly energy.	California utilities are aggressively pursuing energy efficiency programs as the primary means to control energy costs and greenhouse gas (GHG) emissions. Recently, the California Public Utilities Commission (CPUC) approved \$3.1 billion in ratepayer funding for 2010-2012 energy efficiency programs managed by the four investor-owned utilities (IOUs) in the state. This is 42% greater than the prior 3-year funding cycle. PG&E, the largest IOU in California, will spend \$1.34 billion in 2010-2012 on customer energy efficiency programs. As the second largest IOU, SCE will spend \$1.23 billion on energy efficiency programs in the same time period. In the 2010-2012 period, California IOUs must save almost 7,000 GWh and 150 million therms (MMth) utilizing energy efficiency programs. ³

Driver	Brief Description	Examples
<p>Transforming aging transmission and distribution (T&D) infrastructure</p>	<p>A significant portion of the nation's T&D infrastructure is in dire need for replacement or upgrade. Many utilities are currently experiencing bottlenecks in energy delivery, adversely affecting power reliability and power quality. Because T&D improvements are costly and typically require many years to implement, energy efficiency can play an instrumental role in deferring T&D capital expenditures. However, older T&D infrastructure ultimately will require upgrades in the form of a smart grid. State-of-the-art smart grids are capable of delivering energy efficiency gains and peak demand reductions.</p>	<p>The Sacramento Municipal Utility District (SMUD), California State University (CSU) Sacramento, Los Rios Community College, and the California State General Service were recently awarded \$127.5 million in federal stimulus money to install a regional smart grid system. The smart grid partnership project will increase reliability and energy efficiency, lower GHG emissions, and lower electric costs.⁴ SMUD's smart grid will include 600,000 smart meters, 100 electric vehicle charging stations, and 50,000 residential energy control systems including programmable thermostats and home energy management networks.⁴ Two-way communications will allow the utility and end-users to actively manage energy use and peak demand.</p>
<p>Reducing peak energy demand</p>	<p>It is extremely expensive to supply peak demand. Therefore, utilities are relying on energy efficiency programs as a means to reduce peak energy demand. End-users are also increasingly striving for energy efficiency gains in an effort to reduce peak demand charges.</p>	<p>Because of the rapid expansion of energy efficiency and demand response as qualifying resources for the New England Forward Capacity Market, the Independent System Operator New England (ISO-NET) has determined that over 2,900 MW of demand-side resources (energy efficiency accounts for 33% and demand response for 67%) will be available in 2011 to lower energy consumption.⁵ This represents almost 10% of total capacity. Also, see California examples under "Controlling energy costs" and "Transforming aging T&D infrastructure." Specifically, California IOUs must reduce peak energy demand by about 1,500 MW utilizing energy efficiency programs in the 2010-2012 period.³ California public utilities will also need to reduce peak demand. For example, SMUD will rely on energy end-use efficiency to reduce peak demand by 570 MW by 2017.⁶</p>

Driver	Brief Description	Examples
Reducing air pollution	Energy production, delivery, and end-use are associated with emissions of significant air pollutants. Air pollutants present serious health concerns to humans, especially in nonattainment areas. Energy efficiency gains reduce the amount of energy required and thus ultimately the amounts of gaseous and particulate emissions from fossil-fired power production. As a result, energy efficiency projects can help states reduce emissions of air pollutants. Additionally, energy efficiency offers the potential for long-term sources of revenue if the scope of cap-and-trade programs expands to include other pollutants.	Motivated by federal regulations, such as the Environmental Protection Agency (EPA) State Implementation Plan (SIP) to reduce air pollution and the EPA Clean Air Instate Rule (CAIR) to allocate NO _x emission allowances and trading, states are increasingly including energy efficiency in their revised air quality programs. ⁷ For example, Maryland, Virginia, and the District of Columbia submitted a regional air quality plan to EPA in 2007 that included LED traffic signals as a pollution control measure. ⁷ Eight states currently allocate NO _x allowances for energy efficiency and renewable projects under the CAIR. ⁸ For example, New York is allocating 10% of emission allowances to the Energy Efficiency and Renewable Energy Technology (EERET) Account, which will be administered by the New York State Energy Research and Development Authority (NYSERDA). ⁹ Allowances will be sold or distributed in order to provide funds to be used to support programs that encourage and foster energy efficiency measures and renewable energy technologies.
Reducing greenhouse gas (GHG) emissions	GHG emissions are a subset of air emissions. Because energy efficiency gains in end-use allow for reductions in GHG emissions, reducing GHG emissions has emerged as a major driver for energy efficiency measures in utility service territories, entire states, US regions, as well as at the national level.	See California example under “Controlling energy costs.” In 2010-2012, California IOUs must reduce GHG emissions by 3.07 million metric tons of carbon equivalent (MMt CO _{2e}) utilizing energy efficiency programs. ³ EPA recently announced the Mandatory Reporting Rule (MRR), which will require certain end-use sectors to report GHG emissions by 2011. The collected data will subsequently be used to develop federal GHG policies, GHG emission reduction goals, and a cap-and-trade program. Energy efficiency is expected to play an important role in achieving the federal goals.
Complying with federal energy legislation, standards and codes	Energy legislation, standards and codes have been developed and are continually being developed at the federal level to advance energy efficiency. Federal rebates for energy efficiency measures are also becoming increasingly common.	The Energy Policy Act and the International Energy Conservation Code (IECC) are actively promoting energy efficiency. Additionally, several Energy Efficiency Resource Standard (EERS) proposals have recently been introduced in the US Congress, as have several federal clean energy standards. One example is the <i>American Clean Energy and Security Act of 2009</i> . These emerging federal standards would allow energy efficiency to be used to meet a percentage of the overall target each year.

Driver	Brief Description	Examples
Meeting state regulations and target goals for energy efficiency	Some states have adopted more stringent energy codes and standards relative to federal requirements in an effort to advance energy efficiency further. In particular, the adoption of EERSs in many states has become a major driver for energy efficiency.	California's Title 24, which requires energy-efficient construction of new buildings and retrofit of existing buildings, is a good example of how a state has a more stringent energy code compared to the federal requirements. The CPUC has also set interim energy savings goals for 2012-2020 for California's utilities, requiring them to implement all energy efficiency measures that are deemed to be cost-effective. By 2020, CPUC expects electric energy savings of 16,000 GWh and peak demand savings of 4,500 MW. ¹⁰ This represents an EERS of about 8%. For comparison, New York State has adopted an EERS of 15% by 2015. ¹¹
Achieving end-user efficiency and profitability gains and, thus, local development	End-use energy efficiency gains help commercial and industrial end-users increase efficiency and profitability, as well as control energy costs. Ultimately, this will help economic development efforts at the local and regional levels.	Superior Energy Performance is a voluntary, industry-designed certification program that provides a transparent, globally-accepted system for achieving continual improvement in energy efficiency and validating energy intensity performance improvement and management practices at industrial plants. In this program, a non-governmental organization provides ANSI-accredited certification to US manufacturing facilities. The goal of Superior Energy Performance is to actively contribute toward a national energy efficiency goal of reducing industrial energy intensity by 25% over the next decade. ¹²

Sources:

1. Snohomish County PUD, *2008 Integrated Resource Plan*, Approved August 19, 2008, accessible at <http://www.snopud.com/Site/Content/Documents/IRP808.pdf>.
2. American Council for an Energy-Efficient Economy (ACEEE), *Saving Energy Cost-effectively: A National Review of the Cost of Energy Saved Through Utility-Sector Energy Efficiency Programs*, September 2009.
3. California Public Utilities Commission (CPUC), *CPUC Established Energy Efficiency Programs for 2010-2012*, Sept. 24, 2009, http://docs.cpuc.ca.gov/PUBLISHED/AGENDA_DECISION/107378.htm.
4. ISO New England, *2009 Regional System Plan*, October 15, 2009, http://www.iso-ne.com/trans/rsp/2009/rsp09_final.pdf.
5. Sacramento Municipal Utility District, Press Release, *SMUD Gets More Aggressive on Energy Efficiency*, May 17, 2007.
6. Sacramento Municipal Utility District, Press Release, *SMUD and Regional Partners Win \$127.5 million in Federal Grant Money*, October 27, 2009.
7. US Department of Energy, Energy Efficiency and Renewable Energy, *Eastern States Harness Clean Energy to Promote Air Quality*, DOE/GO-102007-2500, October 2007.
8. US Environmental Protection Agency (EPA), Clean Air, State Planning and Incentive Structure, webpage, http://www.epa.gov/RDEE/energy-programs/state-and-local/state_planning.html#cair.
9. US Environmental Protection Agency (EPA), Clean Air, State Planning and Incentive Structure, New York, webpage, <http://www.epa.gov/RDEE/energy-programs/state-and-local/states/ny.html#cair>.
10. California Public Utilities Commission (CPUC), press release, *CPUC SETS SAVINGS GOALS FOR ENERGY EFFICIENCY*, July 31, 2008.
11. US Environmental Protection Agency (EPA), Clean Air, State Planning and Incentive Structure, New York, <http://www.epa.gov/RDEE/energy-programs/state-and-local/states/ny.html#eeps>.
12. Superior Energy Performance, website, <http://www.superiorenergyperformance.net/>.

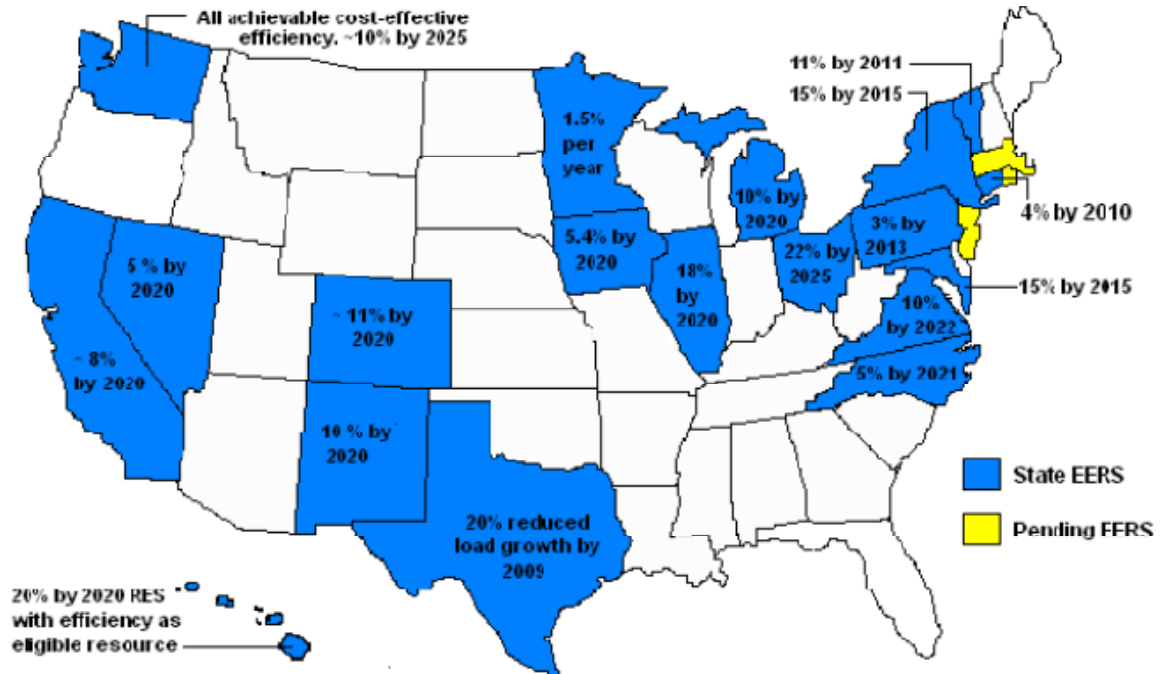


Figure 2-1 US States with Energy Efficiency Resources Standards (as of June 2009)

Courtesy of American Council for an Energy-Efficient Economy (ACEEE)

Under the proposed federal EERS, retail electricity distributors would be required to attain 10% electricity savings by 2020 through energy efficiency gains. In ten US states, however, the requirement is currently much more stringent. For example, Illinois has adopted an EERS goal of 18% by 2020 and Colorado requires energy savings of about 11.5% by 2020 for the state's investor-owned utilities; similarly, New York and Maryland have EES goals of 15% by 2015.³ Other states with significant energy savings targets include Ohio with an EES goal of 15% by 2025, New Mexico with an EES goal of 10% by 2020, and California with an EES goal of 8% by 2020.

The average cost of electric energy efficiency measures is \$0.03 per kilowatt-hour saved.⁴ In comparison, conventional base-load power plants generate electricity at a rate of \$0.07 to \$0.15 per kilowatt-hour.⁵ Because the cost of energy efficiency measures is much less than the cost of conventional base-load electricity generation, additional states are expected to develop EERSs in the near future. Furthermore, utilities need to be aware of any emerging federal EERS, which would require all states to achieve energy efficiency improvements. This, in turn, would likely propel utilities not accustomed to energy efficiency into the planning, designing, and implementation of various end-use energy efficiency programs. The following Chapters are designed to help such utilities understand the basics of developing effective energy efficiency programs.

³ Ibid.

⁴ American Council of an Energy-efficient Economy, *Energy Efficiency Resource Standards (EERS) Retail Electricity and Gas Distribution*, March 17, 2009.

⁵ Ibid.

THE COMPLETE ENERGY EFFICIENCY PROGRAM PROCESS

To maximize energy savings and peak demand reductions in a given service territory, energy planning experts recommend following a systematic approach to plan energy efficiency programs. Global and The Brattle Group recently developed a guidebook for EPRI that details this systematic process.⁶ This chapter summarizes the elements of this approach, which comprises nine steps (see Figure 3-1):⁷

1. Establishing objectives;
2. Baseline forecasting;
3. Screening measures;
4. Sizing up customer acceptance and response;
5. Estimating savings potentials;
6. Designing programs;
7. Measuring cost-effectiveness of programs;
8. Implementing and monitoring programs; and
9. Evaluating, measuring, and verifying program impacts.

In practice, several of the steps in this process can be done in parallel or skipped altogether depending on the utility's resources and its customer base. Global's experience shows that it is often wise for utilities that are just beginning to initiate energy efficiency programs to start with a simplified program planning and implementation process. This point is elaborated on in Chapters 4 and 5, which provide practical strategies for program design and implementation, respectively, for utilities new to the energy efficiency business.

⁶ *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

⁷ Please refer to the EPRI guidebook cited above for more specific information pertaining to each of these steps.

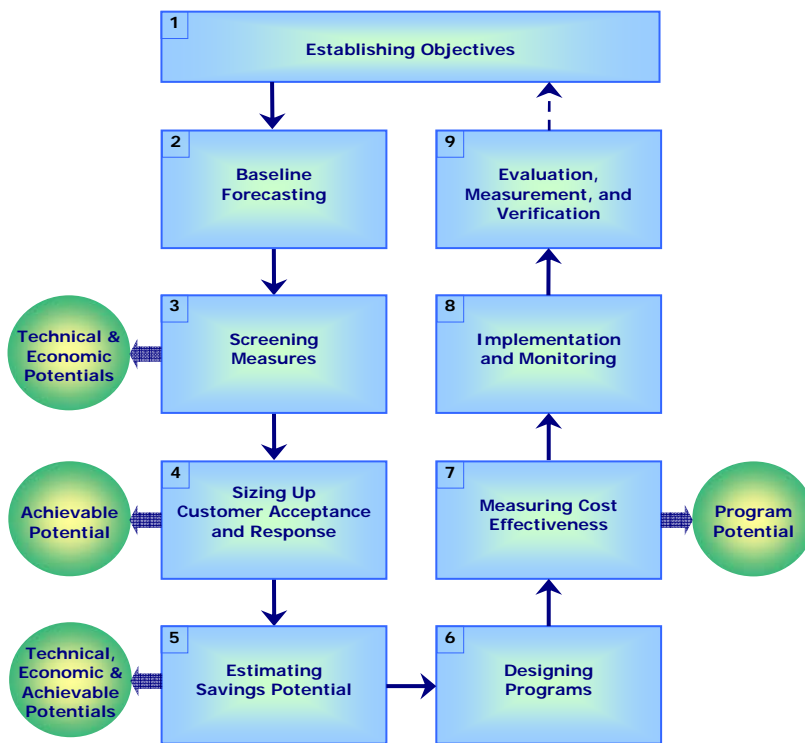


Figure 3-1 Energy Efficiency Program Process

Source: *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273. (Illustration developed by Global.)

3.1 ENERGY EFFICIENCY OBJECTIVES

The first step in the energy efficiency program process is to clarify and establish the utility’s strategic objectives as they relate to energy efficiency. This step intrinsically involves obtaining buy-in from utility top management to pursue energy efficiency program development and then establishing an in-house Energy Efficiency Department. The strategic objectives depend on the specific goals of the utility as well as on state and federal mandates.

A necessary condition for investment in energy efficiency is to have the utility’s financial incentives aligned. A significant concern for utilities is how the costs of utility-sponsored energy efficiency programs are recovered. Therefore, a major objective of utilities is to align their financial incentives with policy interests that support investments in energy efficiency. For example, for regulated utilities, investments in energy efficiency are not as rewarding as supply-side investments under conventional regulation. Unless cost-recovery strategies and appropriate incentive mechanisms are in place, lost sales from energy efficiency can have a negative effect on financial performance.

Once this alignment of incentives is in place, energy efficiency programs can be viewed as a resource to save energy, reduce peak demand, improve reliability, and reduce the need for new supply-side options. Energy efficiency represents an increasingly important component of a utility’s resource portfolio.

Energy efficiency programs also have the important role of reducing greenhouse gas emissions. Utilities and state and federal policymakers recognize the environmental need to reduce greenhouse gas emissions. They also realize that there are potential costs implications to the utility industry that may result from climate change legislation. Energy efficiency is regarded as a low cost alternative to help utilities reduce greenhouse gas emissions.

3.2 BASELINE FORECASTING

The second step in the process is to develop a baseline forecast. The baseline forecast represents a projection of energy use and peak demand in the absence of an energy efficiency program. As such, the baseline serves as a reference against which the impact of energy efficiency programs can be assessed. The baseline forecast is usually based on a utility's load forecast, but it generally incorporates much more detail.

Most frequently the forecast is represented by single yearly values for a specific set of variables, such as annual energy consumption, summer peak demand, and winter peak demand, for each year of the analysis. Some utilities assign a range around the point forecast using either probabilistic or scenario generation methods. In addition, for demand response programs and demand trading operations, tools for short-range hourly load forecasts have become important to utilities to determine the timing and magnitudes of peak demands.

The level of detail used in developing the energy efficiency program baseline forecast is a function of data availability. Figure 3-2 illustrates the different levels of detail that can be included in the baseline forecast, starting with information at the system level and becoming progressively more detailed at levels corresponding to information at the sector, segment, end-use, technology, and equipment levels. Typically, a distinction is made between different vintages, such as existing and new construction. Sometimes an additional distinction is made for owner-occupied versus tenant-occupied buildings.

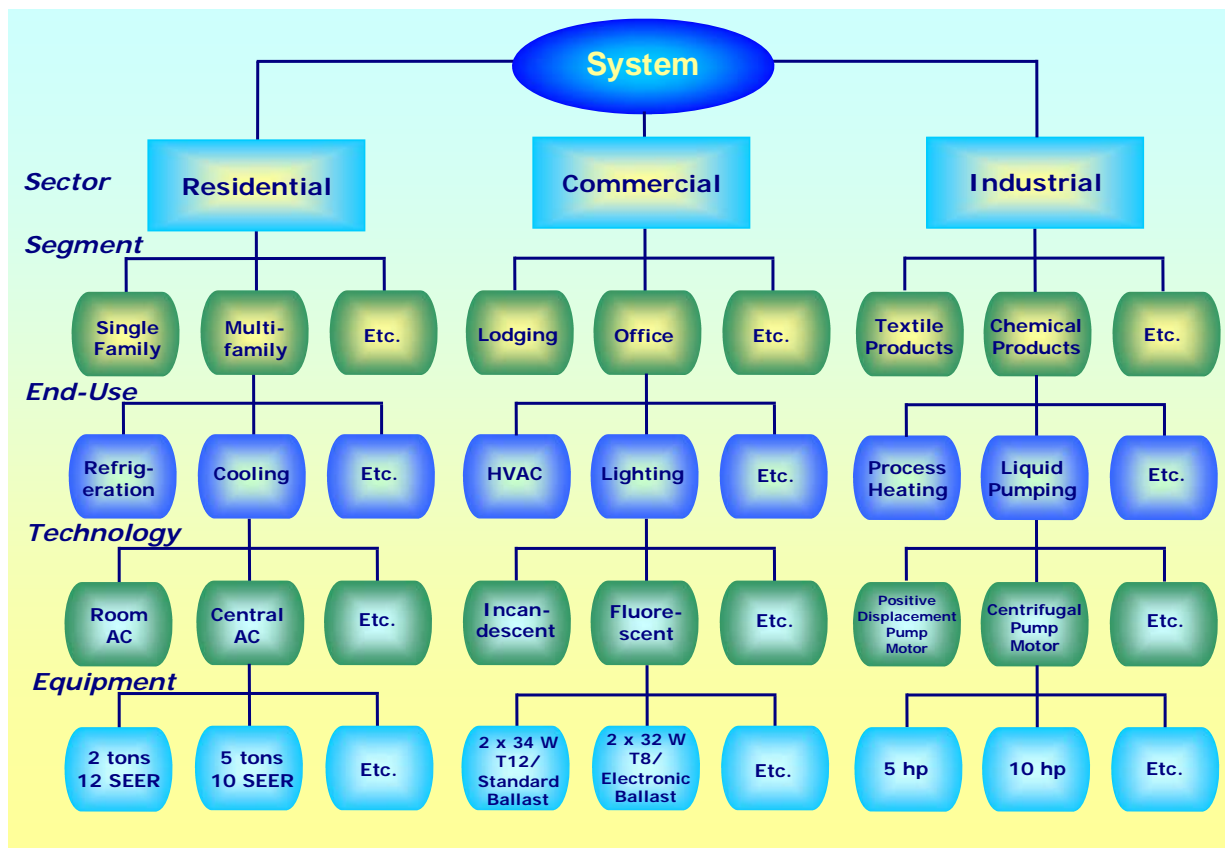


Figure 3-2 Levels of Detail in an Energy Efficiency Program Baseline Forecast

Source: Energy Efficiency Planning Guidebook: Energy Efficiency Initiative. EPRI, Palo Alto, CA: 2008. 1016273. (Illustration developed by Global.)

Most utilities' official load forecasts are developed with econometric models that result in projections at the sector or segment level. A few utilities use a combination of econometric and end-use models that result in projections at the end-use level. Other methods such as time series analysis or informed opinion may also be employed alone or in conjunction with other techniques in utility load forecasting.

Ideally, to assess the impact of all applicable energy efficiency measures thoroughly, the baseline forecast should be established at the most detailed level, i.e., at the equipment level. However, the data required to accomplish this goal are typically not available or are available for very few end-uses and technologies. Therefore, in most cases, it is not possible to establish the baseline forecast at the equipment level.

The baseline forecast should take into account naturally-occurring efficiency improvements, effects of appliance standards and building codes, and impacts of existing energy efficiency programs. These variables are usually included in a utility's official load forecast. However, the baseline forecast should not include any impacts of future energy efficiency programs, since the purpose of the baseline forecast is to serve as a reference for quantifying impacts of future program efforts. Because utility load forecasts may assume some degree of impact from future energy efficiency programs, the effects of future programs must be removed from the utility's official load forecast in order to have a proper baseline forecast from which to compare future programs.

It is useful to establish baseline forecasts for all the major sectors in a utility's service territory, including residential, commercial, and industrial. However, some utilities choose to focus on one or two sectors, or even on just the most important segments or end-uses in the region when developing the baseline forecast. This allows the utility to concentrate its energy efficiency program resources on the areas likely to provide the greatest impact for the investment.

In general, the best approach to developing a baseline forecast depends on data and resource availability. The four main methods used in baseline forecast development are summarized below:

- **Bottom-up approach:** The bottom-up approach begins with a detailed inventory of equipment and corresponding values of average annual energy consumption and diversified load at the time of the system peak for each device. The next step is to calculate the annual energy use and peak demand at the technology level, end-use level, segment level, and sector level by aggregating the results at each level. This process is repeated for each year of the analysis and all types and vintages of equipment. The final step is to compare and calibrate the aggregated results with the utility's official load forecast at the level that the forecast is available – usually at the segment or sector level. The bottom-up approach requires very detailed data that are usually only available with any degree of confidence for the residential customer class or for a few technologies, end-uses, and segments in the commercial sector.
- **Top-down approach:** The top-down approach begins with information at the sector or segment level from the utility's official load forecast. The information is then allocated down to the different hierarchical levels. If the official forecast is only available at the sector level, the first step is to allocate annual energy consumption and peak demand to the various segments by their percentage shares, as derived from the utility's billing records or building consumption data from secondary resources. The next step is to allocate segment-specific energy consumption and peak demand forecasts to different end-uses on the basis of end-use consumption data. End-use consumption information is often obtainable from a neighboring utility's load research or on-site audit data and/or from end-use models or other end-use data developed at the local or national level. The final step is to allocate the end-use forecasts to the different technology types and vintages if there is enough secondary information. Since the official load forecast is intrinsic to this approach, it is important to ensure that any projected impacts of future energy efficiency programs are first removed from the official forecast. The top-down approach is applicable to all end-use sectors.

- **Hybrid bottom-up/top-down approach:** A hybrid bottom-up/top-down approach is appropriate when sufficient primary data are available at the equipment or technology level for specific end-uses and segments. The annual energy consumption and peak demand for these end-uses and segments is then determined using a bottom-up approach, and a top-down approach is used for all other end-uses and segments. Hybrid approaches can be used for determining the baseline forecast for all sectors.
- **Prototype approach:** The prototype approach is a variation of the bottom-up approach that integrates engineering simulation models to evaluate the energy consumption of prototypical buildings. The prototypes usually represent an entire segment or sub-segment within a sector and they are designed to reflect the most important customer in the utility's territory. The remaining segments are then analyzed using a top-down approach.

The choice of approach is a function of time/budget tradeoffs and the level of detail required by the utility. While a bottom-up approach is preferred because it is more rigorous in nature, top-down, hybrid, or prototype approaches are most commonly employed since they have fewer data and resource requirements.

3.3 SCREENING ENERGY EFFICIENCY MEASURES

Most utilities are aware of the wide range of potential energy efficiency measures that can be adopted by their customers. Measures include technologies aimed at saving energy and managing load, as well as innovative rate options such as dynamic rates, interruptible rates, and curtailable rates. The Energy Information Administration (EIA) publishes an annual update to a comprehensive database of energy efficiency programs for the US electric utility industry. The database tracks annual and program-to-date demand impacts, energy savings impacts, peak load reductions, program expenditures, and other data.⁸ This database can be used with other best practice experience from successful utility programs to help utilities identify energy efficiency measures of interest.⁹

Once a utility identifies the range of measures it's interested in evaluating, the process of screening the measures begins. Screening is generally a two or three level process (see Figure 3-3):

1. The first step is to carry out a preliminary qualitative screening procedure to identify measures worthy of more detailed characterization in an energy efficiency potential assessment. This step screens out any measures that are not appropriate to the housing and/or building stock in the utility's service area. Once measures appropriate to the utility's conditions have been selected, information on their relevant characteristics is compiled, including estimates of the measures' energy savings and peak demand impacts.
2. In some cases a secondary screening is performed. The screening criteria used in the secondary step help to screen out measures that are difficult to quantify and/or may be hard to market to customers outside of niche markets. Such measures may still be viable and could be packaged in customized programs, but will not be included in the detailed potential assessment. The secondary screening may also revisit some of the preliminary screening criteria in more detail. Some utilities combine the preliminary and secondary screening steps.
3. The third step is an economic screen used to estimate the costs of the measures in order to identify measures that pass the economic criteria. Cost data for this step can typically be gathered from secondary sources, vendors, and distributors.

⁸ The EIA database contains information on energy efficiency programs and load management programs. See US Energy Information Administration at <http://www.eia.doe.gov/cneaf/electricity/page/eia861.html>.

⁹ Global and EES Consulting recently prepared a Technical Update for EPRI on best practices in energy efficiency programs. See: *Best Practices in Energy Efficiency and Load Management Programs*. EPRI, Palo Alto, CA: 2008. 1016383.

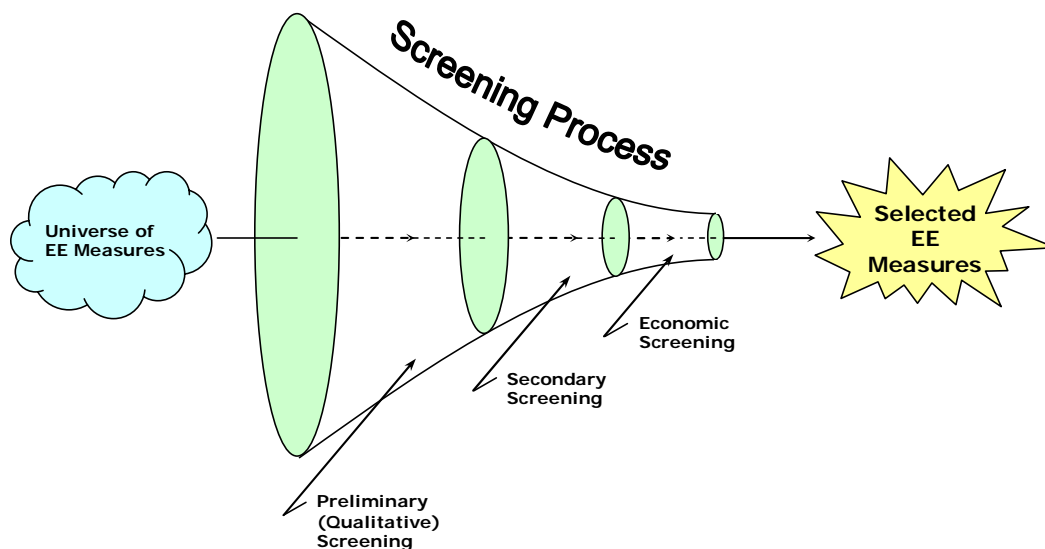


Figure 3-3 Conceptual Screening Process for Selecting Energy Efficiency (EE) Measures

Source: Energy Efficiency Planning Guidebook: Energy Efficiency Initiative. EPRI, Palo Alto, CA: 2008. 1016273. (Illustration developed by Global.)

Completion of the first two levels of screening ultimately leads to quantification of the *technical* potential for saving energy and reducing peak demand. Completion of the third level of screening leads to quantification of the *economic* potential. Completion of the customer response step summarized in Section 3.4 leads to the determination of the *achievable* potential. Section 3.5 discusses estimating these three stages of potential in more detail.

3.4 CUSTOMER RESPONSE

The fourth step in the program process is to estimate customer acceptance, adoption, or participation rates. The manner in which customer response is addressed depends on the type of measure or program being evaluated, for example:

- For measures that involve installing new equipment or building shell improvements, customer response equates to the proportion of customers that will purchase the technologies. This type of response can be referred to as a customer acceptance rate.
- For programs in which multiple measures may affect the same end-use (such as improving the efficiency of space heating), customer response equates to the proportion of customers that will join the program or adopt measures to make the end-use more efficient. This type of response can be referred to as a customer adoption rate.
- For demand response programs, customer response equates to the proportion of customers that will participate in the pricing program. This type of response can be referred to as a customer participation rate.

Customer acceptance, adoption, or participation rates can be estimated with primary data or secondary data. Primary data are typically obtained from surveys of utility customers, pilot programs, or from programs that have already been implemented. Secondary data are typically obtained from other utility pilot or full-scale programs, from results published by energy-related organizations such as EPRI or the American Council for an Energy Efficient Economy (ACEEE), or from government databases compiled by the EIA.

Estimates of customer response are the link between the economic potential and the achievable potential.

3.5 ESTIMATING POTENTIAL

In the context of a program design and planning process, the energy savings and/or peak demand reduction potential of a group of measures that are applicable to a utility's service territory can be quantified at three different levels:

- **Technical Potential** represents the savings due to measures that would result if all of the most efficient measures were adopted by a utility's customers, regardless of cost. It provides the broadest and highest definition of savings potential since it quantifies the savings that would result if all current equipment, processes, and practices in all sectors of the market were replaced by the most efficient measures that pass the first two levels of screening discussed in Section 3.3. Technical potential does not take into account the cost-effectiveness of the measures.
- **Economic Potential** represents the savings due to measures that would result if only cost-effective measures were adopted by the utility's customers. It is a subset of the technical potential and is quantified only for those measures that pass the economic screen discussed in Section 3.3. Program administration costs and customer preferences are ignored in the economic potential analysis.
- **Achievable Potential** is a subset of the economic potential. Achievable potential refines the economic potential by taking into account expected customer response, as discussed in Section 3.4. Achievable potential establishes a maximum target for the savings that a utility can hope to achieve through its programs. As such, this savings potential is often referred to as the *maximum achievable potential*. Achievable potential usually involves incentives that represent 100% of the incremental cost of energy efficient measures above baseline measures, combined with high administrative and marketing costs. Therefore, achievable potential must be balanced against other goals such as maintaining low electric rates and customer equity in the development of final program designs and savings targets.

Figure 3-4 illustrates the relationship between the levels of savings potential and the screening process described in Section 3.3.

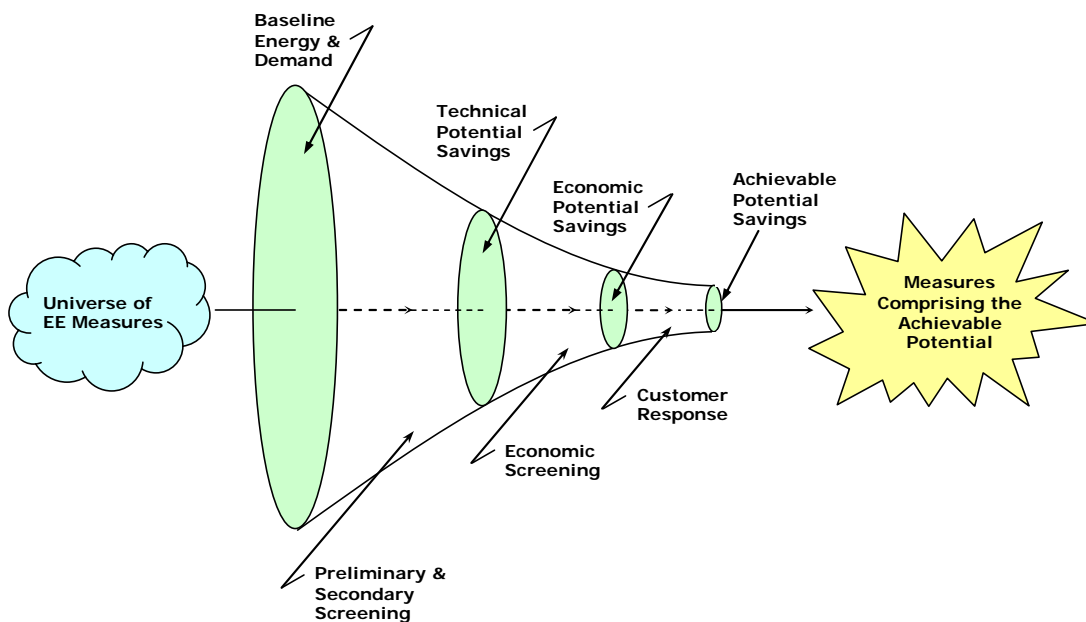


Figure 3-4 Relationship of Potential Savings to Screening Process

Source: *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273. (Illustration developed by Global.)

3.6 DESIGNING PROGRAMS

Energy efficiency program design involves identifying and understanding target markets and then designing programs with features that meet customer needs while achieving the energy and demand impacts desired by the utility. The process of designing an effective program has the following four main steps:

1. Identifying target markets and customer needs;
2. Designing program features to meet customer and utility needs;
3. Developing marketing strategies and methods; and
4. Developing indicators of program energy and demand impacts.

Figure 3-5 illustrates these program design steps and how they relate to the larger energy efficiency program process.

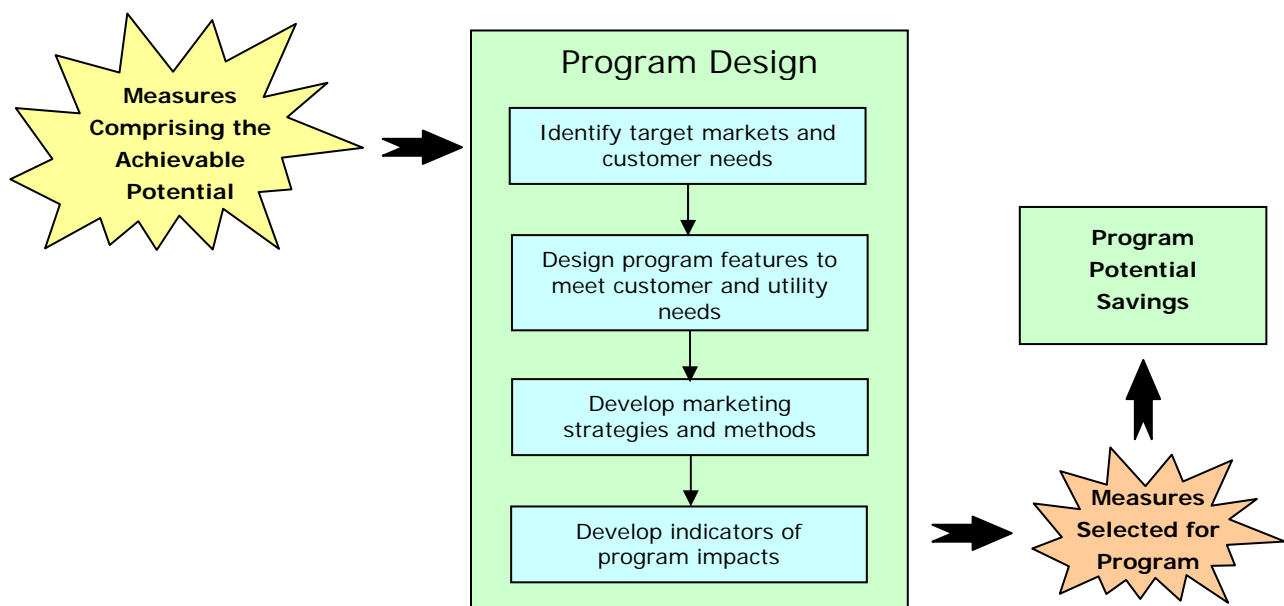


Figure 3-5 Program Design Steps

Source: *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273. (Illustration developed by Global.)

By addressing customer needs and overcoming market barriers, a well-designed energy efficiency program can:

- Attain desired energy and load shape impacts;
- Ensure program cost-effectiveness; and
- Strengthen customer relations.

Chapter 4 provides a detailed discussion of strategies for practical program design.

3.7 COST-BENEFIT ANALYSIS

There are five economic tests commonly used to assess the cost-effectiveness of energy efficiency programs. These tests are often referred to as the *standard practice* tests in the energy industry because they are based on the California Standard Practice Manual.¹⁰ Each test compares all relevant benefits to all relevant costs from a given perspective. The differences in the tests lay in the fact that energy efficiency programs impact the utility, participants, ratepayers, and society as a whole in different ways:

1. The **participant test** addresses the participant's perspective;
2. The **total resource cost (TRC) test** addresses the perspective of the utilities and the ratepayers;
3. The **ratepayer impact (RIM) test** addresses the perspective of utility rates;
4. The **utility cost test** addresses the utility's total cost perspective; and
5. The **societal test** addresses the perspective of society as a whole.

Note that environmental benefits of the programs should be included in some of the tests, particularly the TRC test and the societal test. It is especially important to include the potential for greenhouse gas reductions since carbon reductions are driving much of today's energy efficiency program development.

3.8 IMPLEMENTATION AND MONITORING

Once a program has been designed and its cost-effectiveness has been analyzed to determine the program potential, the program is ready for execution. The implementation and monitoring step in the energy efficiency process is where the program is tested in practice. Depending on the characteristics of the energy efficiency program and the experience of its staff, a utility may opt for either a pilot program or a full-scale implementation.

Pilot programs make sense as a first step in several situations, such as:

- For particularly innovative programs that are new to the industry;
- When utility staff has limited experience with energy efficiency programs or with the targeted markets and technologies; or
- When the cost of rolling out the program is very high.

Pilot programs offer an opportunity to test a program, find out what works, and then fine-tune the design as well as the estimates of impacts and costs. On the other hand, if the utility has experienced staff and the program is not particularly innovative or costly, it may be appropriate to proceed to full-scale program implementation.

Once program delivery begins, the success of a program depends on how well the marketing plan is designed and executed and how well the implementation staff is managed. In some cases, the implementation of programs also requires cooperation of trade allies, contractors, and others outside of the utility. Chapter 5 provides a more detailed discussion of practical strategies for program implementation.

Program monitoring is a necessary step to understand and quantify how well the program is working. It is used to:

- Determine customer participation;
- Quantify energy and load impacts;
- Track costs;
- Monitor contractor performance;

¹⁰ California Standard Practice Manual: Economic Analysis of Demand Side Programs and Projects, July 2002. <http://drrc.lbl.gov/pubs/CA-SPManual-7-02.pdf>.

- Keep programs on track; and
- Assist in regulatory reporting.

3.9 EVALUATION, MEASUREMENT, AND VERIFICATION

The last step in the program process is to evaluate the effectiveness of the program. Typically, energy efficiency program evaluations fall into two categories: process evaluations and impact evaluations.

- **Process evaluations** address program delivery, promotional strategies, coordination, customer satisfaction, and market acceptance. These types of evaluations often rely on surveys, interviews, site visits, and document review and are usually qualitative in nature. The purpose of a process evaluation is to assess the overall performance of the program and to recommend changes to improve program effectiveness.
- **Impact evaluations** quantify the effects of a program in terms of program participation rates, energy impacts, and load impacts. Impact evaluations are quantitative in nature and typically rely on metering data, engineering calculations, and statistical modeling. In contrast to process evaluations, the purpose of an impact evaluation is to quantify the effects of a program in terms of energy and demand impacts.

The present document does not cover the evaluation, measurement, and verification (EM&V) step in any more detail. Rather, the focus is on designing and implementing programs to get them up and running smoothly while optimizing available resources. Nevertheless, the EM&V step is important for utilities to undertake after the program is in play.

DESIGNING PROGRAMS

Effective program design helps translate a utility's energy efficiency program objectives into terms that appeal to customers and will work in the marketplace. In essence, program design bridges the somewhat analytical aspects of program planning (e.g., baseline forecasting, market potential estimation, etc.) with the practical aspects of program implementation.

Planning and designing programs can range from a relatively simple exercise to a multi-faceted complex study. The level of detail depends primarily on the commitment, resources, experience, goals, and customer base of the utility. For utilities just starting out in energy efficiency, it often makes sense to start with a simple planning study and small program design to prove to upper utility management that energy efficiency has the potential for significant impacts. The program can then be expanded once there is justification for additional financial resources to plan and design a larger, more detailed program. This simplified approach can side-step some of the formal program planning procedures explained in Chapter 3. In contrast, for utilities committed to and experienced with energy efficiency programs, it may be appropriate to follow the complete program planning process in Chapter 3, as long as they have the necessary resources.

This chapter presents a practical approach to designing programs. It is aimed at utilities that are interested in initiating energy efficiency programs, but have little prior experience. It begins by offering a modified program process that combines program design and the initial program planning steps in a way that minimizes resource expenditures and maximizes program impacts. It then highlights key characteristics of successful program designs that are based on utility best practices research. Next, the chapter summarizes the basic elements of the program design process as they pertain to identifying target markets and customer needs, designing program features to meet customer and utility needs, developing marketing strategies and methods, and developing indicators of program impacts. The chapter ends with tips to consider when designing programs for specific market segments.

4.1 SIMPLIFIED PROGRAM PLANNING AND DESIGN

After establishing utility objectives, the order of the program planning process can be modified in practical application for utilities initiating their first energy efficiency programs. Figure 4-1 shows an example of a simplified planning and design process. Rather than conducting an all-encompassing baseline forecast, screening the universe of every possible energy efficiency measure for all sectors, subsectors, and end-uses, and estimating the technical, economic, and achievable savings potentials, it may be wise for the utility to jump to the first step in the program design phase, which is to identify target markets and customer needs. Target markets are likely to be the most significant end-use needs for the largest load customers in the given utility's service territory.

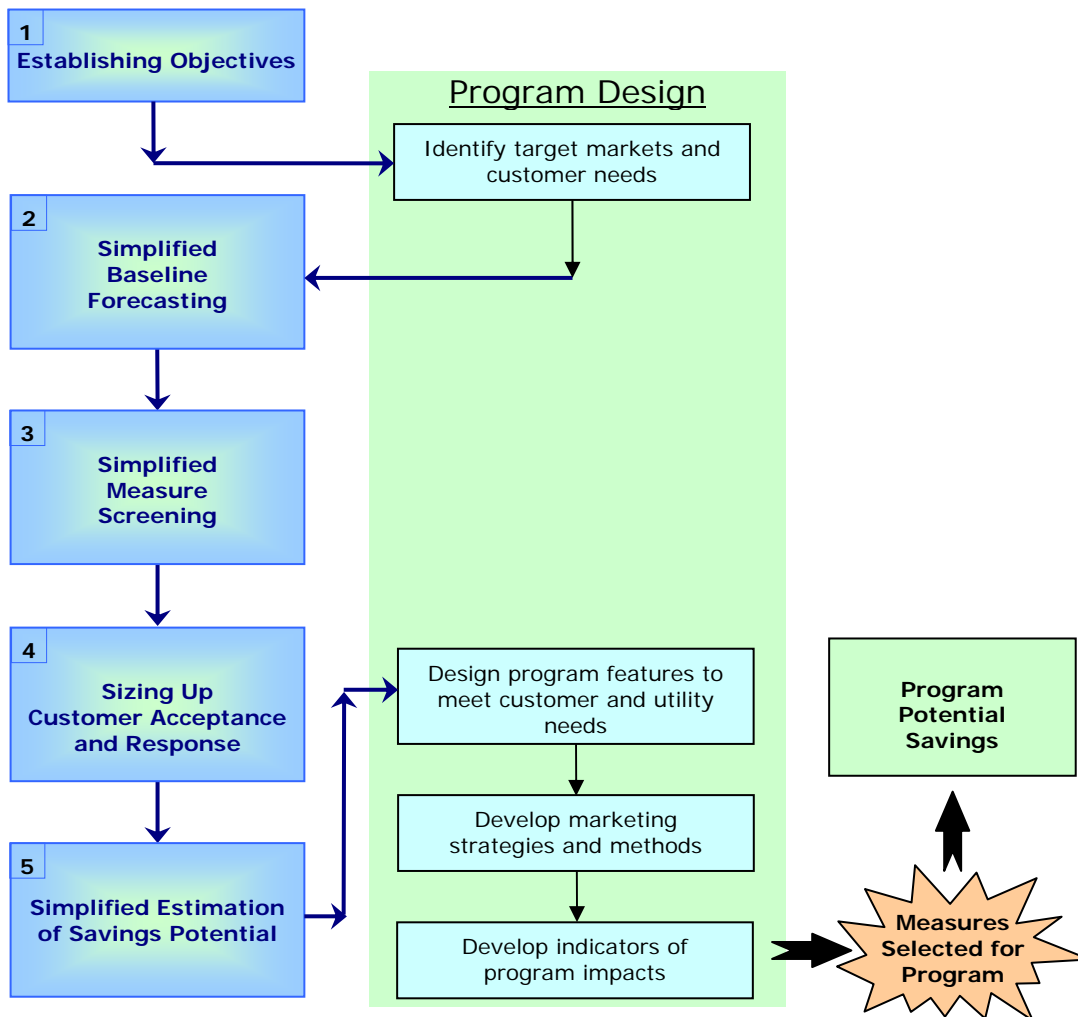


Figure 4-1 Simplified Program Planning and Design Process

Once the target markets and customer needs have been identified, it may then be appropriate to slip back into the mainstream program process at the baseline forecast. At this point, the baseline forecast could be a simple forecast that focuses just on the sectors, sub-sectors, segments, and/or end-uses of greatest interest based on the target market identification exercise. Thus, the baseline forecast is greatly simplified compared with a complete, all-sector, analysis. Likewise, the list of measures to screen is now a small subset of the “universe” of measures, since only the measures applicable to the target markets are included in the screening. Similarly, the steps involving sizing up customer response and estimating savings potential are made easier by avoiding analysis of measures for potentially viable, but perhaps small, markets.

Next, the program design process can be picked back up at the step of designing program features to meet customer and utility needs. The program features will depend on the targeted markets and measures, but can largely be developed using best practice experience from similar programs offered by other utilities. In addition, there are numerous proven market strategies and methods that focus on marketing to customers based on their needs and ultimate satisfaction. Lastly, in order to compute the program potential, it is necessary to develop three primary indicators to estimate a program’s impact prior to implementation: 1) participation rate; 2) market penetration; and 3) energy and demand impact. While the planning process should

produce reasonable estimates of the *unit* impacts of energy efficiency measures, the impact of the program over a given time period will depend on the participation and market penetration rates produced by the program. Benchmarking information from other utilities can serve as a useful resource for determining these important indicators.

4.2 KEY CHARACTERISTICS OF SUCCESSFUL PROGRAM DESIGNS

For many program types, a significant amount of best practices information exists to help utilities get started. Global often uses past experience to help guide utilities in the successful design of programs. Global and EES Consulting, Inc. recently conducted a review of best practices in energy efficiency programs for EPRI. The results of the study identified several key elements associated with successful program design.¹¹ Table 4-1 summarizes these important program characteristics.

¹¹ For more best practices information, please refer to *Best Practices in Energy Efficiency and Load Management Programs*. EPRI, Palo Alto, CA 2008. 1016383.

Table 4-1 Key Characteristics of Successful Program Design

Characteristic	Description
Maintain Simplicity in Program Design	Simplicity in participation terms and conditions for all parties is key. Confusing participation rules, procedures, and paperwork can deter trade allies and customers from participating.
Design Incentive Structure to Fit Customer Requirements	Participation and adoption rates are a direct function of program incentive levels. It is important to design appropriate incentive structures and levels to address customer requirements while also using resources efficiently by not overpaying to achieve results. Design of incentives should be based on a market assessment and stakeholder input process, and incentive levels should be reassessed periodically.
Maintain Flexibility in Program Design to Accommodate Measures	Changes in market conditions as well as changes in codes and technologies require a periodic reassessment of measures. Successful programs often remain flexible and adapt over time to include new measures or reassess existing measures.
Maintain Dynamism in Program Design to Fit Market Requirements in Specific Industries	Some industries are changing rapidly and energy efficiency professionals must be flexible enough to respond to these changes. Utility programs must also adapt to changing economic conditions.
Incorporate Customer Choice and Control Features in Program Design	Programs in which customers can easily and directly see tangible results are likely to be successful. Enabling customers to visualize the direct impacts of their actions on their energy consumption generally carries an associated conservation effect.
Ensure Resource Allocation is Commensurate with Program Tasks	Adequate resources must be allocated for a program to be successful. Many programs require significant marketing and branding efforts over time to build recognition.
Obtain Stakeholder Support at the Design Stage	A key program success factor is to convene stakeholder advisory groups from the onset as part of the design process to obtain multiple perspectives on the need and nature of planned programs. Even after a program is operational, stakeholder groups should be reconvened periodically to provide feedback on how the program is operating and perceived in the community, and to recommend program modifications.
Maintain High-Quality Products	The technologies featured in a program should be vetted for performance, reliability, and quality. Programs that promote faulty products have a difficult time recovering from the negative impact.
Establish Program Branding	Nationally, Energy Star® provides a platform for program implementation across customer classes. Building a brand name or tapping into nationwide branding such as Energy Star increases customer awareness, and iconic labeling influences point-of-purchase decisions.
Undertake Program Improvements Over Time	Many successful programs start as pilots and then subsequently expand into full programs. Continuous feedback from program constituents can help to guide program improvements.

Source: Adapted from *Best Practices in Energy Efficiency and Load Management Programs*. EPRI, Palo Alto, CA 2008. 1016383.

4.3 BASIC ELEMENTS OF PROGRAM DESIGN

Effective energy efficiency program design is based on a solid understanding of both customers and markets. The basic elements of the program design process consist of identifying target markets and customer needs, designing program features to meet customer and utility needs, developing marketing strategies and methods, and developing indicators of program impacts.¹²

4.3.1 Identifying Target Markets and Customer Needs

Identifying target markets and customer needs is the initial step in program design. Market segmentation helps with both of these tasks.

4.3.1.1 Identifying Target Markets and Measures

Perhaps the most fundamental step for practical program design is to pinpoint the customers and end-use markets associated with the greatest potential for achieving the desired energy efficiency impacts and then to identify potential measures capable of producing these effects. Market segmentation (see Section 4.3.1.3) helps with this task by supplying the necessary data to make informed decisions.

As already mentioned, the general exercise of identifying target markets can be done before steps 2 through 5 in Figure 4-1. However, if steps 2 through 5 have already been carried out prior to program design and they have produced specific customer end-use targets and measures, the program designer can proceed with this information. Often, utilities have enough basic information to be able to recognize the main target markets and potential measures without a detailed planning study.

For example, if the utility knows that commercial office lighting is a significant end-use target and that T-8 fixtures, compact fluorescent lamps, and occupancy sensors can help achieve desired objectives, then the Energy Efficiency Department can focus steps 2 through 5 in Figure 4-1 on this specific market, without undergoing an extensive planning study. However, this prior knowledge may be limited, and more measure screening may be required to identify and compare the measure alternatives to find those with the greatest potential impacts. Given an individual utility's load shape objectives, it is usually not difficult to identify the end-uses that show the greatest desired load impact and the measures that bear the greatest cost-effective potential to achieve that impact.

4.3.1.2 Understanding Customer Needs

Finding out how customers think and behave with respect to energy efficiency measures and programs can be a key factor in the success or failure of a program. To design effective programs, you need to know how customers use energy, how they think about energy consumption, how they make decisions about buying energy-using products, and what their foremost concerns are about certain kinds of products. Some of this information can be determined during market segmentation if the segmentation considers the "psychographic" variables discussed below (see Section 4.3.1.3). Understanding customer needs and attitudes is important for identifying barriers to participation in the program and then designing ways to overcome these barriers. It is also important for helping to recognize the most effective market mechanisms for delivering the programs.

4.3.1.3 Market Segmentation

Program design experience has shown that market segmentation of customers early on in the process of developing energy efficiency programs helps utilities meet their objectives more effectively. Market segmentation is the division of a large class of customers into smaller groups with similar characteristics. Although it may not seem entirely necessary for some types of simple energy efficiency programs such as lighting rebates promoted broadly through residential and commercial customer classes, market segmentation becomes increasingly important as a utility's

¹² Please refer to the following resource for more specific information pertaining to each of these program design steps: *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

program objectives become more varied and the measures become more customer-specific. Typically, small programs evolve into larger, more complex programs, and successful program designers have learned that market segmentation early in the program design process can help meet utility objectives more cost-effectively and intelligently in the long run. In particular, segmentation allows program designers to target equipment types, incentives, and delivery mechanisms to specific audiences. In this way, program designers can reduce uncertainty and risk, and most importantly, reduce the cost of attaining program goals. Some degree of experience and judgment is necessary to determine the level of detail that should go into market segmentation for utilities just starting out. In this sense, market segmentation can be an iterative process that builds up gradually as the Energy Efficiency Department continues to justify resource use.

Table 4-2 summarizes the three main ways to segment markets in order to target the markets appropriate for specific program types:

Table 4-2 Ways to Segment Markets

Market Segmentation Approach	Description
Quantitative Facility Characteristics	This type of market segmentation considers such “hard” data as facility energy use characteristics, facility age and construction type, facility size, saturation of specific types of equipment, etc. These data help illuminate the physical impacts that energy efficiency measures could potentially have on the customers. Quantitative facility characteristics are useful for targeting customers with specific types of equipment and facility attributes.
Demographic Customer Characteristics	This type of market segmentation considers demographic data. For residential customers, demographic data include age, family size, income, and ownership status. For nonresidential customers, demographic data include functional usage (office, school, retail, etc.) and ownership characteristics. These data are useful to target customers with specific demographics, such as owner-occupied facilities or retail buildings, etc. ¹³
Attitudinal and Organizational Customer Characteristics	This type of market segmentation considers segmenting customers according to clusters of related attitudes and values. So-called “psychographic” variables include attitudes toward risk, value, comfort, convenience, choice, and reliability. They also include the customers’ decision-making styles, types of financial investment criteria, and perceptions of the credibility of sources of energy information. These data are useful to target customers with specific attitudes and values. For example, they could be used to segment customers by the payback period they would require to make a technology investment, or by the sources of information on energy equipment they consider most credible. ¹⁴

Source: Adapted from *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

¹³ Note that EPRI has recently published a report on the subject of customer segmentation that covers both demographic and psychographic dimensions of classifying customers: *Customer Preference and Behavior: Exploring Customer Segmentation for Utility Energy Efficiency Programs*. EPRI, Palo Alto, CA: 2008. 1016386.

¹⁴ Ibid.

4.3.2 Designing Program Features to Meet Customer and Utility Needs

The task of designing program features to meet customer and utility needs involves revisiting the utility's strategic objectives and clearly and specifically articulating how the program will meet all or a subset of these objectives. It also involves defining equipment and customer eligibility, financial incentives, the service package, and delivery mechanisms.

4.3.2.1 Establish Specific Program Objectives

Once general agreement is reached on the purpose of a program, it is essential to list objectives as specifically as possible. For example, specific objectives include the items listed in Table 4-3:

Table 4-3 *Examples of Objectives for an Energy Efficiency Program*

Objective
Encouraging installation of a priority list of targeted technologies
Reaching a priority list of target market segments
Responding to customers' needs and priorities
Reducing specific market barriers for target customer groups
Learning more about market response to energy efficiency programs; testing planning assumptions about market conditions, program participation, and program impacts
Building program design and implementation capability within the energy efficiency program organization and staff
Meeting specific regulatory directive from utility commissions or other bodies

Source: Adapted from Energy Efficiency Planning Guidebook: Energy Efficiency Initiative. EPRI, Palo Alto, CA: 2008. 1016273.

4.3.2.2 Define Equipment and Customer Eligibility

An effective energy efficiency program must specify what equipment is eligible for inclusion, what customers are eligible, and how eligibility is to be determined. Table 4-4 summarizes factors to consider when defining equipment and customer eligibility.

Table 4-4 Factors to Consider when Defining Equipment and Customer Eligibility

Equipment Eligibility	Customer Eligibility
<ul style="list-style-type: none"> • It is important to maximize equipment performance by selecting the highest efficiency or most cost-effective products without limiting customer choice too much. • Some programs list eligible products by make and model number while others prescribe specification and performance criteria. The choice depends on whether the utility wants to simplify the selection process for customers and trade allies or allow for more creativity and customer choice. • It is essential to determine whether vendors can supply the needed quantities of eligible products in the program's timeframe. A related factor to consider is if eligible products are available from more than one manufacturer. • Another important consideration is if customers and trade allies are sufficiently familiar with the eligible products. This may require an understanding of the current saturation estimates for the particular class of equipment and penetration estimates for eligible models. • The potential for "free ridership" must also be considered. (Free-riders are participants that would implement energy efficiency measures without any incentive, but receive the incentive anyway.) For example, including products with low costs and significant pre-program market penetration, such as T-8 fluorescent lamps and electronic ballasts for commercial customers, can result in a high rate of free-ridership. 	<ul style="list-style-type: none"> • Identifying target markets is the first step in determining customer eligibility (see Section 4.3.1). • Another factor to consider is how long the customer accounts have been or will be active. Some programs require accounts to have been active for a minimum period or to show the likelihood of remaining active for a minimum period. These requirements help assure adequate pre-and post-installation billing data, and can be used to screen out certain buildings (e.g., new buildings or facilities likely to be closed in the near future). • Location is also a key consideration. Many programs, especially in the pilot phase, limit their geographic scope to control costs and other factors. • In some cases, certain classes of customers may not be eligible for programs if, for example, they are pursuing self-generation and cogeneration options. This may be especially true if customer-owned generation is for peaking or load-following purposes, and would not necessarily affect the utility system's peak demand.

Source: Adapted from *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

4.3.2.3 Design Financial Incentives

The importance of properly designing financial incentives cannot be overstated. Financial incentives are central to most energy efficiency programs; they are the offering intended to influence equipment purchasing and energy usage decisions. There are three basic steps to designing incentives: 1) define the incentive range; 2) select the incentive level; and 3) define the incentive structure. Table 4-5 summarizes each of these steps.

Table 4-5 Steps in Designing Financial Incentives

Step	Description
Define the Incentive Range	Incentives must be high enough to motivate customers and low enough to stay within the utility's economic constraints. The maximum of the acceptable range for incentive payments is typically based on the utility's resource value for the incentive. It may be prudent to discount the resource value cap to allow for free ridership, capacity equivalence factors, and overestimation of savings, among other factors. The minimum is defined by the incentive level that meets customers' financial criteria, such as a maximum payback period or a minimum internal rate of return.
Select the Incentive Level	To find a point in the incentive range that is likely to trigger customer participation, information is used such as financial performance thresholds (e.g., one-year or two-year paybacks) that market research indicates will motivate participation. This calculation is very specific to the equipment involved, its price premium, and estimated energy and demand savings.
Define the Incentive Structure	Effective incentive structures have three main characteristics: 1) they can be used with clearly specified equipment; 2) they are easy for the customers to understand; and 3) they are easy for the utility to administer. The incentives most commonly used in energy efficiency programs include fixed rebates, customized incentives (e.g., based on \$ per unit energy savings), and specialized incentives (e.g., loan financing, performance contracting, shared savings, or direct installation). Fixed rebates are used for most first-generation energy efficiency programs.

Source: Adapted from *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

4.3.2.4 Design the Service Package

Once the financial incentives are established, they are usually embedded in a package of services that invites customer participation. A rebate, for example, may be offered in a direct-mail brochure that offers free energy audits and customer workshops. The goal is to design a total service package that presents the financial incentive and overcomes other barriers to customer participation, such as lack of information, lack of design expertise, or lack of time to arrange the transaction.

Simple program designs may offer a single service, such as an energy audit, combined with a financial incentive. More complex programs may provide a more sophisticated package or menu of service elements. Some of the services commonly offered include facility energy surveys, education and training workshops, technical design assistance, installation assistance, and financing assistance. More sophisticated packages include turn-key direct installation where the utility handles the entire transaction for the customer, comprehensive services where the utility typically handles all services needed except for direct installation, and performance contracting where the cost of the measure is paid for by the savings it generates, essentially splitting the savings between the customer and the utility or an energy services company.

4.3.2.5 Define Delivery Mechanisms

Energy efficiency program design should assess the program from a market vantage point and structure its delivery so as to make best use of existing market mechanisms. Many of the basics of program delivery are dictated by the program features designed in the earlier steps, such as eligible technologies, eligible customers, and incentive structure. Components of the delivery mechanism typically include equipment availability, role of trade allies, and support services delivery (see Table 4-6).

Table 4-6 Components of Delivery Mechanisms

Component	Description
Equipment Availability	Manufacturers and local vendors must be able to supply sufficient eligible products in the timeframe the program requires.
Role of Trade Allies	Incentives may be offered through trade allies such as equipment vendors, installation contractors, and design professionals. Trade allies may also play key roles in marketing, installation, and quality control. Trade allies are particularly valuable partners in commercial/industrial programs geared to the natural replacement market.
Support Services Delivery	Development of support materials must be arranged and decisions must be made about the timing, location, and staffing of training, design assistance, energy auditing, and other services. If services are offered in a package, the coordination and delivery of these service packages must be defined. Coordination is especially important in commercial/industrial programs offering comprehensive services.

Source: Adapted from *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

4.3.3 Developing Marketing Strategies and Methods

In the context of energy efficiency programs, it is first essential to orient a program to customer needs and concerns. Then, the marketing effort must be refined to suit the products, incentives, mechanics of program delivery, and trade allies involved.

Customers typically go through five stages in reaching a decision on energy efficiency program participation. At each stage, customers need different kinds of messages and information. Table 4-7 summarizes the stages of awareness and corresponding marketing methods.

Table 4-7 Marketing Strategies Focused on Customer Needs

Stage of Awareness	Marketing Methods
Awareness of the new technology or service available through the energy efficiency program	Bill inserts, brochures, radio advertisements, cooperative advertisements with trade allies
Understanding the applications of the new technology or service	Live demonstrations, personal sales presentations, television and video messages
Evaluation of the benefits of the new technology or service	Facility survey, call from an account representative, detailed case study information
Motivation to participate in the program	Personal sales presentations, peer influence, detailed descriptions of financial incentives
Adoption of the program	Rebate forms at the point of purchase, bill envelope tear-offs, on-line enrollment forms

Source: Adapted from *Energy Efficiency Planning Guidebook: Energy Efficiency Initiative*. EPRI, Palo Alto, CA: 2008. 1016273.

The earlier steps of market segmentation and research on customer needs and attitudes should provide information on how customers think and feel about energy equipment and programs. This information should be used to identify marketing messages that will appeal to specific audiences. Many utilities employ marketing and advertising firms to assist them in identifying and articulating the messages that will work best in their markets.

Although the range of choices in designing a marketing effort is quite broad, the process of shaping an effective marketing effort does not need to be complex. Attention to four general principles can be used to focus most marketing efforts:

1. Design the marketing effort from the customers' point of view – keep it simple and make the customers feel their needs are being addressed.
2. Clearly define the role of the trade allies – the program design should enlist enough trade ally involvement to attain the leverage benefits associated with their support, but should exert enough utility control so that trade ally activity remains focused along the intended lines of the program.
3. Locate the marketing campaign responsibility carefully – find a balance between the control of doing everything from within the Energy Efficiency Program Department and the effectiveness of contracting out the marketing effort to advertising professionals.
4. Relate the marketing message to other utility messages – explore potential synergies or conflicts between program messages and other utility messages with the communications department before the marketing effort is launched.

4.3.4 Developing Indicators of Program Impacts

To quantify an energy efficiency program's potential impact, three primary indicators must be developed during the program design phase: 1) participation rate; 2) market penetration; and 3) energy and demand impact. While the planning process should produce reasonable estimates of the *unit* impacts of energy efficiency measures, the impact of the *program* over a given time period will depend on the participation and market penetration rates produced by the program.

4.3.4.1 Participation Rate

An energy efficiency program's participation rate may be defined in three ways:

1. Percentage of customers eligible for the program who participate within a fixed time period;
2. Percentage of eligible customers who were reached by the marketing effort and chose to participate; and
3. Percentage of customers in the market for a given type of equipment during the program cycle who participate in the program.

These three participation rates are best explained by examples. If 100,000 residential customers are eligible for an air conditioning cycling program and 10,000 sign up in a given year, the participation rate would be 10%. By the second, narrower definition, if only 30,000 customers of the 100,000 are made aware of the program and 10,000 sign up, the participation rate is 33%. The third definition, even narrower, applies to programs like those aimed at refrigerator replacement: if there are 100,000 eligible residential customers, but only 7,000 buy refrigerators in a typical year, the practical limit of the target population is 7,000. If 2,000 of those customers participate in the program, the participation rate would be only 2% of the total residential class, but almost 30% of those active in the market for that year.

For a realistic expectation of program performance, participation estimates should be refined from the original planning estimates. The original estimates may have, for instance, projected that 50% of commercial customers would participate in lighting programs. However, the market segmentation, incentive design, marketing plan, and other features of the program—constrained by annual program budgets—may limit first-year participation to 5%. Annual, perhaps even quarterly, estimates of program impacts must be developed for utility planners responsible for

near-term resource projections. If, for example, a direct load control program has a goal of 100,000 customers, but only 25,000 will have completed installations before the next summer peak season, that information must be available to system dispatchers.

4.3.4.2 Market Penetration

Market penetration is a somewhat different measure than program participation in that participation is measured in customers while penetration is measure in physical units. For example, in a commercial lighting program, 5,000 of an eligible 100,000 customers may participate, yielding a participation rate of 5%. But if the program affects 8,000 of the 25,000 fluorescent ballasts sold annually, the program achieves 32% market penetration. A program can also experience high program participation with low market penetration. For example, in a compact fluorescent program, 20% of eligible customers may participate; however, if these customers average one lamp each, perhaps only 5% of total incandescent lamps can be affected.

4.3.4.3 Energy and Demand Impacts

Analyses conducted during the measure screening and savings potential of the program process will typically produce projections of measures' energy and demand impacts. While these are valuable guidelines, it may be necessary to refine the assumptions and redo the analysis once the specific program features have been selected. Two kinds of refinements usually need to be made:

- **Per-Unit Savings Assumptions:** For planning purposes, the general characteristics of the technology and the equipment it will replace are sufficient. As the program design process more carefully identifies eligible equipment and the typical equipment to be replaced, the per-unit energy and demand impacts may need to be adjusted.
- **Number of Units Installed:** Planning may project participation rates based on the size of the eligible population and penetration rates based on total sales of target equipment types. However, program constraints such as funding, time, and market barriers can limit the actual number of eligible customers enrolled within a given timeframe. Estimates of load impacts may need to be refined according to actual expected participation rates and the number of units to be installed per customer.

The complexity of these refinements depends on the type of program. It is simplest to develop impact estimates for programs that offer fixed incentive payments. Refining energy and demand impact estimates can be more complicated when there are multiple rebates for multiple equipment types, tiered rebates, customized/calculated rebates, or more complicated incentive structures or packages of services.

4.4 DESIGNING PROGRAMS FOR SPECIFIC MARKETS

As mentioned at the beginning of this chapter, it is prudent to start designing programs for customers and market segments with the potential to yield the largest impact on desired energy and peak load objectives. Depending on the markets that fit this bill in a given service territory, the program design approach will likely differ. That is, targeting markets requires different techniques depending on whether they comprise residential, commercial, or industrial customers.

For example, there are specific market barriers for residential customers that often inhibit these customers from participating in energy efficiency programs, such as:

- **Lack of Capital and Borrowing Power:** Many residential customers have limited disposable income available to purchase energy-efficiency measures, despite the long-term bill savings associated with these measures.
- **Rental Market:** Multifamily dwellings and renter-occupied housing is a difficult market segment because the costs and benefits of the installations are borne by and benefit different stakeholders. Owners incur the costs, but tenants benefit from the savings.

- **Access to Information:** Typically, residential consumers have limited access to information regarding energy savings opportunities and available energy services. Consequently, lost opportunities for energy efficiency improvements are prevalent in this sector.

The energy efficiency program should be designed to overcome these market barriers with focused market segmentation, targeted information, and effective financial incentives. It is often wise for utilities beginning to initiate energy efficiency programs to leverage the success of widely recognized, “canned” products and programs for residential customers, such as Energy Star. Point-of-sale instant rebates, manufacturer upstream buy-down, and prescriptive rebates are also effective program strategies for residential customers.

For commercial customers, there are several types of programs that have proven to be successful. In particular, prescriptive rebates, direct install, and customized incentives are well matched to the commercial sector. Table 4-8 summarizes each of these program types.

Table 4-8 Examples of Successful Programs Types for Commercial Customers

Program Type	Description
Prescriptive Rebates	For each qualifying measure a prescribed, or deemed, rebate amount is offered. For commercial customers, contractors typically drive the recruitment process for programs with low to medium incentives since their contact with customers through the course of normal business provides a low marginal cost opportunity for program marketing. In programs with higher incentives and energy savings, utilities can justify committing more of their staff time to the direct support of marketing, often in the form of contractor education and training.
Direct Install	A direct install program is a turnkey approach designed to cover all aspects of measure installation for the customer. Because commercial customers (especially small businesses) usually don't have the expertise nor the capital required to implement energy efficiency measures, direct install programs are instrumental in helping them achieve energy cost reductions.
Customized Incentives	Customized incentives allow for greater flexibility in the use of measures and in determining measure incentive levels. The incentives are in the form of dollars per kWh saved or dollars per kW reduced. They are typically used for large commercial customers. The administrative costs associated with customized projects are significantly higher than prescriptive rebates due to the additional calculation and verification efforts required, but the project savings are also higher.

Source: Adapted from Strategies for Electric Energy Efficiency Programs, Tech Review, Global Energy Partners, LLC, Walnut Creek, CA: 2009.

For industrial customers, an entirely different method may be required for successful program design. Global's experience has shown that it is best to approach industrial customers directly to identify opportunities for energy savings. Then, these opportunities can be offered to other similar customers. Industrial customers respond very well to hand-in-hand interaction and support. Working closely with the large industrial loads to design customized or semi-customized programs is likely to yield the best results.

Programs with customized incentives help overcome two of the major barriers to implementing energy efficiency improvements in both the commercial and industrial sectors:

1. **Economics:** Custom rebates adjust the project economics so that the project can pass the customer's economic screening criteria.
2. **Lack of Technical Staff:** The utility provides an energy expert that can be trusted to offer an unbiased opinion on the best energy-efficient options.

In development of the recent best practices report for EPRI, Global and EES Consulting, Inc. synthesized information gathered during discussions with utility program staff as well as from a review of program-related documents to list some of the key challenges faced by residential and commercial/industrial programs. Table 4-9 and Table 4-10 summarize these challenges, list key factors that have contributed to program success, and offer specific examples of successful programs.

Table 4-9 Synthesis of Key Challenges and Success Factors for Selected Energy Efficiency Programs in the Residential Sector

Key Challenges	Key Success Factors	Program Example
Residential Conservation		
<ul style="list-style-type: none"> Keeping customers abreast of technology developments Providing easy access to pay portals 	<ul style="list-style-type: none"> Enhancing customer knowledge and control over their consumption 	Salt River Project: M-Power
Residential Lighting		
<ul style="list-style-type: none"> Low customer motivation, especially if electricity prices are low Allocating necessary utility resources toward marketing and outreach efforts Overcoming customer experience or perception of poor quality products CFL disposal issues 	<ul style="list-style-type: none"> Aggressive customer awareness and outreach efforts Strong publicity campaigns Leveraging Energy Star brand Building and maintaining relationships with manufacturers and retailers 	Georgia Power: Energy Star Change a Light Campaign Snohomish County PUD: Residential CFL Program
Residential Load Management		
<ul style="list-style-type: none"> Obtaining customer trust to install equipment Addressing customer complaints unrelated to the program Low level of customer motivation if electricity prices are low 	<ul style="list-style-type: none"> Simple program design Widespread customer awareness and outreach efforts Establishing system reliability Maintaining continuity in customer participation Building strong customer relationships Providing customer choice and control on electricity usage 	Florida Power & Light: Residential On Call Gulf Power: Good Cents Select
Residential New Construction		
<ul style="list-style-type: none"> Generating interest in the program by all parties Maintaining consistent expectations among builders and energy raters 	<ul style="list-style-type: none"> Energy Star name recognition Building and maintaining relationships with builders and raters 	CenterPoint Energy: Energy Star New Home Oncor Electric Delivery: Energy Star Homes Program
Low Income Program		
<ul style="list-style-type: none"> Building customer trust and confidence Dealing with rapid turnaround in contractor workforce responsible for delivery 	<ul style="list-style-type: none"> Delivering non-energy benefits, such as comfort and safety Engendering participant trust through program stability and continuity Successful education and outreach efforts Partnering with community-based organizations for effective delivery 	Pacific Gas & Electric: Energy Partners

Source: Adapted from *Best Practices in Energy Efficiency and Load Management Programs*. EPRI, Palo Alto, CA 2008. 1016383.

Table 4-10 Synthesis of Key Challenges and Success Factors for Selected Energy Efficiency Programs in the Commercial and Industrial Sectors

Key Challenges	Key Success Factors	Program Example
Commercial and Industrial Energy Efficiency		
<ul style="list-style-type: none"> Incorporating flexible incentives to fit different customer requirements, while keeping program design simple 	<ul style="list-style-type: none"> Simplicity in program design Strong financial incentives Keeping customer's financial bottom-line in mind Strong customer relationships/ maintaining close contact with customers directly and through contractors 	Alliant Energy: Shared Savings Program
Commercial and Industrial New Construction		
<ul style="list-style-type: none"> Generating interest from designers, builders, and owners Shortage of qualified staff 	<ul style="list-style-type: none"> Building broad awareness Starting with a pilot program and expanding Staff development and training Flexible approach Full energy simulation capability 	We Energies: C/I New Construction Program
Commercial and Industrial Retrofit Programs		
<ul style="list-style-type: none"> Need to conform to new/increased codes and standards Interactions with regulators 	<ul style="list-style-type: none"> Flexibility in accommodating different measures Stakeholder collaborative process in designing programs Highly skilled utility staff Contractor capacity building Contractor-customer relationships 	Connecticut Light and Power: Energy Opportunities
Commercial and Industrial Niche Programs		
<ul style="list-style-type: none"> Accommodating industry requirements Obtaining customer interest for participation Addressing differences in the way the new technology is used 	<ul style="list-style-type: none"> Targeting niche, high-growth industries Dynamic program design to fit market requirements Forming partnerships and collaborations with related groups Integrating energy efficiency into customers' business strategies Achieving more than just the energy benefits 	Pacific Gas & Electric: High Tech Energy Efficiency Program Salt River Project: Pre-Rinse Spray Valves
Commercial and Industrial Small Business Programs		
<ul style="list-style-type: none"> Developing web-based delivery infrastructure Bringing vendors up to speed 	<ul style="list-style-type: none"> Making program participation as simple as possible Building a strong network of vendors 	Southern California Edison: Express Efficiency Rebate Program

Source: Adapted from *Best Practices in Energy Efficiency and Load Management Programs*. EPRI, Palo Alto, CA 2008. 1016383.

IMPLEMENTING PROGRAMS

Once a program has been designed and its cost-effectiveness has been analyzed to determine the program potential, the program is ready for delivery and execution. The implementation step in the energy efficiency process is where the program is tested in practice. The success of a program depends on how well the marketing plan is designed and executed and how well the implementation staff is managed.

Managing energy efficiency programs during the implementation phase necessitates a commitment by upper management to resolve organizational issues and it can involve significant financial and human resources. In some cases, this step requires cooperation of trade allies, contractors, and others outside of the utility.

This chapter presents a practical approach to implementing programs. It begins by listing key elements of the program implementation phase. Next, it explains when to use pilot programs and when it is appropriate to jump into full scale programs. It then addresses the resources needed for program implementation. The chapter ends by providing case study examples of implementation strategies and successes.

5.1 KEY ELEMENTS OF PROGRAM IMPLEMENTATION

Global and EES Consulting, Inc. recently conducted a review of best practices in energy efficiency programs for EPRI. The results of the study identified several key elements related to successful program implementation.¹⁵ Table 5-1 summarizes these important elements. Experience shows that understanding and applying these elements will help ensure program success.

5.2 PILOT VERSUS FULL-SCALE PROGRAMS

Many utilities start with pilot programs in order to develop and refine the knowledge and skills required to implement the programs. Pilot programs help utilities determine the aspects of programs that work and the aspects that need to be revised. They also test the accuracy of impact estimates and customer acceptance rates as well as provide an opportunity to test data collection procedures and analysis methods – all without high expenditures. They are small enough in scale and visibility that they allow for modifications in program design and features before full-scale implementation. Pilot programs make sense as a first step in several situations, such as:

- For particularly innovative programs that are new to the industry;
- When utility staff has limited experience with energy efficiency programs;
- When utility staff has limited experience working with trade allies and wants to establish relationships prior to full-scale implementation; or
- When the cost of rolling out the full-scale program is very high.

Thus, pilot programs offer an opportunity to test a program, find out what works, and then fine-tune the design as well as the estimates of impacts and costs.

¹⁵ For more best practices information, please refer to *Best Practices in Energy Efficiency and Load Management Programs*. EPRI, Palo Alto, CA 2008. 1016383.

Table 5-1 Key Elements of Successful Program Implementation

Element	Description
Enhance Program Success through Collaborative Efforts	Collaboration with other entities (energy organizations, utilities, manufacturers, or otherwise) is an important part of successful program implementation. Before launching a program, it is advisable to research similar activities at the national, state, regional, or local level being undertaken by other organizations addressing the same technology categories or targeted customer segments. Most organizations engaged in influencing the adoption of energy efficiency welcome partnership and collaboration with utilities.
Build Networks and Alliances with other Relevant Groups	Developing alliances with other energy or environmental organizations (such as state energy agencies, environmental advocacy groups, industry trade associations, third-party program administrators, and other utilities) helps to increase participation by broadening program awareness. Working with these organizations provides access to their constituents and the opportunity to leverage funding, marketing opportunities, and/or energy efficiency education and training.
Coordinate with other Utilities and Program Administrators	Coordinating with other organizations administering similar programs can improve the efficiency of operation and help to prevent reinventing the wheel. In addition, developing regional or nationwide coalitions and consistency among programs helps to increase momentum of the programs.
Establish Strong Customer Education and Outreach Efforts	Customer education and outreach is a key component of successful programs, particularly during the early years of program implementation. Successful programs take advantage of existing utility channels (such as the utility website, call centers, bill stuffers, targeted newsletters, and public media) to provide information and service offerings to customers in an easy-to-understand and familiar manner.
Integrate Energy Efficiency into Customers' Business Strategies	A key element of program implementation is to show how energy efficiency improvements are linked to bottom-line benefits for customers. Program acceptance is increased when the benefits are expressed in appropriate terms the customer can relate with, such as payback period, rate of return, and net present value.
Deliver Non-Energy Benefits	Successful programs deliver more than just energy and cost-saving benefits to customers; they also increase the functionality of the end-use process. Ideally, the technologies will offer benefits that improve the customer's way of life – better illumination, less noise, cleaner air, increased productivity, etc. Utility outreach should highlight non-energy benefits of the technologies to increase customer acceptance.
Undertake Efforts to Build Contractor Infrastructure	Many successful programs build a strong contractor infrastructure for program implementation. Such an infrastructure ensures that local contractors are provided with the necessary information and convenient, low-cost training on promoted technologies. A lack of infrastructure can constrain deployment of energy efficiency programs.
Foster Trade Ally Relationships	Many successful utility programs rely on trade allies such as electrical and mechanical contractors, architecture and engineering design firms, and builders to market to customers. Strong and sustained relationships with trade-allies are essential since these allies have direct contact with customers and are well-positioned to promote programs. Collaboration with manufacturers, retailers, and distributors is also important through mechanisms such as training.
Foster Utility-Customer Relationships	It is essential to foster positive relationships with customers to gain their trust in the benefits of energy efficiency programs.

Element	Description
Build Customer-Contractor Relationships	Successful programs help implementation contractors build strong relationships with customers. A good customer-contractor relationship is important for the utility, as customers often view contractors as an extension of the utility. Actions such as regular monitoring of contractor performance, work quality, and customer satisfaction through participant surveys can help build this relationship.
Maintain Strong In-House Capabilities	Successful programs have dedicated staff knowledgeable about the latest advancements in energy efficiency technologies and with a good understanding of the marketplace. Even if a program is operated by a 3rd party contractor, in-house expertise is still necessary to monitor and verify program operation and results. This expertise can be maintained by providing on-going training to account managers and other marketing staff.
Maintain Consistency over Time	After the initial start-up period, successful programs strive for consistency over time. This consistency helps sell the programs because trade allies and customers increasingly understand the program characteristics and learn to depend on the services and incentives being offered. Program disruptions or frequent changes are frustrating to trade allies and confusing to potential participants.
Undertake Program Publicity Campaigns	Some programs benefit from periodic publicity campaigns to supplement or replace ongoing marketing. Contractors often appreciate new utility energy efficiency program publicity campaigns as a means to boost customer interest in their services.

Source: Adapted from Best Practices in Energy Efficiency and Load Management Programs. EPRI, Palo Alto, CA 2008. 1016383.

On the other hand, if the utility has experienced staff and/or the program is not particularly innovative or costly, it may be appropriate to proceed to full-scale program implementation. Full-scale program implementation is warranted for:

- A program that is a simple refinement of an existing, proven energy efficiency program offered by the utility;
- A program that is similar to programs offered by many other utilities;
- A utility that has prior experience in designing and running energy efficiency programs for its customer base;
- Cases when a significant lost opportunity would occur during the pilot phase; or
- A utility that urgently needs the energy efficiency resource, as long as the value of the resource gained is expected to exceed any additional costs associated with unproven program features.

Utilities just starting out with energy efficiency may want to consider beginning with pilot programs to test the market. Alternatively, utilities with limited experience could leverage lessons learned from other successful utility programs and jump into a straightforward full-scale program that mimics a proven, common program design. Either way, initial program attempts will provide the utility with valuable practical experience that will build with time as the utility expands its program offerings. After several years of experience, the utility is likely to include more specialized program features, more complex technologies, and more specialized markets in its program portfolio.

5.3 RESOURCE NEEDS

The three main categories of resource needs for implementing programs are human resources, financial resources, and trade allies. The following subsections describe how these resource types contribute to successful program implementation.

5.3.1 Human Resources

Knowledgeable people contributing to program implementation represent the backbone of a successful program. Delivering energy efficiency programs is labor intensive and requires personnel with a range of skill sets. The number of people involved in program implementation varies widely across program types depending on the size and complexity of the program and the size and experience of the utility. In some cases, utilities set up an implementation services department that consists of the personnel needed to carry out all tasks. In other cases, utilities contract people to perform specific tasks. In all cases, it is essential for the various human resources to work together. In general, the skills needed for implementing programs include:

- Marketing;
- Customer service;
- Engineering;
- Technology adeptness;
- Building design;
- Financial analysis;
- Data analysis; and
- Administration (e.g., tracking program activities and incentive payments).

Though all skills are important, the ability to market energy efficiency programs effectively is one of the key elements of successful program implementation. The marketing staff must know how to creatively sell the program to the appropriate customers in a way that yields the utility's desired energy and demand impacts.

Utilities new to the energy efficiency business may find it prudent to contract experienced people or organizations to carry out essential labor tasks, rather than set up a large in-house implementation team. With time, experience, and confidence, the utility may ultimately decide it makes sense to have more, or even the majority, of staff in-house.

5.3.2 Financial Resources

As opposed to the capital expense associated with building new generation capacity, designing and delivering an energy efficiency program is an operating expense. Utilities can spend on the order of a few million dollars per year to upwards of hundreds of millions of dollars per year on energy efficiency programs. The programs can involve anywhere from a few personnel to hundreds of personnel. Table 5-2 summarizes typical ranges of program budgets for small, medium, and large-scale utility programs.

Table 5-2 Typical Program Budgets for Energy Efficiency Programs

Small Utility or Initial Energy Efficiency Program	Medium Utility with Full Scale Energy Efficiency Program	Large Utility or Aggressive Energy Efficiency Program
\$2-5 million per year	\$10-40 million per year	\$50-200+ million per year

Source: Adapted from Energy Efficiency Planning Guidebook: Energy Efficiency Initiative. EPRI, Palo Alto, CA: 2008. 1016273.

Most of the program budget goes toward financial incentives to encourage customers to participate in the program. In some cases incentives account for as much as three-fourths of the budget. Other program expenses are in the form of marketing expenditures and payments to program implementation personnel, including utility staff and contractors.

5.3.3 Trade Allies

Trade allies include entities such as:

- Manufacturers;
- Suppliers;
- Distributors;
- Designers;
- Architects;
- Electrical contractors; and
- Mechanical contractors.

Trade allies are extremely valuable to program implementation. Many successful utility programs utilize trade allies to help promote and expand customer adoption of the programs. These allies also help minimize the two other main resources required for program implementation, namely human and financial resources. However, there is often a cost associated with training and supporting allies to ensure they represent the program well to the customers they interface with. Ultimately, the degree to which trade allies are employed to market to customers depends on specific program objectives. The advantages of relying heavily on the direct contact allies have with customers must be weighed with the advantages of controlling the marketing function in-house. Table 5-3 lists examples of the advantages of each approach.

Table 5-3 Example Trade-Offs of In-House and Trade Ally Marketing

In-House Marketing	Trade Ally Marketing
<p>Advantages:</p> <ul style="list-style-type: none"> • Maintain close contact with customers • Possibility to better target promising customers • In-house logistical and administrative ease <p>Disadvantages:</p> <ul style="list-style-type: none"> • Higher marketing and program delivery costs since infrastructure must be developed • Time for staff to develop contacts 	<p>Advantages:</p> <ul style="list-style-type: none"> • Established marketing infrastructure • Frequent direct contact with customers • Lower marketing and delivery costs <p>Disadvantages:</p> <ul style="list-style-type: none"> • Need for training on program specifics • Possibility for “selective” promotion • Possibility for over-promotion leading to backlogs and customer dissatisfaction

Source: Adapted from Energy Efficiency Planning Guidebook: Energy Efficiency Initiative. EPRI, Palo Alto, CA: 2008. 1016273

5.4 CASE STUDIES

The manner in which a program is implemented is very important. Programs that follow tried-and-true approaches are usually successful. However, in some cases programs attempt to promote novel, untested measures or they are aimed at hard-to-reach markets. In such cases, it is impossible to rely on proven program designs and implementation strategies – new approaches must be developed. When successful, these unique programs open the door to greater opportunities for energy savings and demand reductions.

The following subsections present case studies of program implementation for two types of programs: 1) energy efficiency in the hard-to-reach agriculture sector; and 2) Auto-DR (automated demand response) in the commercial and industrial sectors. Both case studies provide important lessons learned. The first case study describes a successful full-scale implementation of an agriculture energy efficiency program implemented by a third party contractor (Global). The second case study discusses the initial challenges of pilot program implementation efforts carried out by a utility for an Auto-DR program.

5.4.1 Case Study 1: Full-Scale Implementation of Energy Efficiency in the Agriculture Sector

Global has been a third-party implementer in a number of energy efficiency and demand response programs for California IOUs. Through this work, Global has helped achieve energy savings of over 213,000 MWh and demand reductions of more than 177 MW. This case study describes Global's implementation of an energy efficiency program for the California agriculture sector.

Energy efficiency programs targeted to agricultural customers have typically received far less attention than those in other sectors, in part due to the size of the market relative to the residential, commercial, and industrial sectors. However, energy use in the agricultural sector is large – approximately 950 trillion Btu a year in the U.S. Until recently, agricultural customers in California have been underserved by energy efficiency programs. While agricultural customers in California have been eligible to participate in energy efficiency rebate programs, those programs were neither tailored nor promoted to this market. Furthermore, these customers have been historically reluctant to embrace change, making them a relatively hard-to-reach group.

In late 2006, Southern California Edison contracted Global to launch *Ag Efficiency Plus*, a program targeted for the state's agricultural producers (growers and processors of all sizes). The program was offered between 2006 and 2008 with a goal to reduce net annual electricity use by about 1% (20 million kWh). This goal was exceeded, yielding energy savings of 23 million kWh.

5.4.1.1 *Ag Efficiency Plus Program Design*

Ag Efficiency Plus was an incentive and education program. The program goals were firmly focused on reducing electricity use through installation of energy efficient equipment in agricultural operations. Success was measured in savings generated by documented actions by the program participants.

The program design focused on identifying electricity-reducing opportunities for agricultural customers and enabling these customers to install energy efficient equipment. The two focal points of identifying opportunities and enabling action led to designing two "tracks" for enrolling participants in the program: audits and rebates.

- **Audits:** The audits provided on-site inspections of farms and processing facilities, followed by recommendations of specific rebate-eligible equipment measures that could improve the energy efficiency of operations. The audits were also a means by which to educate farmers and growers about the measures available to them, the energy and non-energy benefits they provide, and how to identify additional energy-saving opportunities. Anticipating that on-site audits could not be provided to all candidate participants, Global also built in less formal discussions and surveys with customers that could be conducted on-site or by phone. These communication channels typically focused on specific issues of concern to customers, or served a more focused campaign within the program. For example, this channel was used to

inform dairies about energy-efficient fan options as the summer approached, and to alert row crop farmers about drip irrigation prior to planting.

- **Rebates:** The rebates were intended to encourage and enable customer action. They were designed to cover all aspects of agricultural activities, including vegetable, grain, cotton, fruit and nut growing; dairying; ranching; crop packing; processing and storage; and also water supply. Rebates were offered for both farm-specific measures (e.g., milk precoolers) and more generally applicable ones (e.g., lighting fixtures). Additionally, consistent with other programs in California, rebates were divided into two categories of measures: itemized and calculated measures.
 - **Itemized Measures:** The itemized measure list consisted of over 150 measures that agricultural customers could choose from. The itemized measures were usually off-the-shelf equipment such as lighting fixtures and fans that were rebated at a fixed amount per item. Some measures were rebated based on size, such as acreage covered or motor horsepower size.
 - **Calculated Measures:** The calculated measures were more often tailored to the specific needs of the customer. These tended to be larger projects, often involving multiple pieces of equipment. The calculated measure projects often garnered larger rebates for their greater energy savings, and were more time-consuming since they required both pre- and post-inspections and site-specific calculations.

By offering two mechanisms for receiving rebates on energy-efficient installations, the program accommodated two desirable characteristics for a broad array of projects: 1) the speed and convenience of choosing off a list; and 2) the flexibility of developing custom projects.

The outreach component of Ag Efficiency Plus had a number of distinguishing features as well:

- First, agricultural customers could enroll in the program either by having an audit or by proceeding directly to installation of a rebate-eligible measure. With the two tracks, customers who had never considered energy efficiency improvements or needed help in evaluating different project and equipment options could obtain all the assistance they needed – ranging from identifying opportunities and understanding benefits of the alternatives to receiving technical advice.
- The second unusual feature for a full-scale, sector-wide program was that much of the outreach and participant assistance was conducted on-site. The program team consisted of a call center and field representatives. In the design, the call center was set up to address inquiries about the program from equipment vendors and/or customers, make a number of measure recommendations, and provide assistance with the audit and rebate paperwork. The field representatives would conduct audits, provide technical advice, make custom measure calculations, and perform whatever inspections might be necessary.
- A third key feature in the program design was the broad scope of the outreach. From the start, program awareness and energy-efficiency education was directed to the entire agricultural community. This meant not just the growers and processors but also local equipment dealers and contractors, associations, and farm lending bureaus. By directing promotional materials, educational sessions, and face-to-face contact to the broader set of agricultural market actors, Global made use of an influential supply chain for farm equipment decision makers. Even though this was a downstream program, meaning only the end users (farmers and processors who are the utility's customers) can receive the rebates, equipment vendors have a great deal of influence in farm equipment decisions and also benefit from a program that encourages new equipment purchases. The marketing plan contained waves of mailings to, and live contact with, the customers, the vendors, and the associations.

5.4.1.2 Crafting the Marketing Message

Electric bill reductions and environmental benefits that program implementers usually cite to advocate making energy efficiency improvements are not enough to get a farmer to make changes. Other costs loom large, such as labor and water, and there are other concerns, including productivity, hazardous waste, water policy, and market prices. The marketing effort needed to highlight at least one of these other issues to make the case for investing in energy efficiency.

While circumstances facing farm producers and processors make energy efficiency less attention-grabbing, some of the most pressing challenges to California farmers in 2007 (e.g. winter frost, summer *e. coli* outbreak, fires) actually provided Global with opportunities to address farmers' primary needs while making the case for participating in the program. For instance, water allocation cutbacks became more pressing in 2007, forcing farmers to think of new ways to keep their crops alive with less water. So, while replacing a functioning irrigation system is not something a grower would ordinarily embrace, documented evidence showing that changing from traditional flood-irrigation or high-pressure sprinklers to low-pressure drip irrigation significantly reduces water use attracted growers' interest in making the change. With rebates available for drip measures based on reduced electric pumping requirements, Global was able to craft an effective message about the Ag Efficiency Plus program specifically for crop, fruit, and nut growers: "*install drip irrigation to save crops and, by the way, save electricity.*"

The agricultural market, at least in California, is a collection of very diverse grower and processor markets—row crop growers, grain growers, fruit and nut tree growers, dairy farmers, hog and cattle ranchers, egg and poultry producers, citrus packers, juicing facilities, wineries, and more. The program message needed to tap into concerns of the grower or processor and be specific to their needs. The irrigation example in the previous paragraph is sufficient for many of the growers, but dairy farmers had a different pressing issue: keeping their livestock alive and producing milk during the heat wave that hit California that year. For that market segment, Global needed to highlight that Ag Efficiency Plus offers a variety of energy-efficient circulation fans at a time when dairy farmers were clamoring to buy any kind of fan that would provide relief. Accounting for differences in the types and seasonal timing of their various activities, Global developed a unique marketing message for each of the fourteen separate market segments.

5.4.1.3 Implementation Realities and Findings

Lessons learned through field implementation enabled Global to make adjustments to improve the program appeal to the decision makers in this market. The following are examples of field experience that can be applied to other similar programs:

- **Enrollment via audit turned out to be time-consuming and no more effective in generating projects than informal on-site visits.** Farmers and food processors are typically a cautious, risk-averse group. Perhaps this is why the more informal contacts, often focused on a specific aspect of the farm operation, were more effective than more sweeping audits; farmers and food processors exhibit a preference for observing success one measure at a time. However, numerous customers installed additional measures as their satisfaction with, and confidence in, the program grew. Repeat outreach to participants from the call center and/or field representatives was also important.
- **The majority of participants went straight to installations and rebate, with minimal oversight from the program implementer beyond making recommendations and confirming the eligibility of equipment for rebate.** Customers seemed happy to make use of the simplicity that the itemized measure category offered. Having the full list of measures available via web and printed claim forms was enough to spur customers to initiate projects.

- **More projects were completed when the field team saw farm and processing operations, made recommendations, and helped customers fill out paperwork.** This is not surprising, but the value of proactive support, rather than simple availability or reactive support, was proven during this program.
- **Having a call center to complement “boots on the ground” field support was worthwhile but required extensive real-time coordination.** Global had a real-time tracking system that accommodated notes from both the call center and field reps, and near daily calls between the two.
- **Promotion to, and networking with, vendors was key to attracting customers to the program and getting projects done with proper documentation to assure rebate approval.** What started as a promotional activity to this group evolved into collaboration as vendors notified Global of pending projects. Global also helped the vendors by ensuring that the projects were rebate eligible.
- **Bringing projects through to fruition (i.e., customer receipt of rebate) required more field representative support than was originally anticipated.** Even after investing substantial funding for installations, experience shows that a significant share of program participants would forego the submittal of the rebate claim unless an in-person request for signatures on the required paperwork was made.
- **Word-of-mouth among farmers led to customer-initiated inquiries and program-influenced projects.** This further underscores the effectiveness of working with customers throughout the process, from recruitment to installation to rebate claim. The call center/field representative combination made that kind of ongoing contact possible and effective.

In general, this program was a great success, exceeding program goals and doing so under budget. Being flexible and applying knowledge as it was obtained helped the implementation team achieve results in this hard-to-reach market segment.

5.4.2 Case Study 2: Pilot Scale Implementation of Auto-DR in the Commercial and Industrial Sectors

In 2007, the California Public Utilities Commission required California IOUs to deploy Auto-DR in their service territories as a way to augment their demand response programs. The following subsections describe one California utility's initial implementation experience with an Auto-DR pilot program in 2007.

5.4.2.1 Auto-DR

Auto-DR provides commercial and industrial customers with electronic, Internet-based price and reliability signals that are linked into the facility energy management control system (EMCS) and related whole-building controls. Auto-DR price and reliability signals trigger automatic customer-programmed load curtailment strategies. The Auto-DR price and reliability signals can be used to automate response to dynamic pricing as well as conventional interruptible and demand bid options. Enabling Auto-DR requires three basic technologies:

1. Price or reliability signal generator (DR Automation Server);
2. Communications device at each facility to receive the price and reliability signals (gateways and relays); and
3. Customer-provided EMCS or related system for lighting, HVAC and other systems.

One important concept in Auto-DR is that the participant should be able to “opt out” or “override” a demand response event if the event comes at a time when a reduction in end-use services is not acceptable.

Critical Peak Pricing (CPP) is a relatively new form of retail time-of-use rate (TOU) that relies on very high, critical peak prices, as opposed to the ordinary peak prices in TOU rates. A specified high per-unit rate for usage is in effect during times that the utility defines as critical peak

periods. CPP events may be triggered by system contingencies or high prices faced by the utility in procuring power in the wholesale market. Unlike TOU blocks, which are typically in place for 6 to 10 hours during every day of the year or season, the days in which critical peaks occur are not designated in the tariff, but dispatched on relatively short notice as needed, for a limited number of days during the year. Some utilities in California are using the CPP rate program, as well as other programs such as demand bidding, as a means for determining Auto-DR events (i.e. customers participating in Auto-DR would automatically curtail loads during CPP days).

5.4.2.2 Customer Recruitment

Shortly after the project's kick-off in early 2007, the utility prepared a list of customers with high potential for Auto-DR implementation. Customer participation in the CPP rate was a requirement and, thus, the list included about 50 customers that were either already on the CPP rate or appeared to have strong potential for financial benefits on the CPP rate. The approach was to have the account executives lead the customer recruitment efforts. Therefore, the utility organized a meeting to provide information concerning the Auto-DR Program and its related processes to the account executives. The account executives were then tasked with marketing the Auto-DR program to their customers through face-to-face meetings.

By the time the summer started (i.e., the demand response season), only a handful of customers had expressed interest in participating. One customer had the necessary hardware installed and software programmed at their facility in time to participate in an automated fashion in the summer CPP events; four other customers were expected to complete the Auto-DR system installation and programming by the end of 2007.

Several factors contributed to the limited customer participation:

- The 2007 pilot program was restricted to customers enrolled in the CPP program. However, the utility's account executives had difficulties getting customers to enroll into the CPP tariff, citing the CPP rate is a "tough sell."
- Most of the customers that were targeted by the utility were industrial customers. The process for getting industrial customers to become Auto-DR-enabled required more time than commercial customers because the complexity of industrial processes requires more in-depth analysis to determine the load shed potential as well as to understand how best to integrate the systems into the Auto-DR technology infrastructure and then to complete the installation.
- Many of the customers that were initially targeted by the utility were already enrolled in the CPP rate. Since many of these customers had permanently shifted their schedules to avoid operations during the CPP peak hours, they did not qualify for financial incentives provided under the Auto-DR program – that is, they had no additional loads that could be reduced during CPP events.

5.4.2.3 Implementation Issues

The primary issues observed during the utility's implementation of the Auto-DR pilot program are summarized below.

- **The method used by the utility to select customers to be targeted for Auto-DR resulted in a target list that almost entirely consisted of industrial customers.** An analysis of the CPP tariff by Lawrence Berkeley National Laboratory (LBNL) suggested that commercial customers can also be viable candidates for the CPP rate. This became a focus of subsequent recruitment efforts.
- **Account executives were utilized to market the Auto-DR pilot program directly to eligible customers.** Judging from the lag times it took to report on whether or not their customers were interested in Auto-DR and the recruitment realization rates, it appeared that many of the account executives had a difficult time selling the CPP program and/or Auto-DR to their customers. This points to the need for more training of the account executives so that they are better prepared to answer questions and address customers' concerns regarding the Auto-DR process and technical specifications.

- **The process for enabling industrial customers with Auto-DR required significantly more time and technical coordination than for commercial customers.** Industrial processes require more in-depth analysis of the load shed potential and determination of the specifics of how to integrate the systems into the Auto-DR technology infrastructure. The time required for a controls contractor to complete the installation of the Auto-DR system is also longer for industrial customers due to the sophistication of the hardware integration.
- **The utility decided to eliminate technical coordinators from the 2007 pilot program design.** Within the context of an Auto-DR program, technical coordinators are third-party contractors that ensure Auto-DR systems are installed correctly by the customer and help troubleshoot problems in the field. By not having technical coordinators, there were various technical challenges with the few installations that were put into place. For example, at one customer facility, there were technical issues with the hardware, but the customer's controls contractor's scope of services did not include commissioning services. As such, it was necessary for members of the utility's team to visit the customer's site to troubleshoot the system after installation.
- **The utility's staff served as the operator of the software platform utilized for Auto-DR.** However, the duties and responsibilities of the operator were not sufficiently defined and assigned to utility's staff. For instance, there were periods when communications with a customer's Auto-DR system went offline for a long period of time without being noticed by the staff.

5.4.2.4 Applying Lessons Learned

Since these initial pilot efforts took place, Auto-DR program implementation has made great strides. Many of these lessons learned have since been applied in subsequent pilot and full-scale Auto-DR programs in California. Global has been involved in many of the recent and on-going Auto-DR efforts, achieving over 60 MW of peak demand reduction for California IOUs since 2007.

CONCLUSIONS

Numerous important conclusions on how to plan, design, and implement energy efficiency programs can be drawn from this document. The primary conclusions are summarized below.

6.1 ENERGY EFFICIENCY AS A RESOURCE

- Energy efficiency is emerging as an important tool to individual utilities and entire US states in meeting increases in energy demands as well as in addressing climate change issues.
- There are currently 20 US states that have adopted Energy Efficiency Resource Standards (EERSs) in an effort to meet energy and greenhouse gas emission reduction goals. It is anticipated states that currently do not have an EERS will develop one in the near future.
- Under the proposed federal EERS retail electricity distributors would be required to attain 10% electricity savings by 2020 through energy efficiency gains.
- Energy efficiency gains are typically achieved through utility or third-party-operated energy efficiency programs targeting end-users.

6.2 FORMAL PLANNING

- Planning and designing programs can range from a relatively simple exercise to a multi-faceted complex study. The level of detail depends primarily on the commitment, resources, experience, goals, and customer base of the utility.
- To maximize energy savings and peak demand reductions in a given service territory, a systematic, formal approach to plan energy efficiency programs should be followed. However, this approach can be costly and time-consuming.
- The formal process discussed here involves nine steps: 1) establishing objectives; 2) baseline forecasting; 3) screening measures; 4) sizing up customer acceptance and response; 5) estimating savings potentials; 6) designing programs; 7) measuring cost-effectiveness of programs; 8) implementing and monitoring programs; and 9) evaluating, measuring, and verifying program impacts.

6.3 PRACTICAL PROGRAM DESIGN

- Though formal planning of energy efficiency programs has its place, for utilities just starting out in energy efficiency, it often makes sense to start with a simple planning study and small program design to prove to upper utility management that energy efficiency has the potential for significant impacts. The program can then be expanded once there is justification for additional financial resources to plan and design a larger, more detailed program.
- Rather than conducting an all-encompassing baseline forecast, screening the universe of every possible energy efficiency measure for all sectors, subsectors, and end-uses, and estimating the technical, economic, and achievable savings potentials, it may be wise for the utility to jump to the first step in the program design phase, which is to identify target markets and customer needs.
- It is prudent to start designing programs for customers and market segments with the potential to yield the largest impact on desired energy and peak load objectives. Depending on the markets that fit this bill in a given service territory, the program design approach will

likely differ. That is, targeting markets requires different techniques depending on whether they comprise residential, commercial, or industrial customers.

- It is essential to orient a program and marketing efforts to customer needs, concerns, and satisfaction. Then, the marketing effort must be refined to suit the products, incentives, mechanics of program delivery, and trade allies involved.
- When designing energy efficiency programs, there is no need to reinvent the wheel. For many program types, a significant amount of best practices information exists to help utilities get started.

6.4 IMPLEMENTING PROGRAMS

- The implementation step in the energy efficiency process is where the program is tested in practice. The success of a program depends on how well the marketing plan is designed and executed and how well the implementation staff is managed.
- Managing energy efficiency programs during the implementation phase necessitates a commitment by upper management to resolve organizational issues and it can involve significant financial and human resources. In some cases, this step requires cooperation of trade allies, contractors, and others outside of the utility.
- Utilities just starting out with energy efficiency may want to consider beginning with pilot programs to test the market. Alternatively, utilities with limited experience could leverage lessons learned from other successful utility programs and jump into a straightforward full-scale program that mimics a proven, common program design.
- Utilities new to the energy efficiency business may also find it wise to contract experienced people or organizations to carry out essential labor tasks, rather than set up a large in-house implementation team. With time, experience, and confidence, the utility may ultimately decide it makes sense to have more, or even the majority, of staff in-house.
- As opposed to the capital expense associated with building new generation capacity, designing and delivering an energy efficiency program is an operating expense. Utilities can spend on the order of a few million dollars per year to upwards of hundreds of millions of dollars per year on energy efficiency programs.
- The manner in which a program is implemented can make or break a program. Programs that follow tried-and-true approaches are usually successful; however, in some cases programs attempt to promote novel, untested measures or they are aimed at hard-to-reach markets. In such cases, it is impossible to rely on proven program designs and implementation strategies – new approaches must be developed.

ABOUT GLOBAL

Established in 1998, Global Energy Partners, LLC is a premier provider of energy and environmental engineering and technical services to utilities, energy companies, research organizations, government/regulatory agencies and private industry.

Global's offerings range from strategic planning to turn-key program design and implementation and technology applications.

Global is an employee-owned consulting organization committed to helping its clients achieve strategic business objectives with a staff of world-class experts, state of the art tools, and proven methodologies.

Global Energy Partners, LLC

500 Ygnacio Valley Road, Suite 450

Walnut Creek, CA 94596

P: 925.482.2000

F: 925.284.3147

E: globalhq@gepllc.com

