



National Action Plan for Energy Efficiency  
**Vision for 2025:**  
Developing a Framework for Change

A RESOURCE OF THE NATIONAL ACTION PLAN FOR  
ENERGY EFFICIENCY

NOVEMBER 2007

## Letter from the Co-Chairs of the National Action Plan for Energy Efficiency

To all,

As you know, the National Action Plan for Energy Efficiency is playing a vital role in advancing the dialogue and the pursuit of energy efficiency in our homes, buildings, and industries—an important energy resource for the country.

With the commitment and leadership from more than 60 diverse organizations nationwide we have made great progress in a short time. We have:

- Developed five broad and meaningful recommendations for pursuing cost-effective energy efficiency.
- Brought together more than 100 organizations from 50 states around this common goal to take energy efficiency to the next level.

However, there is much more to do. We remain substantially underinvested in efficiency at a time when using energy wisely can help address rising energy costs, rising emissions of greenhouse gases, and our dependence on foreign fuel supplies.


We need a concerted, sustained effort to overcome what are truly surmountable hurdles to making energy efficiency a larger part of our supply picture. To continue our progress we need to move from our initial Action Plan to implementation. We need a vision for where we want to be and a path for getting there.

Commensurate with that goal, we are pleased to offer this 2025 Vision for the National Action Plan. This Vision outlines what our long-term goals should be if we are to truly achieve all cost-effective energy efficiency. This Vision outlines what we consider are ten key implementation goals as well as the steps we need to take to achieve them. It is a framework for changing our course on energy efficiency.

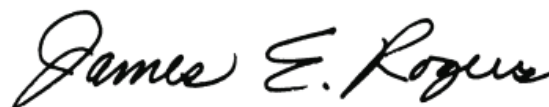
This Vision represents the thinking of many leading organizations nationwide. Importantly, we believe that this Vision is a living document that looks out to long-term needs and will be modified to reflect new information and changing conditions.

We thank the Leadership Group for its contribution to this document. It is a pleasure to work with this committed group to advance energy efficiency to address the critical energy and environmental issues facing the country.

Sincerely,

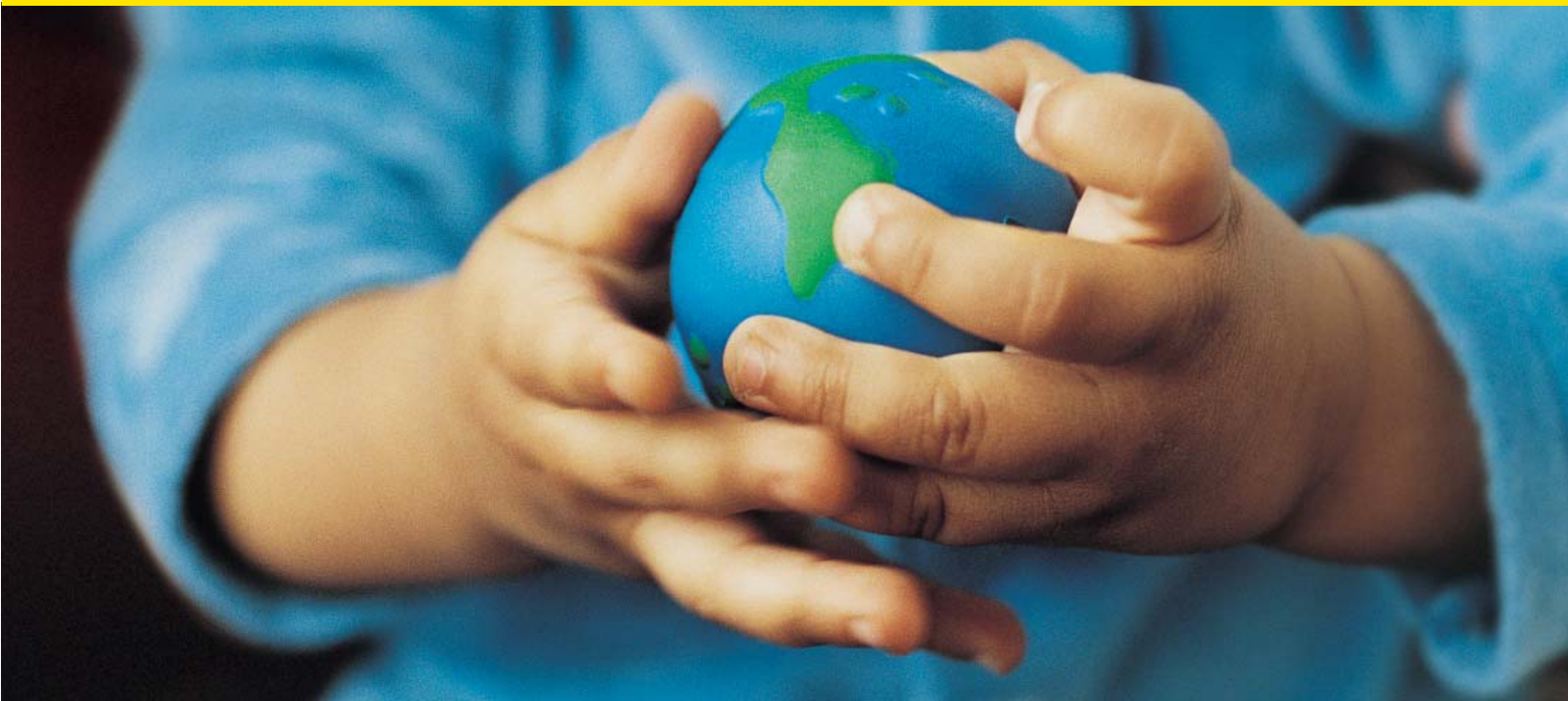


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The Vision is a product of the National Action Plan for Energy Efficiency Leadership Group and does not reflect the views, policies, or otherwise of the federal government. The role of U.S. DOE and U.S. EPA is limited to facilitation of the Action Plan.

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<[www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan)>

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## List of Abbreviations and Acronyms

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### A

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**ACEEE** American Council for an Energy-Efficient Economy

**AMI** advanced metering infrastructure

### B

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**Btu** British thermal unit

### C

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**CO<sub>2</sub>** carbon dioxide

### D

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**DOE** U.S. Department of Energy

### E

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**EERE** U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy

**EIA** Energy Information Administration

**EM&V** evaluation, measurement, and verification

**EPA** U.S. Environmental Protection Agency

### F

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**FERC** Federal Energy Regulatory Commission

### G

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**GJ/t** gigajoules per tonne

**GW** gigawatt

**GWh** gigawatt-hour

### H

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**HVAC** heating, ventilation, and air conditioning

### I

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**ISO** independent system operator

### K

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**kW** kilowatt

**kWh** kilowatt-hour

### L

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**LIHEAP** Low Income Home Energy Assistance Program

### M

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**MEEA** Midwest Energy Efficiency Alliance

**MMBtu** million British thermal units

**MMcf** million cubic feet

**MtC** metric tonnes of carbon

**MtCO<sub>2</sub>e** metric tonnes of carbon dioxide equivalent

**MW** megawatt

**MWh** megawatt-hour

### N

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**NARUC** National Association of Regulatory Utility Commissioners

**NEEA** Northwest Energy Efficiency Alliance

**NEEP** Northeast Energy Efficiency Partnership

**NYSERDA** New York State Energy Research and Development Authority

### P

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**ppm** parts per million units



## List of Abbreviations and Acronyms

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### R

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<b>R&amp;D</b>	research and development
<b>RRP</b>	regional resource planning

### S

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<b>SEEA</b>	Southeast Energy Efficiency Alliance
<b>SWEEP</b>	Southwest Energy Efficiency Partnership

### T

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<b>Tcf</b>	trillion cubic feet
<b>TWh</b>	terawatt-hour

### W

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<b>WAP</b>	Weatherization Assistance Program
<b>WGA</b>	Western Governors' Association



# Executive Summary



*This Vision for the National Action Plan for Energy Efficiency establishes a goal of achieving all cost-effective energy efficiency by 2025; presents ten implementation goals for states, utilities, and other stakeholders to consider to achieve this goal; describes what 2025 might look like if the goal is achieved; and provides a means for measuring progress. It is a framework for implementing the five policy recommendations of the Action Plan, announced in July 2006, which can be modified and improved over time.*

## Background

Through the Leadership Group of the National Action Plan for Energy Efficiency (Action Plan), more than 60 diverse leading organizations recognized the importance of bringing greater emphasis to the role that cost-effective energy efficiency<sup>1</sup> can and should play in supplying our future energy needs. Improving the energy efficiency of homes, businesses, schools, governments, and industries—which consume more than 70 percent of the natural gas and electricity used in the United States—is one of the most constructive, cost-effective ways to address the challenges of high energy prices, energy security and independence, air pollution, and global climate change in the near future. Energy efficiency can play a significant role in meeting our energy requirements, and it is a critical component of the overall modernization of utility energy systems worthy of the 21st century.

Despite the value that cost-effective energy efficiency offers, it is not achieving its full potential for a number of reasons. In July 2006, the Action Plan presented five key policy recommendations for fully developing the cost-effective energy efficiency resources in this country, building upon experiences in particular states and regions. It was a call to action to take investment in energy efficiency to the next level. As of November 2007, more than 100 organizations have endorsed these recommendations and/or made commitments to take energy efficiency to the next level within their spheres of influence.

As a next step, the Action Plan co-chairs challenged the Leadership Group to define a vision that would detail

the steps necessary to fully implement the Action Plan. The Vision presented in this document is the response to that challenge. It includes establishment of a long-term aspirational goal and ten key implementation goals. It also describes what 2025 could look like if the long-term goal were achieved and provides a means for measuring progress over time. The Vision is provided as a framework to guide the changing policies toward energy efficiency for natural gas and electricity; it can be modified and improved over time.

## Achieve All Cost-Effective Energy Efficiency

The long-term aspirational goal for the Action Plan is to achieve all cost-effective energy efficiency by the year 2025. Based on studies, the efficiency resource available may be able to meet 50 percent or more of the expected load growth over this time frame, similar to meeting 20 percent of electricity consumption and 10 percent of natural gas consumption.<sup>2</sup> The benefits from achieving this magnitude of energy efficiency nationally can be estimated to be more than \$100 billion in lower energy bills in 2025 than would otherwise occur, over \$500 billion in net savings, and substantial reductions in greenhouse gas emissions.

Importantly, the energy efficiency resource's role in meeting load and load growth may vary across the country due to regional differences in growth patterns, costs of energy, and other factors. Furthermore, the long-term goal is not a statement about the need for new power

supply additions in the future, as new plants may be a critical component of the desired modernization of the energy supply and delivery system. However, the greater the energy efficiency savings, the greater the likelihood that efficiency gains can help replace older, less efficient power supply options, resulting in substantial environmental benefits.

## Ten Implementation Goals

The Vision suggests that implementation of a number of policies will enhance the likelihood that the long-term goal will be achieved. Energy efficiency needs to be valued similarly to supply options. Utilities and investors need to be financially interested in saving energy. State activity is key in this transformation of natural gas and electricity supply and delivery, including updating and enforcing codes and standards to ensure that savings are captured as new buildings and products enter the system. Customers must also have the proper incentives to make investments in cost-effective energy efficiency. With such policies in place, cost-effective energy efficiency can be a key component of the modernization of the energy supply and delivery system and help to transform how customers receive and value energy services.

These policies are included in the following ten implementation goals. These goals provide a framework for implementing the recommendations of the Action Plan by outlining the key steps state decision-makers should consider to help achieve the 2025 Vision. The time line for achieving these implementation goals is by 2015 to 2020, so that the necessary policy foundation is in place to help ensure success of the 2025 Vision.

### Goal One: Establishing Cost-Effective Energy Efficiency as a High-Priority Resource

Utilities<sup>3</sup> and applicable state agencies are encouraged to:

- Create a process to explore the energy efficiency potential in the state and commit to its full development.
- Regularly identify cost-effective energy efficiency potential in conjunction with state rate making bodies.

- Set energy savings goals consistent with the cost-effective potential.
- Integrate energy efficiency into energy resource plans at the utility, state, and regional levels.

### Goal Two: Developing Processes to Align Utilities Incentives Equally for Efficiency and Supply Resources

Applicable state agencies are encouraged to:

- Work with utilities to implement revenue mechanisms to promote utility and shareholder indifference to supplying energy savings, as compared to energy generation options.
- Consider how to remove utility disincentives to energy efficiency such as by removing the utility throughput disincentive and exploring other rate making ideas.
- Ensure timely cost recovery in place for parties that administer energy efficiency programs.

### Goal Three: Establishing Cost-Effectiveness Tests

Applicable state agencies along with key stakeholders are encouraged to:

- Establish a process to examine how to define cost-effective energy efficiency practices that capture the long-term resource value of energy efficiency.
- Incorporate cost-effectiveness tests into rate making procedures going forward.

### Goal Four: Establishing Evaluation, Measurement, and Verification Mechanisms

State rate making bodies are encouraged to:

- Work with stakeholders to adopt effective, transparent practices for the evaluation, measurement, and verification (EM&V) of energy efficiency savings consistent with establishment of rate making incentives.

Program administrators are encouraged to:

- Conduct EM&V consistent with these practices.

### **Goal Five: Establishing Effective Energy Efficiency Delivery Mechanisms**

Applicable agencies are encouraged to:

- Clearly establish who will administer energy efficiency programs.
- Review programs, funding, customer coverage, and goals for efficiency programs; ensure proper administration and cost recovery of programs, as well as ensuring that goals are met.
- Establish goals and funding on a multi-year basis to be measured by evaluation programs established.
- Create public education programs for energy efficiency.
- Ensure that best practice information is shared regionally and nationally.

### **Goal Six: Developing State Policies to Ensure Robust Energy Efficiency Practices**

Applicable agencies are encouraged to:

- Have a mechanism to review and update building codes.
- Establish enforcement and monitoring mechanisms of energy codes.
- Adopt and implement state-level appliance standards.
- Develop and implement lead-by-example energy efficiency programs at the state and local levels.

### **Goal Seven: Aligning Customer Pricing and Incentives to Encourage Investment in Energy Efficiency**

Utilities and state rate making bodies are encouraged to:

- Examine, propose, and modify rates considering impact on customer incentives to pursue energy efficiency.
- Create mechanisms to reduce customer disincentives for energy efficiency (e.g., financing mechanisms).

### **Goal Eight: Establishing State of the Art Billing Systems**

Utilities are encouraged to:

- Work with large customers to develop methods of supplying consistent energy use and cost information across states, service territories, and the nation.

### **Goal Nine: Implementing State of the Art Efficiency Information Sharing and Delivery Systems**

Utilities and other program administrators are encouraged to:

- In conjunction with their regulatory bodies, explore the development and implementation of state of the art efficiency delivery information, including smart grid infrastructures, data analysis, two-way communication programs, etc.
- Explore methods of integrating advanced technologies to help curb demand peaks and monitor efficiency upgrades to prevent equipment degradation, etc.
- Coordinate demand response and energy efficiency programs to maximize value to customers.
- Support development of an energy efficiency services and program delivery channel (e.g., quality trained technicians).

### **Goal Ten: Implementing Advanced Technologies**

Applicable state agencies and utilities are encouraged to:

- Review advanced technologies such as batteries, strategically integrated solar facilities, and other clean distributed generation forms; ensure their adaptation into the broader resource plans for efficiency achievements.
- Work collectively to review advanced technologies and determine rapid integration time lines.

## The Energy System in 2025

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An energy system in 2025 that would evolve with the suite of energy efficiency policies in place as outlined above and that captures all cost-effective energy efficiency will be different from the one we have today. Some of the key differences based on the effects that some of these policy changes are having in parts of the country, as well as expectations of some of the advantages that new technology and system modernization can bring, are highlighted below from the perspectives of the energy customer and society.

- **Customers** across the residential, commercial, and industrial sectors would have ready, uniform access to comprehensive energy efficiency services across the country. These services would bring a range of efficiency improvements to homes, buildings, and facilities and reduce customers' bills below what they would have been without these programs. Customers would also have clear information on the cost of energy and increased awareness of their total energy use. In addition, new efficient appliances and other equipment will help to control the peak demand of utility systems and give large customers greater flexibility in how they manage and control their own operations to reduce energy use, reduce costs, and increase their own competitive positions. New homes and buildings would meet up-to-date energy codes.
- **Society** would benefit from significantly modernized energy supply, transmission, and distribution systems and, with increased investment in cost-effective energy efficiency, would benefit from lower overall cost of energy supply, increased fuel diversity, and lower emissions of air pollutants and greenhouse gases. The low-income populations would benefit, in particular, from the lower energy bills resulting from a commitment to deliver energy efficiency to these customer classes. Society may also see economic benefits from the greater employment necessary to build an industry capable of delivering energy efficiency services at this broad scale, from a robust business in energy

efficiency products and services, and from using more capital locally.

## Measuring Progress

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Measurement of the progress toward full implementation by 2015 to 2020 is an important part of the Vision. Progress will be measured and reported on every few years. As of 2007, based on information collected from across the country, there is a strong basis of experience with these energy efficiency policies upon which to draw and to expand. For example, more than a dozen states that are looking to advance energy efficiency have:

- Established a policy to recognize energy efficiency as a high-priority resource.
- Identified the cost-effective, long-term potential for energy efficiency and established energy savings goals consistent with this potential.
- Established cost-effectiveness tests for energy efficiency consistent with the long-term benefits of energy efficiency.
- Established tailored energy efficiency programs for their various types of customers.
- Integrated the energy efficiency savings goals into state energy resource plans.

There is also more progress to make. For example, a few additional states have also looked to the following policy steps to advance energy efficiency:

- Aligned utility incentives with the delivery of cost-effective energy efficiency.
- Provided for stable (multi-year) funding for energy efficiency programs.

Beyond the adoption of the key policies and programs at the state level, progress will be measured in terms of:

- Energy expected to be saved through energy savings goals (kWh, kW, and therms).

- Energy that has been saved (kWh, kW, and therms).
- Reductions in emissions of carbon dioxide.
- Dollars invested in energy efficiency programs.
- Cost-effectiveness of energy efficiency program delivery.

## Next Steps

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This Vision is offered as a framework to assist change in energy efficiency and related policies and programs at the state level across the country, toward the goal of achieving all cost-effective energy efficiency in 2025. It presents a snapshot of where the country is in 2007 based on the collection and organization of available state-level information on the existing policy and program options. This snapshot, as well as other elements of the Vision, will be updated as new information becomes available and improved as information changes. People are encouraged to provide additional information and their comments for

how to refine this Vision to the Action Plan Leadership Group. Please send feedback to the Action Plan sponsors via Larry Mansueti, U.S. Department of Energy (lawrence.mansueti@hq.doe.gov, 202-586-2588) and Stacy Angel, U.S. Environmental Protection Agency (angel.stacy@epa.gov, 202-343-9606).

## Notes

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1. "Energy efficiency" refers to using less energy to provide the same or an improved level of service to the energy consumer in an economically efficient way. As used here, the term includes using less energy at any time, including at times of peak demand through demand response and peak shaving efforts.
2. The energy efficiency savings as a percent of load growth and savings depend on forecast assumptions used and vary by region. This magnitude of savings is consistent with the potential savings documented in a number of recent studies. See Appendix B for references for these studies.
3. "Utility" refers to any organization that delivers electric and gas utility services to end-users, including investor-owned, cooperatively owned, and publicly owned utilities.





# 1: Introduction



*Improving the energy efficiency of homes, businesses, schools, governments, and industries—which consume more than 70 percent of the natural gas and electricity used in the United States—is one of the most constructive, cost-effective ways to address the challenges of high energy prices, energy security and independence, environmental concerns, and global climate change in the near term (Figure 1-1). Mining this efficiency could help us meet on the order of 50 percent or more of the expected growth in U.S. consumption of electricity and natural gas in the coming decades, yielding many billions of dollars in saved energy bills and avoiding significant emissions of greenhouse gases and other air pollutants.<sup>1</sup>*

## Scope of the Vision for 2025

Recognizing this large opportunity, more than 60 leading organizations representing diverse stakeholders from across the country joined together to develop the National Action Plan for Energy Efficiency. The Action Plan identifies many of the key barriers contributing to underinvestment in energy efficiency, outlines five key policy recommendations for achieving all cost-effective energy efficiency, focusing largely on state-level energy efficiency policies, and provides a number of options to consider in pursuing these recommendations (Figure 1-2). As of November 2007, more than 100 organizations have endorsed the Action Plan recommendations and/or made public commitments to implement them in their areas (Figure 1-3).

As a next step, the Action Plan co-chairs challenged the Leadership Group to define a vision for the Action Plan which would detail the steps necessary to fully implement the recommendations of the Action Plan. The Vision presented in this document is the response to that challenge.

This Vision includes establishment of a long-term aspirational goal and the establishment of ten key implementation goals. It also describes what 2025 could look like if the goal were achieved and provides a means for measuring progress over time. Further, the Vision reviews the potential interactions between the largely state-level energy efficiency policies of the Action Plan and other existing state, regional, or federal policies such as clean energy portfolio standards<sup>2</sup> and greenhouse gas mitigation

policies and provides recommendations to ensure that these policies are designed to leverage energy efficiency as a cost-effective resource.

The 2025 Vision is offered as a general framework for pursuing a variety of policy options at the state level for advancing cost-effective energy efficiency as would be consistent with regional, state, and local circumstances, maintaining a fundamental principle of the Action Plan that one size does not fit all. This general framework leaves the policy details and the decision of whether to implement a policy to be determined through appropriate processes. It is a framework that can be updated and improved over time.

This document does not address the best practices for developing and implementing cost-effective energy efficiency program and portfolios, as these issues have been addressed elsewhere through the Action Plan.<sup>3</sup> However, it does offer the implementation goals and steps to assist in the establishment of the necessary policy framework to support the growth of best practice energy efficiency programs across the country. These types of programs are of interest for the following reasons:

- **Large energy savings available in existing homes, buildings, and industrial facilities.** The homes, commercial buildings, and industrial facilities already in place offer many opportunities for saving energy cost-effectively. Options exist through improved building envelopes and tighter ducts in addition to more efficient lighting, appliances, heating and cooling, and a variety of industrial process

## Figure 1-1. Reasons for the National Action Plan for Energy Efficiency

- **Energy efficiency is a large, untapped, low-cost energy resource.** Energy efficiency on the order needed to meet 50 percent or more of expected growth for natural gas and electricity is available at a cost of less than half of new generation, in many parts of the country. Overall savings from pursuing this efficiency would be more than \$100 billion annually by 2025.\*
- **Energy efficiency improves energy security.** Energy efficiency reduces the level of U.S. per capita energy consumption, thus decreasing the vulnerability of the economy and individual consumers to disruptions from natural disasters or terrorist acts. Energy efficiency also improves system reliability and reduces the potential for disruptions from brownouts or blackouts.
- **Energy efficiency mitigates risk of future carbon policy.** Pending regulation of greenhouse gas emissions presents significant uncertainty as to the generation investments that will contribute to a low-cost energy system for the future. Importantly, energy efficiency is low-cost now, will stay low-cost, and presents an important resource option for the future, particularly while waiting for the uncertainty to be resolved. Efficiency also makes sizable reductions in carbon emissions more attainable. Without moderating demand growth, investment in energy efficiency and other clean energy sources will be necessary.
- **Higher prices do not remove the barriers that impede investment in cost-effective energy efficiency.** Price signals alone (based on time of use rates) are insufficient to realize the full energy efficiency potential, in part due to large and persistent market barriers, including the principal-agent problem\*\* transaction costs, and lack of information as well as customer requirements for very short paybacks.\*\*\* Specific policies are necessary to target and overcome these well-defined barriers for energy efficiency. Many policies play a role in overcoming the barriers, such as up-to-date appliance standards, building codes, and organized energy efficiency programs.
- **Carbon policies will not necessarily remove the barriers to energy efficiency.** A variety of approaches for limiting emissions of greenhouse gases are at various stages of discussion and development across the country at the state, regional, and national levels. Most approaches (e.g., cap and trade and carbon taxes) provide a carbon price signal but do not directly address the unique barriers to energy efficiency. Therefore, provisions to address these barriers to efficiency within carbon policies as well as complementary policies to promote the delivery of cost-effective energy efficiency will be essential to mine the low-cost greenhouse gas reductions from energy efficiency.
- **Utilities are well-positioned to deliver energy efficiency programs, but regulatory changes may be necessary so that they are as profitable when saving energy as in generating or delivering energy.** Utilities typically have strong relationships with their customers, will accept longer paybacks for investments than customers will, and have access to lower-cost capital. However, the regulatory structure has historically rewarded utilities for building supply infrastructure (e.g., power plants, transmission lines, pipelines) and selling energy, while discouraging energy efficiency, even when energy-saving measures cost less than constructing new infrastructure. Some states have modified utility regulatory policies to eliminate efficiency disincentives. Alternative mechanisms such as third-party administration of energy efficiency programs have also been used.
- **Parties embrace energy efficiency for different reasons and solutions can be designed to address all these motivations.** For all of these reasons, advancing energy efficiency programs and policies requires attention and commitment by a critical mass of leading parties, including regulators, utilities, state governments, consumer advocates, environmental groups, and large end-users.

\* See Chapter 2 for more information on these benefits.

\*\* The principal-agent problem exists when the entity who makes energy efficiency investments, such as a landlord, is different from the entity who pays the energy bills, such as a tenant.

\*\*\* See Appendix B for references to studies that discuss the existing barriers to energy efficiency in more detail.

Note: This set of reasons is based on experience of the Action Plan Leadership Group and input received through Regional Implementation Meetings and the Sector Collaborative for Energy Efficiency.

## Figure 1-2. National Action Plan for Energy Efficiency Recommendations & Options

### Recognize energy efficiency as a high-priority energy resource.

#### *Options to consider:*

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

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

#### *Options to consider:*

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

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

#### *Options to consider:*

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

- Communicating the role of energy efficiency in lowering customer energy bills and system costs and risks over time.
- Communicating the role of building codes, appliance standards, and tax and other incentives.

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

#### *Options to consider:*

- Deciding on and committing to a consistent way for program administrators to recover energy efficiency costs in a timely manner.
- Establishing funding mechanisms for energy efficiency from among the available options, such as revenue requirement or resource procurement funding, system benefits charges, rate-basing, shared-savings, and incentive mechanisms.
- Establishing funding for multi-year periods.

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

#### *Options to consider:*

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

**Figure 1-3. Commitments to Implement the Recommendations of the Action Plan (as of November 2007)\***

Type of Commitment	Number of Organizations
Establishing and supporting state-level collaborative processes to explore how best to increase investment in energy efficiency	15
Additional money to be spent on energy efficiency programs	4
Start new and/or expand existing energy efficiency programs	17
Exploring policies and practices to align utility incentives with the delivery of cost-effective energy efficiency	5
Advancing efforts to include energy efficiency on a consistent and comparable basis with supply-side resources in future resource planning activities	24
Meeting aggressive energy savings goals	26
Proactively educating stakeholders on the benefits of and opportunities for energy efficiency	63

\* See the Action Plan Web site ([www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan)) for a full listing of energy efficiency commitments.

improvements. The buildings in existence today will remain the vast majority of the nation's buildings and facilities for years to come, and there are a variety of proven, cost-effective energy efficiency programs that can be employed to pursue these opportunities.

- **Importance of new construction.** Efforts to encourage higher energy efficiency in building codes and building beyond code complement energy efficiency programs focused on existing buildings and facilities. In any given year, more energy savings can be harvested from existing buildings in total than from new construction, but new buildings determine the long-term energy footprint of the built infrastructure. Thus it is critical to identify and realize the cost-effective efficiency potential in new buildings. There are a number of approaches for improving the requirements, training, and verification of new construction efforts.
- **Opportunities across customer classes.** Energy efficiency measures are available and can be pursued in all customer classes. Conventional regulatory cost allocation practices can be applied to energy efficiency to ensure that all classes pay their fair share

of program costs. The barriers to energy efficiency in each of the customer classes are distinct; policies and programs can account for these differences. Energy efficiency programs may be especially important and yet challenging for low-income energy consumers, because these customers can face difficult economic choices that lead to inefficient energy use. Because of the larger economic barriers in place and because of the distinct social value associated with energy efficiency for low-income households, programs targeting these households may not be expected by some regulatory authorities to meet the same cost-effectiveness thresholds as other programs.

- **Evolving technology will offer new opportunities.** Technology performance and costs are evolving rapidly, offering new opportunities to meet load growth. These new technologies need to be effectively integrated into energy efficiency program design as well as the enabling policies for energy efficiency programs to capture these new opportunities. This document incorporates several policies for making progress with the integration of these technologies. It is expected that this is one of the areas that will be updated in the future.

## This Document

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The 2025 Vision is presented in the following sections:

- **Chapter 2: The Goals of the 2025 Vision.** This chapter outlines the long-term goal of this Vision and ten implementation goals for pursuing the steps necessary to meet the long-term goal. It also outlines a way to measure progress toward the 2025 goal in terms of the percent of the states that have adopted key policies, in part or in full, and in terms of other key indicators of progress such as energy saved, dollars spent, and greenhouse gas emissions avoided.
- **Chapter 3: The Vision for 2025.** This chapter describes what the energy system could look like in 2025 if the Vision is achieved and the Action Plan recommendations are fully implemented from a variety of perspectives. It also outlines a number of evolving policies and technologies and the role they may play in achieving the Vision. As the Vision is updated in the future, attention will be paid to how best to address these changes.
- **Chapter 4: Related State, Regional, and National Policies.** This chapter identifies important interrelationships between other federal, regional, and state energy and environmental policies, and provides a number of recommendations and considerations for integrating these efforts so that they act in tandem to promote investment in cost-effective energy efficiency and do not impede each other.
- **Chapter 5: Tools and Assistance to Help Realize the Vision.** This chapter reviews the progress that is expected through the first goal period of this national Vision and shows the tools and resources that are available to help states make progress toward these goals.

## Development of the Action Plan Vision for 2025

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The National Action Plan for Energy Efficiency was developed by a diverse group of leading organizations from

across the country, including public and private utilities, regulators, other state decision-makers, policy advocates, and large end-users. It also engaged many trade associations (see Appendix A). The Action Plan process is chaired by James Rogers, CEO and President of Duke Energy and Marsha Smith, President-Elect of NARUC.<sup>4</sup> It is facilitated by the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE).

This document was developed under the guidance of a work group of Leadership Group participants. The work group was composed of 17 organizations, representing stakeholder perspectives including investor-owned utilities, regulatory commissions, other state decision-makers, cooperatives, municipal utilities, and energy and environmental policy advocates. Four conference calls were held for the work group to discuss the initial outline and approach, goals and tracking, complementary policies, and the draft report. The Vision work group members are:

Glenn Cannon	Waverly Light and Power
Jorge Carrasco	Seattle City Light
Sheryl Carter	Natural Resources Defense Council
Ollie Frazier	Duke Energy
Anne George	Connecticut Department of Public Utility Control
Dian Grueneich	California Public Utilities Commission
Jeff Genzer	National Association of State Energy Officials
Sandra Hochstetter	Arkansas Electric Cooperative Corporation (formerly with the Arkansas Public Service Commission)
Chris James	formerly with the Connecticut Department of Environmental Protection

Mary Kenkel	Alliance One (consultant to Duke Energy)
Michelle New	National Association of State Energy Officials
Bill Prindle	American Council for an Energy-Efficient Economy
Roland Risser	Pacific Gas and Electric
Richard Robinson	National Rural Electric Cooperative Association
Gene Rodrigues	Southern California Edison
James Rogers	Duke Energy
Marsha Smith	Idaho Public Utilities Commission
Jim Spiers	Tri-State Generation and Transmission Association, Inc.
Mike Winka	New Jersey Board of Public Utilities
Janet Streff	MN Department of Commerce

Further, information for this document was compiled, in part, through a set of regional implementation meetings for the Action Plan. As part of these meetings, information on the status of the adoption of a variety of policies and other action steps was provided for review and additional comment. This information was subsequently sent to state organizations for further comment. These state and regional summaries form the baseline for the initial measuring progress approach presented as a “strawman” and summarized in Chapter 3.

In addition, two conference calls were offered to the entire Leadership Group in order to solicit further comments and provide additional information.

## The Intent of the 2025 Vision

This Vision document is offered as a framework to guide changes in energy efficiency policies and programs toward the goals of achieving all cost-effective energy efficiency. The decision of whether to adopt a policy or program and particular design details at the state level are, of course, to be determined through state processes that address state goals, objectives, and circumstances.

## Notes

1. Meeting 50 percent of energy consumption is similar to meeting 20 percent of electricity consumption and 10 percent of natural gas consumption, subject to forecast assumptions used. These savings are consistent with the potential savings documented in a number of recent studies. See Appendix B for references for these studies. Across the country, the potential for cost-effective energy efficiency varies, subject to a number of area-specific factors, such as load growth, energy efficiency approaches pursued, local economics, and existing infrastructure.
2. Clean energy portfolio standards direct utilities and other retail electric providers to supply a specified amount of energy from clean resources, such as energy efficiency and renewable energy.
3. See “Energy Efficiency Program Best Practices,” Chapter 6 in the *National Action Plan for Energy Efficiency Report*.
4. Diane Munns of the Iowa Utilities Board, while President of NARUC, served as the initial co-chair of the Action Plan.

## 2: The Goals of the 2025 Vision



*The 2025 Vision for the National Action Plan for Energy Efficiency includes establishment of a long-term aspirational goal and ten key implementation goals. These goals and a set of steps to take to achieve them are offered as a framework for the implementation of the Action Plan recommendations and to guide state-level policies toward energy efficiency where it is cost-effective. In addition, the framework helps in measuring progress toward the 2025 Vision. This Vision will be updated and improved over time as new information becomes available.*

### The Long-Term Goal: Achieve All Cost-Effective Energy Efficiency

Building upon the five recommendations of the National Action Plan, the long-term aspirational goal of this effort is to achieve all cost-effective energy efficiency by the year 2025. Achieving this goal will yield important environmental and economic benefits while integrating energy efficiency into the modernization of the nation's energy system.

Based on available studies, the cost-effective energy efficiency resource available may be able to meet 50 percent or more of the expected load growth nationally. This is similar to meeting 20 percent of electricity consumption and 10 percent of natural gas consumption given current forecasts for future energy demand.<sup>1</sup> Benefits from achieving this magnitude of energy efficiency can be estimated to be:

- More than \$100 billion in lower energy bills in 2025 than would otherwise occur.
- Annual energy savings exceeding 900 billion KWh.
- Equivalent to over 50 GW of power, or more than 100 500 MW power plants over 20 years.
- Over \$500 billion of total net savings.<sup>2</sup>

- Reductions in greenhouse gas emissions on the order of 500 million metric tons of CO<sub>2</sub> annually, equivalent to 90 million cars off the road.

These benefits reflect the full implementation of best practice energy efficiency programs currently being delivered in some parts of this country, as well as the broad adoption of up-to-date building codes and other energy efficiency policies.

Importantly, the role that the energy efficiency resource may play in meeting load or load growth (or in replacing existing generation options) varies across the country due to regional differences in growth patterns, costs of energy, existing infrastructure, and other factors. In high growth areas, as an example, perhaps less of the expected growth could be addressed and in slower growing areas, perhaps substantially more. In addition, cost-effectiveness needs to be determined at a state and local level. Furthermore, the long-term goal is not meant to imply that new power plant additions are not needed in the future, as new plants may be a critical component of the desired modernization of the energy supply and delivery system. Indeed, the greater the energy efficiency savings, the greater the likelihood that efficiency gains can help replace older, less efficient power supply options, resulting in substantial environmental benefits.

## Ten Implementation Goals

For the long-term goal to be achieved, a number of policies need to be in place. Energy efficiency needs to be valued similarly to supply options. Utilities and investors need to be financially interested in saving energy. States must be active in this transformation of energy supply and delivery, including updating and enforcing codes and standards to ensure that savings are captured as new buildings and products enter the system. Customers must also have the proper incentives to make investments in cost-effective energy efficiency. With such policies in place, cost-effective energy efficiency can be a key component of the modernization of the energy supply and delivery system and help to transform how customers receive and value energy services.

These policies are included in the following ten implementation goals. These goals provide a framework for implementing the recommendations of the Action Plan by outlining the key steps state decision-makers should consider to help achieve the 2025 Vision. The timeline for achieving these implementation goals is by 2015 to 2020, so that the necessary policy foundation is in place to help ensure success of the 2025 Vision. With most of these policy and program steps, there is significant experience across the country and substantial materials and lessons learned that can be drawn upon. However, there are some policies and technologies that are emerging and may evolve in a variety of ways; such policies are explored further in Chapter 3 and future updates to the Vision will highlight progress in these areas.

The ten implementation goals and key steps to achieve them are outlined below. A description of how progress in implementing these goals can be measured follows.

### Goal One: Establishing Cost-Effective Energy Efficiency as a High-Priority Resource

Utilities<sup>3</sup> and applicable state agencies are encouraged to:

- Create a process to explore the energy efficiency potential in the state and commit to its full development.

- Regularly identify cost-effective energy efficiency potential in conjunction with state ratemaking bodies.
- Set energy savings goals consistent with the cost-effective potential.
- Integrate energy efficiency into energy resource plans at the utility, state, and regional levels.

### Goal Two: Developing Processes to Align Utilities Incentives Equally for Efficiency and Supply Resources

Applicable state agencies are encouraged to:

- Work with utilities to implement revenue mechanisms to promote utility and shareholder indifference to supplying energy savings, as compared to energy generation options.
- Consider how to remove utility disincentives to energy efficiency such as by removing the utility throughput disincentive and exploring other ratemaking ideas.
- Ensure timely cost recovery in place for parties that administer energy efficiency programs.

### Goal Three: Establishing Cost-Effectiveness Tests

Applicable state agencies along with key stakeholders are encouraged to:

- Establish a process to examine how to define cost-effective energy efficiency practices that capture the long-term resource value of energy efficiency.
- Incorporate cost-effectiveness tests into ratemaking procedures going forward.

### Goal Four: Establishing Evaluation, Measurement, and Verification Mechanisms

State ratemaking bodies are encouraged to:

- Work with stakeholders to adopt effective, transparent practices for the evaluation, measurement, and verification (EM&V) of energy efficiency savings consistent with establishment of ratemaking incentives.



Program administrators are encouraged to:

- Conduct EM&V consistent with these practices.

### **Goal Five: Establishing Effective Energy Efficiency Delivery Mechanisms**

Applicable agencies are encouraged to:

- Clearly establish who will administer energy efficiency programs.
- Review programs, funding, customer coverage, and goals for efficiency programs; ensure proper administration and cost recovery of programs, as well as ensuring that goals are met.
- Establish goals and funding on a multi-year basis to be measured by evaluation programs established.
- Create public education programs for energy efficiency.
- Ensure that best practice information is shared regionally and nationally.

### **Goal Six: Developing State Policies to Ensure Robust Energy Efficiency Practices**

Applicable agencies are encouraged to:

- Have a mechanism to review and update building codes.
- Establish enforcement and monitoring mechanisms of energy codes.
- Adopt and implement state-level appliance standards.
- Develop and implement lead-by-example energy efficiency programs at the state and local levels.

### **Goal Seven: Aligning Customer Pricing and Incentives to Encourage Investment in Energy Efficiency**

Utilities and state ratemaking bodies are encouraged to:

- Examine, propose, and modify rates considering impact on customer incentives to pursue energy efficiency.

- Create mechanisms to reduce customer disincentives for energy efficiency (e.g., financing mechanisms).

### **Goal Eight: Establishing State of the Art Billing Systems**

Utilities are encouraged to:

- Work with large customers to develop methods of supplying consistent energy use and cost information across states, service territories, and the nation.<sup>4</sup>

### **Goal Nine: Implementing State of the Art Efficiency Information Sharing and Delivery Systems**

Utilities and other program administrators are encouraged to:

- In conjunction with their regulatory bodies, explore the development and implementation of state of the art energy delivery information including smart grid infrastructures, data analysis, two-way communication programs, etc.
- Explore methods of integrating advanced technologies to help curb demand peaks and monitor efficiency upgrades to prevent equipment degradation, etc.
- Coordinate demand response and energy efficiency programs to maximize value to customers.
- Support development of an energy efficiency services and program delivery channel (e.g., quality trained technicians).

### **Goal Ten: Implementing Advanced Technologies**

Applicable state agencies and utilities are encouraged to:

- Review advanced technologies such as batteries, strategically integrated solar facilities, and other clean distributed generation forms; ensure their adaptation into the broader resource plans for efficiency achievements.
- Work collectively to review advanced technologies and determine rapid integration timelines.

## The Vision for Cooperatively and Publicly Owned Utilities

The Vision goals are broad, intended for all types of utilities to take the applicable steps necessary to capture the benefits of greater energy efficiency. While much of the resource planning and energy efficiency program issues relate to all utility types, cooperatively and publicly owned utilities operate under different ratemaking and utility financing considerations than investor-owned utilities. Some of the key steps under Goal Two, relating to utility financial incentives, may not apply to cooperatively and publicly owned utilities. These utilities typically operate on an annual budget basis rather than a cost-recovery basis, are regulated by their board members, and are typically not subject to state utility regulation.

The key financial indicator for a cooperatively or publicly owned utility is its debt coverage ratio (which is critical to maintaining a high bond rating and low cost capital) or its minimum cash position (for utilities with no debt). Typically, these utilities can adjust rates whenever the debt coverage ratio or minimum cash position falls below a threshold. An investor-owned utility may need to wait until a formal rate case proceeding to adjust rates for decreases in sales from energy efficiency; the effect of energy efficiency on cooperatively and publicly owned utilities' financial health, however, is relatively modest. The publicly and cooperatively owned utilities will experience similar financial health problems as investor-owned utilities if they do not adjust rates.

## Measuring Progress

Measurement of the progress in achieving the ten implementation goals by 2015 to 2020 is an important part of the Vision. Progress will be measured and reported on every few years, with an emphasis on measurable outcomes. An initial summary of the implementation of key policy and program steps in support of the Vision

across the 50 states and the District of Columbia is provided in Figures 2-1 and 2-2 for electricity and natural gas systems, respectively. These figures show the number of states that have implemented key policy and program steps, in whole or in part, as of 2006/2007. The approach used to assess this progress is offered as an initial strawman approach and will be refined in the future as part of efforts under the Action Plan. The information presented was collected through a series of interactions with state-level organizations. More detail on this strawman approach is provided below and in Appendix D. The summary of progress shows there is a strong base of experience, with many of these energy efficiency policies and programs upon which to draw and expand.

### Goal One: Establishing Cost-Effective Energy Efficiency as a High-Priority Resource

Progress can be measured as utilities and applicable state agencies work to accomplish the following:

1. **Process in place, such as a state and/or regional collaborative, to pursue energy efficiency as a high-priority resource.** A valuable early step is to establish a collaborative process involving all appropriate stakeholders. State and or regional collaboratives, representing a diverse group of stakeholders such as utilities, state policy makers, consumers, businesses, and energy service companies, help raise awareness of the value of greater investment in energy efficiency, review the available options, reach agreement among stakeholders on feasible energy savings goals and appropriate funding, and resolve important program and administrative issues. The resulting broader understanding of energy efficiency leads to generally smoother processes in energy efficiency programming, both as new programs are being started and as programs are expanded and improved over time. A collaborative for energy efficiency can be a stand-alone process or one that is part of a state energy planning, state clean energy planning, or climate change planning process. It can have a variety of charters and anticipated longevity.

Examples include California, Kentucky, and Minnesota at the state level and the Western Governors' Association's Clean and Diversified Energy Advisory Committee at the regional level (National Action Plan for Energy Efficiency, 2006).<sup>5,6</sup>

2. **Policy established to recognize energy efficiency as a high-priority resource.** Another important early step is recognizing energy efficiency as a high-priority resource in energy planning. Energy efficiency needs to be considered on the same basis as conventional supply options when it is less expensive than the conventional options. This may be an important change in perspective for entities that are used to focusing on conventional supply options. It is important to review and address any limitations in state statutes to ensure that energy efficiency can be appropriately considered. Further, explicitly establishing energy efficiency as the first or among the first resources requires the relevant entities to bring energy efficiency to the top of their planning process. A number of states have recognized energy efficiency as a high-priority resource due to its broad benefits through a variety of policy directives. For example, the California Energy Action Plan II has established energy efficiency as the first resource to be developed in the state (CEC and CPUC, 2005). In addition, legislation passed in Illinois in 2007, and gubernatorial action in New York, Connecticut and Massachusetts, initiate actions that will recognize energy efficiency as a high-priority resource.
3. **Potential identified for cost-effective, attainable energy efficiency over the long term.** A key step in developing energy efficiency programs is analyzing the potential for all cost-effective energy efficiency in the specific jurisdiction over the long term across all customer classes. Because energy usage patterns, technologies, and costs change over time, it is important to have an up-to-date study that incorporates the latest information on energy costs, energy forecasts, and available energy efficiency options. Such a study helps parties have realistic expectations of what can be achieved, informs energy efficiency savings goals and funding targets, and guides program design.
4. **Energy efficiency savings goals established consistent with cost-effective potential.** Energy efficiency savings goals are being used in several states to help set a high-level policy direction and to establish energy savings targets that can be integrated into resource planning efforts. These savings targets should reflect an understanding of the true cost-effective potential for increased effectiveness.
5. **Energy efficiency savings goals incorporated into state resource plan, with provisions for regular updates.** The integration of energy efficiency resources and an energy savings target into formalized resource planning processes at the state and utility levels can help establish the rationale for energy efficiency funding levels and for properly valuing the benefits. Resource plans account for the long-term benefits from energy savings, capacity savings, potential reductions of air pollutants and greenhouse gases, and improved reliability, as well as other benefits. Provisions for routine review and updating of these resource plans are important.
6. **Energy efficiency savings goals integrated into a regional energy resource plan.** The integration of energy efficiency resources and an energy savings target into a resource planning process at the regional level may also have value by developing a view of the resources necessary and the role that energy efficiency can play across a broader area. There may be opportunities to explore the role that energy efficiency can play in regional efforts as entities respond to the federal policies recently promulgated by the Federal Energy Regulatory Commission (FERC) and DOE which promote the use of regional electric system planning efforts.

**Figure 2-1. Progress in Meeting Implementation Goals: Strawman Approach for Electricity Services\***

Implementation Goal and Key Steps: Electricity Services		States Having Adopted Policy or Step as of 2007	
		Completely	Partially
<b>Goal One: Establishing Cost-Effective Energy Efficiency as a High-Priority Resource</b>			
1	Process in place, such as a state and/or regional collaborative, to pursue energy efficiency as a high-priority resource	21	0
2	Policy established to recognize energy efficiency as a high-priority resource	16	9
3	Potential identified for cost-effective, attainable energy efficiency over the long term	17	5
4	Energy efficiency savings goals established consistent with cost-effective potential	10	5
5	Energy efficiency savings goals integrated into state energy resource plan, with provisions for regular updates	14	9
6	Energy efficiency savings goals integrated into a regional energy resource plan**	N/A	N/A
<b>Goal Two: Developing Processes to Align Utilities Incentives Equally for Efficiency and Supply Resources</b>			
7	Utility throughput incentive is addressed and disincentives are removed	6	4
8	Utility incentives for energy efficiency savings reviewed and established as necessary**	N/A	N/A
9	Timely cost recovery in place**	N/A	N/A
<b>Goal Three: Establishing Cost-Effectiveness Tests</b>			
10	Cost-effectiveness tests adopted which reflect the long-term resource value of energy efficiency	26	8
<b>Goal Four: Establishing Evaluation, Measurement, and Verification Mechanisms</b>			
11	Robust, transparent EM&V procedures established	12	12
<b>Goal Five: Establishing Effective Energy Efficiency Delivery Mechanisms</b>			
12	Administrator(s) for energy efficiency programs clearly established	18	10
13	Stable (multi-year) and sufficient funding in place consistent with energy efficiency goals	6	8
14	Programs established to deliver energy efficiency to key customer classes and meet energy efficiency goals	17	11
15	Strong public education programs on energy efficiency in place**	N/A	N/A

**Figure 2-1. Progress in Meeting Implementation Goals: Strawman Approach for Electricity Services\***

Implementation Goal and Key Steps: Electricity Services		States Having Adopted Policy or Step as of 2007	
		Completely	Partially
16	Energy efficiency program administrator(s) engaged in developing and sharing program best practices at the regional and/or national level	26	0
<b>Goal Six: Developing State Policies to Ensure Robust Energy Efficiency Practices</b>			
17	State policies require routine review and updating of building codes	32	6
18	Building codes effectively enforced**	N/A	N/A
19	State appliance standards in place	10	0
20	Strong state and local government lead-by-example programs in place	13	24
<b>Goal Seven: Aligning Customer Pricing and Incentives to Encourage Investment in Energy Efficiency</b>			
21	Rates examined and modified considering impact on customer incentives to pursue energy efficiency	6	3
22	Mechanisms in place to reduce consumer disincentives for energy efficiency (e.g., including financing mechanisms)	3	6
<b>Goal Eight: Establishing State of the Art Billing Systems</b>			
23	Consistent information to customers on energy use, costs of energy use, and options for reducing costs**	N/A	N/A
<b>Goal Nine: Implementing State of the Art Efficiency Information Sharing and Delivery Systems</b>			
24	Investment in advanced metering, smart grid infrastructure, data analysis, and two-way communication to enhance energy efficiency	14	28
25	Coordinated energy efficiency and demand response programs established by customer class to target energy efficiency for enhanced value to customers	10	0
26	Programs established to use trained and certified professionals as part of energy efficiency program delivery**	N/A	N/A
<b>Goal Ten: Implementing Advanced Technologies</b>			
27	Policies in place to remove barriers to clean, efficient distributed generation	2	28
28	Timelines developed for the integration of advanced technologies**	N/A	N/A

\* See Appendix D for additional information on how these numbers have been determined.

\*\* See Appendix D for discussion of why progress on this policy step is not currently measured.

\*\*\* N/A—Not Available

**Figure 2-2. Progress in Meeting Implementation Goals: Strawman Approach for Natural Gas Services\***

Implementation Goal and Key Steps: Natural Gas Services		States Having Adopted Policy or Step as of 2007	
		Completely	Partially
<b>Goal One: Establishing Cost-Effective Energy Efficiency as a High-Priority Resource</b>			
1	Process in place, such as a state and/or regional collaborative, to pursue energy efficiency as a high-priority resource	9	0
2	Policy established to recognize energy efficiency as a high-priority resource	6	0
3	Potential identified for cost-effective, attainable energy efficiency over the long term	5	0
4	Energy efficiency savings goals established consistent with cost-effective potential	3	2
5	Energy efficiency savings goals integrated into state energy resource plan, with provisions for regular updates	2	4
6	Energy efficiency savings goals integrated into a regional energy resource plan**	N/A	N/A
<b>Goal Two: Developing Processes to Align Utilities Incentives Equally for Efficiency and Supply Resources</b>			
7	Utility throughput incentive is addressed and disincentives are removed	5	11
8	Utility incentives for energy efficiency savings reviewed and established as necessary**	N/A	N/A
9	Timely cost recovery in place**	N/A	N/A
<b>Goal Three: Establishing Cost-Effectiveness Tests</b>			
10	Cost-effectiveness tests adopted which reflect the long-term resource value of energy efficiency	10	2
<b>Goal Four: Establishing Evaluation, Measurement, and Verification Mechanisms</b>			
11	Robust, transparent EM&V procedures established	3	2
<b>Goal Five: Establishing Effective Energy Efficiency Delivery Mechanisms</b>			
12	Administrator(s) for energy efficiency programs clearly established	11	4
13	Stable (multi-year) and sufficient funding in place consistent with energy efficiency goals	1	5
14	Programs established to deliver energy efficiency to key customer classes and meet energy efficiency goals	5	5
15	Strong public education programs on energy efficiency in place**	N/A	N/A

**Figure 2-2. Progress in Meeting Implementation Goals: Strawman Approach for Natural Gas Services\***

Implementation Goal and Key Steps: Natural Gas Services		States Having Adopted Policy or Step as of 2007	
		Completely	Partially
16	Energy efficiency program administrator(s) engaged in developing and sharing program best practices at the regional and/or national level	13	0
<b>Goal Six: Developing State Policies to Ensure Robust Energy Efficiency Practices</b>			
17	State policies require routine review and updating of building codes	32	6
18	Building codes effectively enforced**	N/A	N/A
19	State appliance standards in place	10	0
20	Strong state and local government lead-by-example programs in place	13	24
<b>Goal Seven: Aligning Customer Pricing and Incentives to Encourage Investment in Energy Efficiency</b>			
21	Rates examined and modified considering impact on customer incentives to pursue energy efficiency	1	0
22	Mechanisms in place to reduce consumer disincentives for energy efficiency (e.g., including financing mechanisms)	0	0
<b>Goal Eight: Establishing State of the Art Billing Systems</b>			
23	Consistent information to customers on energy use, costs of energy use, and options for reducing costs**	N/A	N/A
<b>Goal Nine: Implementing State of the Art Efficiency Information Sharing and Delivery Systems</b>			
26	Programs established to use trained and certified professionals as part of energy efficiency program delivery**	N/A	N/A
<b>Goal Ten: Implementing Advanced Technologies</b>			
28	Timelines developed for the integration of advanced technologies**	N/A	N/A

\* See Appendix D for additional information on how these numbers have been determined.

\*\* See Appendix D for discussion of why progress on this policy step is not currently measured.

\*\*\* N/A—Not Available

## Goal Two: Developing Processes to Align Utilities Incentives Equally for Efficiency and Supply Resources

Progress can be measured as the following steps are achieved:

7. **Utility throughput incentive is addressed and disincentives are removed.** Under conventional ratemaking, utilities have typically been compensated based on the volume of energy delivered to customers; this creates a disincentive for investing in efficiency, which reduces throughput. Removing this disincentive so that utilities are indifferent to selling energy or saving energy is an important step.
8. **Utility incentives for energy efficiency savings reviewed and established as necessary.** Removing the disincentive that many utilities have to save energy (see #7) is important but not necessarily sufficient to fully align utility incentives behind the delivery of cost-effective energy efficiency. Utilities may need other incentives to view energy efficiency on an equal playing field with supply options. It may be important to review the existing utility incentive structure and to provide incentives, linked to performance, to spur greater investment in energy efficiency where it is cost-effective, or to ensure appropriate shareholder incentives are in place in similar to those associated with generation options.
9. **Timely cost recovery in place.** A basic requirement for the elimination of disincentives to energy efficiency programs is establishing a fair, expeditious process for recovery of costs. Failure to recover program costs directly negatively affects a utility's cash flow, net operating income, and earnings. Further, lack of timely cost recovery increases regulatory risk and requires the utility to incur carrying costs.

## Goal Three: Establishing Cost-Effectiveness Tests

Progress can be measured as the appropriate state agencies accomplish the following step:

10. **Cost-effectiveness tests adopted which reflect the long-term resource value of energy efficiency.** Energy efficiency can provide long-term benefits to an energy system when it costs less to save a watt or a therm than it does to deliver one, particularly when the energy savings are accumulated over time and the costs of new power plants and transmission can be avoided. Cost-effectiveness tests that reflect these long-term benefits help stakeholders set goals and develop programs to put them on a path to capturing all cost-effective energy efficiency.<sup>7</sup> As an example, the total resources cost test compares the total costs and benefits of an efficiency program, including benefits to the utility and all participants and avoided costs of energy supply. Cost-effectiveness tests may also require establishing values for saved energy (kWh or therms) and capacity (kW or decatherms/day). These values may account for a variety of costs and risks including the costs of all supply options, including losses, and risks associated with permitting, construction, operation; costs and risks of fuel supplies, costs and risks of environmental regulations. They may also include the social value of low-income programs, if applicable.

## Goal Four: Establishing Evaluation, Measurement, and Verification Mechanisms

Progress can be measured as the following step is achieved:

11. **Robust, transparent evaluation, measurement, and verification procedures established.** Robust and transparent EM&V serves a number of objectives including: (1) measuring and documenting the impacts of a program and how well it met its goals with respect to being a reliable energy resource, (2) helping to identify ways to improve current and future programs, (3) determining the cost-effectiveness of a program, and (4) when public or ratepayer funds are involved, documenting compliance with regulatory requirements. Establishing robust and transparent EM&V approaches will, over time, also contribute to greater



consistency in EM&V across utilities, programs and states; which will reduce the burden on individual program developers to establish such protocols, and build consistent understanding of proven efficiency programs that can participate in regional and national markets. Most existing efficiency programs have some form of EM&V, but improving those programs and standardizing them over time are a key part of the Vision. EM&V of energy efficiency may also become a feature of grid modernization programs where real-time monitoring and evaluation of energy use is achieved.

### **Goal Five: Establishing Effective Energy Efficiency Delivery Mechanisms**

Progress can be measured as the following steps are achieved:

12. **Administrator(s) for energy efficiency programs clearly established.** There are variety of successful program models for delivering energy efficiency which use different types of program administrators. These types include utilities, state agencies (e.g., NYSERDA), third parties (e.g., Efficiency Vermont), or a combination of administrator types. Clearly establishing parties to administer energy efficiency programs is an important step.
13. **Stable (multi-year) and sufficient funding in place consistent with energy efficiency goals.** It is critical to establish adequate, multi-year funding to support the energy efficiency program measures, consistent with the established energy savings target and cost-effective potential. Multi-year funding more easily allows longer-term planning and development of programs, particularly ones that have some upfront costs to access the larger energy savings in a customer group. There are many funding mechanisms that have been applied for different program structures. Funding might be through a systems benefit charge, another rate mechanism, or rate-based recovery mechanisms such as revenue requirement funding or resource procurement funding.
14. **Programs established to deliver energy efficiency to key customer classes and meet energy efficiency goals.**<sup>8</sup> There are significant cost-effective energy savings to tap into through well-designed energy efficiency programs across the key customer classes, for both new and existing buildings, and there are many successful efficiency programs providing reliable results which serve as best practice models for new programs. A robust efficiency program portfolio that provides broad access to energy savings is the linchpin of a successful energy efficiency effort.
15. **Strong public education programs on energy efficiency in place.** Public education is an important element of encouraging customers to take advantage of available energy efficiency programs as well as to take greater control of their energy costs through energy saving measures they can undertake themselves. Many states and utilities have public outreach efforts, but greater integration with energy efficiency programs, both at the state and regional level, and leveraging the national ENERGY STAR<sup>®</sup> platform can increase overall effectiveness.
16. **Energy efficiency program administrator(s) engaged in developing and sharing program best practices at the regional and/or national level.** Sharing of best practices in program design, implementation, and evaluation as well as keeping current on emerging technologies and practices as an important part of maintaining well-designed, cost-effective programs and potentially enhancing the consistency of energy efficiency programs offered across a state and region. Coordination at the national level such as that offered by the Consortium for Energy Efficiency can be important to effectively engage with national organizations such as manufacturers, retailers, and others that are essential for effective energy efficiency programs. Coordination and sharing of best practice at the regional level (e.g., through NEEP, NEEA, SWEEP, MEEA, and SEEA) is also important to improve the

consistency in energy efficiency programs offered across a region and to help reduce program costs.<sup>9</sup> This coordination can be especially effective when utilities serve multiple states in the region. The Edison Electric Institute's newly formed Institute for Energy Efficiency will provide another forum for best practice sharing.

### **Goal Six: Developing State Policies to Ensure Robust Energy Efficiency Practices**

Progress can be measured as the following steps are achieved:

17. **State policies require routine review and updating of building codes.** New construction and major renovations represent cost-effective opportunities to incorporate energy-efficiency measures into buildings because these improvements save energy throughout the life of those buildings and can be expensive to adopt later. Building energy codes specify a series of efficiency measures including construction practices and technologies that have been shown to yield cost-effective savings, providing a minimum set of requirements. Building energy codes are typically developed at the national level, adopted at the state level, and implemented and enforced by local governments. Having up-to-date building codes in place is an important part of realizing the energy savings in new construction and major renovation.
18. **Building codes effectively enforced.** Up-to-date, implemented, and enforced energy codes can lock in cost-effective energy savings of 30 percent or more at the time of building construction relative to typical practices,<sup>10</sup> lowering costs for businesses and consumers. Seeing that the necessary training and enforcement of building codes is in place is an important part of realizing the savings that building codes offer.
19. **State appliance standards in place.** State appliance efficiency standards establish minimum energy efficiency levels for appliances and other energy-consuming products (if those appliances have not already been addressed by federal

efficiency standards). These standards typically prohibit the sale of less-efficient models within a state. Many states have implemented appliance and equipment efficiency standards for products not addressed by the federal government.

20. **Strong state and local government lead-by-example programs in place.** State and local lead-by-example initiatives include a range of programs and policies that advance the use of clean energy within their own facilities, fleets, and operations. In pursuing lead-by-example strategies, states can leverage their purchasing power, their control of significant energy-using resources, and the high visibility of their public facilities to demonstrate clean energy technologies and approaches that lower their energy costs and reduce emissions. Strong programs involve establishing goals and the processes necessary to implement them and report on progress. Energy efficiency program administrators can be important partners in helping governments achieve their goals (EPA, 2006).

### **Goal Seven: Aligning Customer Pricing and Incentives to Encourage Investment in Energy Efficiency**

Progress can be measured as the following steps are achieved:

21. **Rates examined and modified considering impact on customer incentives to pursue energy efficiency.** Rate designs with clear and meaningful price signals to customers, coupled with good customer education, can encourage energy efficiency from the consumer side. For example, removing "declining block" rate structures that discourage energy efficiency by decreasing costs as more electricity or natural gas is consumed may be an initial step.
22. **Mechanisms in place to reduce customer disincentives for energy efficiency (e.g., including financing mechanisms).** Electricity and natural gas rates can also be partnered with other mechanisms that encourage energy efficiency, such as benefit sharing programs and on-bill financing. These mechanisms help provide the financing that

the customer may need to pursue an energy efficiency measure.

### **Goal Eight: Establishing State of the Art Billing Systems**

Progress can be measured as the following step is achieved:

23. **Consistent information to customers on energy use, costs of energy use, and options for reducing energy costs.** Providing customers with clear information on their energy use, the costs of energy use, and the variety of options available for reducing their costs is an important part of the Vision. Further, greater consistency in how energy use and cost information is provided to customers would assist customers with properties in more than one service territory. And greater ability to access data on their energy use for several years at time as well as ability to access electronic versions of the data would assist many customers. This step has resulted from the Sector Collaborative for Energy Efficiency of the National Action Plan (National Action Plan for Energy Efficiency, 2007).

### **Goal Nine: Implementing State of the Art Efficiency Information Sharing and Delivery Systems.**

Progress can be measured as the following steps are achieved:

24. **Investment in advanced metering, smart grid infrastructure, data analysis, and two-way communication to enhance energy efficiency.** Many utilities are studying, piloting, or deploying advanced metering as part of grid modernization, and many millions of advanced meters are now on order for installation over the next five years. Advanced metering, combined with communication, energy information collection systems, and time-based rates, can be used to help identify and promote energy efficiency opportunities, in addition to enhancing system reliability and reducing peak demands. These technologies enable demand response, automated energy management, and better data collection for load analysis and

program evaluation. Two-way communications between the grid and the customer and their energy-using devices help reap the full value of advanced meters and automate the operation of buildings and energy-using devices in ways that save energy and reduce peak loads. Exploration of these opportunities and investment as the business case can be made is a key step in the Vision.

25. **Coordinated energy efficiency and demand response programs established by customer class to target energy efficiency for enhanced value to customers.** Energy efficiency programs aim primarily to reduce total electricity usage (kWh), and demand response programs aim to change customers' usage patterns in response to price signals or incentives that vary over time. Demand response programs today are targeted primarily toward reducing peak load or total demand at times of system emergency when load relief is needed; in the longer term, demand response technologies can enable round-the-clock, automated customer energy management that is interactive with the grid. Customers participating in demand response programs may also reduce their energy consumption<sup>11</sup> and invest in energy efficiency improvements that save kWh and peak demand usage. Coordinated, complementary energy efficiency and demand response measures will be valuable for energy customers and important to achieving the Vision goals.
26. **Programs established to use trained and certified professionals as part of energy efficiency program delivery.** Energy efficiency programs play a vital role in increasing the availability of qualified energy professionals for quality program delivery through training and certification. Further, programs using certified technicians from accredited companies can conduct a whole-building assessment and recommend and professionally install comprehensive improvements that yield the best results in energy efficiency, comfort, health and safety, and building durability.

## Goal Ten: Implementing Advanced Technologies

Progress can be measured as the following steps are achieved:

27. **Policies in place to remove barriers to clean, efficient distributed generation.**<sup>12</sup> Clean, efficient distributed generation resources are an important component of an integrated energy resource plan. Coordinated policies (such as interconnection rules, reviewing clean, efficient distributed generation as part of the planning process and incorporating it where effective, and standby rates) that remove barriers to these technologies, including solar photovoltaic and combined heat and power, are valuable toward achieving this integration.
28. **Timelines developed for the integration of advanced technologies.** To ensure integration of advanced technologies and their adaptation into the broader resource plans, utilities and their regulators are encouraged to work collectively to review advanced technologies and determine rapid integration timelines.

Beyond the implementation of the ten goals and the steps to take, progress will also be measured in terms of key benefits from their adoption and the investment necessary, including:

- Energy to be saved through energy savings goals (kWh, kW, and therms).
- Energy saved (kWh, kW, and therms).
- Carbon dioxide emission reductions.
- Dollars invested in energy efficiency programs.
- Cost-effectiveness of energy efficiency program delivery.

As part of their continued facilitation of the National Action Plan for Energy Efficiency, EPA and DOE are prepared to facilitate the measurement of progress under the Action Plan in conjunction and coordinate with other organizations.

## Notes

1. These savings are consistent with the potential savings documented in a number of recent studies. See Appendix B for references for these studies. Appendix C includes information on how these benefits were derived.
2. Net savings equals the savings from reduced electricity purchases and capital expenditures by the utility minus utility and participant costs of energy efficiency. Value is given in net present value, assuming a 5 percent discount rate.
3. "Utilities" refers any organization that delivers electric and gas utility services to end-users, including investor-owned, cooperatively owned, and publicly owned utilities.
4. See the findings of the Sector Collaborative for Energy Efficiency for additional information (via <[www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan)>).
5. The Action Plan's report has a number of examples of successful collaborative efforts. Examples can be found on the following pages: 2-14, 3-6, 3-8, 6-13, 6-25. The report also lists several best practices to follow when soliciting stakeholders' input on page 6-32.
6. See the reports of the Western Governors' Association's Clean and Diversified Energy Advisory Committee: <<http://www.westgov.org/wga/initiatives/cdeac/cdeac-reports.htm>>.
7. For more information on cost-effectiveness tests, see the Action Plan Guides on Resource Planning with Energy Efficiency and Conducting Potential Studies.
8. See Chapter 6, "Energy Efficiency Program Best Practices," of the Action Plan's report (National Action Plan for Energy Efficiency, 2006).
9. There are a number of regional energy efficiency coordination organizations across the country. They include the Northeast Energy Efficiency Partnership (NEEP), the Northwest Energy Efficiency Alliance (NEEA), the Midwest Energy Efficiency Alliance (MEEA), the South West Energy Efficiency Partnership (SWEEP), and the new Southeast Energy Efficiency Alliance (SEEA).
10. Determined using a BCAP calculator that compares each state's current code to the 2006 IECC for residential and commercial construction. The sum of savings in all 50 states produces a 30 to 40 percent savings range.
11. Based on a survey of over 100 demand response programs, the effect of demand response programs on total energy consumption was found to range from increasing total energy use by 5 percent to achieving total energy savings in excess of 20 percent (King and Delurey, 2005).
12. The term "clean distributed generation" is used in this document to mean distributed generation that is cleaner than the average central station power plant.

# 3: The Vision for 2025



*The long-term goal for the Vision for the National Action Plan for Energy Efficiency is to achieve all cost-effective energy efficiency by 2025. As energy efficiency policies are pursued, the energy system is modernized, and new technologies emerge, there will be a lower-cost, more reliable energy system with significant environmental benefits. The energy system that offers these benefits is likely to look very different than the one we have today.*

## A Look at 2025

By 2025, the energy system would focus on providing energy services rather than energy supply, energy providers would see energy efficiency as an important business area, a vibrant energy efficiency services industry would be in place, there could be greater reliance on clean distributed generation, and the system would be modernized to facilitate appropriate price signals and digital communication, analysis, and system control. It would be very different in terms of how consumers receive and value energy services. Additional description of some of the key differences in 2025 is provided below and illustrated in Figure 3-1. This includes a discussion of some of the challenges and emerging technologies critical to meeting the long-term goal of the Vision.

### Energy Customers

Customers across the residential, commercial, and industrial sectors will have new opportunities and experiences with energy efficiency services, energy information, and energy system interactions. They will be offered a variety of innovative energy service packages to help them manage their energy use and costs better, including universal access to comprehensive energy efficiency services. These services will routinely assess the energy efficiency of homes, buildings, and industrial plants and help customers undertake low-cost energy efficiency improvements, access high-quality contractors, and access financing where necessary. Customers will also have clear information on their use and costs of energy and more options for lowering their energy bills by allowing building appliances and controls to help meet peak energy demands.

For example, with advanced meters, time-of-use information about energy prices, and automated devices to control their energy usage, customers will face higher energy costs when energy costs more to provide but be able to avoid some of these costs through advances in two-way communication and grid-connected controls, appliances, and equipment.

Customers will have lower energy bills in 2025 than if cost-effective energy efficiency programs were not pursued. Based on technologies and practices available, today many individual homes and buildings can be improved by 20 percent or more, and many industrial plants can be improved by 10 percent or more.<sup>1</sup> These savings are being achieved through well-designed energy efficiency programs and policies that deliver a variety of technologies and practices. Some of the approaches that can substantially lower the costs of energy in existing and new homes, buildings, and industries include:

- **Homes:** There are a variety of proven programs delivering energy savings to many types of homes. These programs range from product-based incentive programs to whole-home audit and improvement programs that use trained, certified home professionals. These programs are providing home energy savings of 20 percent savings or more and up to 50 percent.<sup>2,3</sup> Improvements include greater insulation and air sealing, efficient lighting and appliances, efficient windows, properly sized and installed heating and air conditioning, low-standby home products, and efficient water heating. In addition, controls such as programmable thermostats deliver significant savings when used properly. Programs are also resulting

## Figure 3-1. Achieving All Cost-Effective Energy Efficiency: Key Perspectives



\*These are savings on a per facility basis, reflecting the energy consumption savings possible to new and existing homes and buildings based on information available today; these savings could be larger in the future based on development from a range of ongoing research and development efforts.

in the construction of new homes that use substantially less energy than today's homes and go beyond local codes; some organizations have set goals for net zero energy homes by 2015 to 2020.<sup>4</sup>

- **Buildings:** There are a variety of proven programs for delivering energy savings to commercial and institutional buildings as well—public and private office buildings, schools, hospitals, hotels, and others. Proven energy efficiency programs assist with building system improvements, training of building operators, commissioning and recommissioning of buildings, and routine assessment of building energy use. These programs offer savings of 20 percent or more at the building level.<sup>5</sup> They deliver technologies such as optimized, efficient lighting systems employing controls and day lighting; properly sized and efficient heating and cooling equipment; and low-standby and otherwise efficient products and equipment. Additional savings can be achieved when constructing a new building, and some organizations have energy savings goals of 50 percent or more for newly constructed buildings.<sup>6</sup> Additional savings can be achieved from two-way information communications that let customers see and respond to the true costs of service for their building energy use.
- **Industry:** There are also a variety of programs available for the industrial sector, including equipment-specific programs, systems optimization assistance, performance contracting, financial incentives, and low-interest financing. These programs are identifying and achieving energy savings of 10 percent or more.<sup>7</sup> The efforts target high-energy-consuming equipment including air compressors, boilers, motors, furnaces, chillers, cooling towers, fans, pumps, and refrigeration for replacement, tune-up, and enhanced maintenance. Some programs also help utilize waste heat through combined heat and power applications and industrial process optimization.

## Society

Society will benefit environmentally and economically from achieving all cost-effective energy efficiency and integrating it into a modernized energy system. Such

a modernized system, with more options for meeting peak demand, will provide greater reliability and have lower costs. Energy prices will be lower than otherwise since the most cost-effective resource, on the demand or supply side, will be used first, both in planning and day-to-day operations. This system will also have lower vulnerability to disruptions, such as supply curtailments from natural disasters due to greater use of demand-side resources.

Wiser use of natural gas and electricity also has a number of environmental benefits. These benefits include lower air pollution and reduced emissions of greenhouse gas, lower water use, and a lower environmental impact from fossil fuel extraction. Importantly, it offers a low-risk, low-cost approach to address climate change emissions between now and 2025 as decision-makers continue to discuss the level of reductions on greenhouse gas emissions that are necessary. By 2025, depending on the generation sources at the local level and whether efficiency has displaced existing generation or new generation, millions of tons of emissions of carbon dioxide will be prevented from entering the atmosphere, tons of reductions that would cost much more to go back and capture in 2025.

Greater investment in energy efficiency also helps create jobs, improve local economies, and assist low-income populations. Energy efficiency programs can create construction and installation jobs, with positive impacts on employment and local economies, and the savings from energy efficiency are often redirected to other activities that increase local and national employment (Kushler et al., 2005; NYSERDA, 2004; Goldstein, 2007). Local investments in energy efficiency can also lead to more sustainable local economies, requiring less power from elsewhere, as well as reducing load on overly taxed transmission systems; and it can create valuable long-lasting infrastructure changes to building, equipment and appliance stocks (Innovest, 2002). Low-income populations can also benefit when energy efficiency programs are effectively delivered and help relieve some of the financial pressures on these customers. However, it may be important to target specific measures and market transformation efforts toward the low-income

and other “hard-to-reach” groups to address social equity issues with those customers that may have had less access to specific efficiency benefits.

Further, this is a future that would spur greater technology innovation and increase the opportunity for a growing U.S. clean energy technology industry. A more energy-efficient economy benefits the entire U.S. population, with higher productivity from fewer units of energy consumed, fewer dollars spent on energy, and less air pollution.

## Evolving Policies and Technologies

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Achieving the ten implementation goals by 2015 to 2020 would create an energy efficiency picture in 2025 with a number of important features, as summarized above and highlighted in Figure 3-2. There are a number of challenges to achieve this Vision, including the necessary evolution of technology, policy, and program practices. Some of these evolving areas are described below, followed by an overview of what developments to look for as progress is made (see Figure 3-3).

### Regional Resource Planning

In some regions, there is growing focus on energy resource planning at the regional level or regional resource planning (RRP), with the development of regional wholesale markets and regional transmission organizations, the need for new regional interstate transmission, and the need to respond to policies promulgated by FERC and DOE (Roseman and Hochstetter, 2007). RRP is the planning and evaluation of new major generation, transmission, and demand-side resource investments based on their regional and state effects on electricity service, reliability, and rates. A regional view helps identify the value from demand and energy reductions that a more localized perspective could miss. It may be an effective planning process that can inform state and local energy efficiency planning processes and serve a valuable complementary role without superseding local activity or options.

### Evaluation, Measurement, and Verification Procedures

Robust EM&V is essential to the success of achieving all cost-effective energy efficiency. EM&V measures and documents the impacts of an energy efficiency program, allowing energy efficiency to be a reliable energy resource. Effective EM&V protocols are consistent and accurate, allow for transparent evaluation of energy savings and emission reductions, and are independently administered (Schiller Consulting, 2007). While a variety of the EM&V protocols in use today may be useful and credible, a more consistent, standardized set of independently administered protocols would facilitate greater reliance on energy efficiency as a resource in regional and national energy, capacity, and ancillary service markets.

Additional attention is necessary to reach this milestone. Importantly, several developments may push EM&V protocols in this direction. New requirements are being developed for energy efficiency to participate in regional energy markets. Another development is new requirements for greenhouse gas regulations at the state and regional level. This may extend internationally as well, as interest grows in having consistent approaches for measuring energy savings and the related avoided greenhouse gas emissions across country borders. Further, by 2025, EM&V protocols may benefit from the wider deployment of measurement technology at customers’ premises which may produce data on energy efficiency savings. This technology may improve the quality of EM&V, raise the level of savings credited to efficiency as conservative estimates are replaced by more accurate data, reduce the costs of delivering energy efficiency through advanced diagnostics, and reduce the costs of EM&V.

### Demand Response, Advanced Metering, and Smart Grids

These technologies can make a valuable contribution to achieving the goals of the Vision. Demand response and grid technologies, programs, and pricing can help reduce overall energy use when designed with this goal in mind. Measures of interest include time-of-use pricing, advanced meters, power quality management, load management devices like “smart” thermostats, and



distributed generation (also see DOE, 2003). As demand response programs become more established and offer financial, operational, energy, and environmental benefits, more utilities and states are expected to develop these types of programs. Right now, states are addressing EAct 2005 requirements to investigate time-based pricing and advanced meters. As the development and implementation of demand response programs require customer contact and education, these efforts can be combined with efforts to explore energy efficiency programs for greater energy savings and peak reductions. Continued exploration of how to best coordinate energy efficiency and demand response programs, as these technologies evolve, will be important.<sup>8</sup> It is also important to encourage smart grid interoperability<sup>9</sup> and coordination between and across utilities and regions.

### **Building Energy Efficiency Expertise/ Workforce**

The large-scale ramp-up in energy efficiency programs and services described in this Vision requires the efforts of a diverse set of professionals well-versed in a many aspects of energy efficiency. Many believe that successfully investing in energy efficiency as a key component of the nation's energy mix requires substantial additional investment in trained personal in a number of areas, including:

- Policy-makers and planners
- Program designers and implementers
- Energy service contractors
- Evaluators
- And more

## **Figure 3-2. Important Features of Energy Systems and Services in 2025 to Achieve All Cost-Effective Energy Efficiency**

- Universal energy efficiency services provided across residential, commercial, and industrial sectors
- Funding for energy efficiency programs that is consistent with cost-effective potential and allows for multiyear program planning
- Utility incentives aligned with the delivery of cost-effective energy efficiency
- Energy savings (capacity and energy) from efficiency programs integrated into long-term state/regional resource plans
- Consistent, robust, and independent evaluation, measurement, and verification of energy efficiency programs in place
- Strong public education on energy efficiency benefits and opportunities
- Updates to building codes to reflect the current cost-effective potential; enforcement of the updated codes
- Strong state, local, and federal government lead-by-example energy efficiency programs
- Energy bills that provide consistent information on energy use and costs, reflect true cost of service, and provide appropriate price signals
- New financing mechanisms for a variety of energy efficiency measures and services
- Modernized energy systems, including advanced meters, that enable demand-side resources; energy-efficient appliances and building controls that are connected to the electric grid
- Energy efficiency and demand response programs delivered in a coordinated manner
- Training on energy efficiency expertise in utility, regulatory, and private sectors
- Cost-effective, clean, efficient distributed generation integrated into energy resource plans
- Integration of R&D, building codes, appliance standards, and market transformation efforts

**Figure 3-3. Overview of Evolving Technologies and Practices**

Policy Area	Now	Long Term	Changes to Watch
Evaluation, measurement, and verification	<ul style="list-style-type: none"> <li>• Robust, transparent procedures established</li> </ul>	<ul style="list-style-type: none"> <li>• Consistent EM&amp;V approaches across the United States</li> <li>• Independent administered EM&amp;V</li> </ul>	<ul style="list-style-type: none"> <li>• Development of national standards</li> <li>• Requirements for independent verification</li> <li>• Growing role for smart grid technologies in EM&amp;V</li> <li>• Requirements for state and regional carbon programs</li> </ul>
Demand response, advanced metering, and smart grids	<ul style="list-style-type: none"> <li>• Customer energy use is not routinely linked to the energy system</li> </ul>	<ul style="list-style-type: none"> <li>• Consistent energy use and energy cost information available to all customers</li> <li>• Customers connected with two-way electricity grid</li> <li>• Delivery of energy efficiency enhanced through diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>• New technologies, such as advanced meters and smart appliances/controls</li> <li>• Data collection networks and data analysis to enhance energy efficiency</li> <li>• New customer interfaces</li> <li>• Increased interoperability</li> </ul>
Regional resource planning	<ul style="list-style-type: none"> <li>• State-level resource planning</li> <li>• Some regional energy efficiency program coordination</li> <li>• Federal policies at FERC and DOE</li> </ul>	<ul style="list-style-type: none"> <li>• Regional coordination informs state-level resource planning</li> </ul>	<ul style="list-style-type: none"> <li>• Regional value of energy efficiency identified</li> </ul>
Building energy efficiency expertise/workforce	<ul style="list-style-type: none"> <li>• Some established protocols and certification programs for key industry services</li> <li>• Some curriculum for universities and community colleges</li> </ul>	<ul style="list-style-type: none"> <li>• Robust energy efficiency industry across policy, planning, programming, and energy efficiency services</li> </ul>	<ul style="list-style-type: none"> <li>• Development and use of energy efficiency curriculum for various segments of the workforce</li> <li>• Development and broad use of training and certification programs</li> </ul>
Integration of R&D, building codes, appliance standards, and market transformation efforts	<ul style="list-style-type: none"> <li>• Some states managing programs in and across these key program areas</li> </ul>	<ul style="list-style-type: none"> <li>• States have processes to integrate R&amp;D, updates to building codes and appliance standards, and market transformation programs</li> </ul>	<ul style="list-style-type: none"> <li>• Regional and national coordination across these efforts</li> </ul>

Sources: PJM, 2007; CEC and CPUC, 2005; Business Roundtable, 2007; Elliott et al., 2007; Roseman and Hochstetter, 2007; Schiller Consulting, 2007; Western Governors' Association, 2006.

While there have been important developments in these areas—such as programs focusing on quality installation, new training and certification programs for home contractors, and new curricula for colleges and universities—more work is necessary to assess the workforce infrastructure required to support the robust energy efficiency industry envisioned in 10 or more years, and to see that the necessary training is provided.

### **Integration of R&D, Building Codes, Appliance Standards, and Market Transformation Efforts**

While there is significant cost-effective potential for meeting growing energy demand through energy efficiency and demand response technologies and practices in the coming years, technology continues to evolve and produce new opportunities for additional energy savings. Effectively taking advantage of these emerging opportunities requires coordination of the results of these R&D efforts with other key policy areas such as building codes, appliance standards, and market transformation programs. Further, the findings and results from delivering energy efficiency programs can inform the development of R&D strategies. Successful coordination across all of these efforts is important to increasing the overall benefits that energy efficiency can provide.

## **Notes**

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1. Sources are provided in the following notes for each of the key sectors: residential, commercial, and industrial. Additional sources on cost-effective opportunities for energy savings across these sectors can be found in Appendix B.
2. Home Performance with ENERGY STAR is an example of a whole home improvement program offering 20 percent, and up to 50 percent, savings per home and currently being implemented in more than a dozen jurisdictions around the country.
3. Nadel et al. (2004) found the median achievable potential for the residential sector is 26 percent; EPA analysis shows that the typical home can save about 30 percent on home energy bills through use of ENERGY STAR-qualified products. New homes are being constructed to offer savings of 20 percent from improvements to building envelopes and heating, ventilation, and air conditioning, without accounting for energy savings from plug loads such as lighting and appliances.

4. Austin Energy has announced a goal of zero-net-energy new homes by 2015; California is developing a roadmap for their new homes programs to get to zero-net-energy new homes by 2020; and the American Institute of Architects has a goal of zero-carbon new buildings by 2030, with an interim goal of 50 percent better than average buildings by 2010.
5. Nadel et al. (2004) found that the median achievable potential for the commercial sector is 22 percent. The Action Plan's Sector Collaborative found savings of 20 to 40 percent to be readily achievable in typical office buildings, hotels, and retail stores through common energy efficiency measures. EPA has information on a number of typical buildings that have been improved by 20 percent, 30 percent, or more. It also has information on more than 400 buildings that use 50 percent less energy than average buildings.
6. The American Institute of Architects has a goal of zero-carbon new buildings by 2030 with an interim goal of 50 percent better than average buildings by 2010.
7. Nadel et al. (2004) found the median achievable potential for the industrial sector is 14 percent. In addition, the DOE Save Energy Now program is identifying energy savings at the plant level of 10 percent or more across audits performed at hundreds of industrial facilities.
8. State decision-makers may want to design price-based demand response programs carefully to minimize the use of less-efficient and high-polluting distributed generation, which can negate the environmental benefits that can be achieved through demand response or energy efficiency. (For discussion, see EPA's analysis on clean energy options for the Ozone Transport Commission High Electric Demand Day Ozone Attainment Strategies, 2006 and 2007: <<http://www.otcair.org/document.asp?fview=meeting#>>.)
9. See the GridWise Architecture Council <<http://www.gridwiseac.org>> for more information on interoperability needs and potential benefits.



# 4: Related State, Regional, and National Policies



*A number of energy and environmental policies are being advanced at the state, regional, and national levels that have important interrelationships with the state-level energy efficiency policies of the Action Plan and the achievement of the Vision goal. These policies can be designed and implemented through a variety of approaches. Some would assist in breaking down the barriers to energy efficiency and work in conjunction with the Action Plan to help integrate cost-effective energy efficiency into a modernized energy system, while achieving other objectives. Other approaches might overlook energy efficiency and thereby lead to a higher-cost energy system than otherwise necessary.*

## Introduction to Policies

This chapter identifies important interrelationships between the Action Plan and five other state, regional, and federal policy areas. These policy areas are those designed to:

- Limit emissions of greenhouse gases.
- Encourage the use of clean, efficient distributed generation.
- Promote clean energy supply, such as renewable energy.
- Promote load reductions at critical peak times through demand response.
- Modernize and maintain the nation's electric transmission and distribution system, including "smart grid" and advanced meter infrastructure.
- Maintain a sufficient reserve margin for reliable electricity supply.

Policies in these areas each impact the nation's energy system and the energy customer.

## Recommendations and Considerations

Key interrelationships, recommendations, and considerations for effectively integrating these efforts so that

they act together to achieve the goals of the Vision are provided below.

- **Limit emissions of greenhouse gases.** Climate change is a serious environmental issue and a number of states are advancing policies to limit emissions of these gases. In addition, there are a variety of legislative proposals at the federal level. Energy efficiency is a near-term, low-cost approach for reducing emissions of carbon dioxide, the primary greenhouse gas.<sup>1</sup> However, particular attention needs to be paid to the design of these regulatory approaches so that they provide sufficient funding and/or incentives to overcome the market barriers that persistently limit greater investment in energy efficiency, and incorporate energy efficiency as part of the solution. If efforts are not taken to integrate cost-effective energy efficiency, carbon regulation can be expected to cost society substantially more. States and others are exploring a variety of approaches to integrating energy efficiency. It is recommended that:
  - Greenhouse gas regulation be designed to capture all low-cost carbon emission reductions available through energy efficiency by creating funding/incentives for energy efficiency programs and investments.
  - Methodologies for reporting greenhouse gas emissions be standardized and include guidance for measuring and verifying reductions from energy efficiency.

- Potential costs of reducing emissions of greenhouse gases be reflected in resource planning processes, including the application of cost-effectiveness tests for energy efficiency, where appropriate.
- **Encourage the use of clean, efficient distributed generation.** Distributed generation brings generation close to demand loads. When clean and efficient, distributed generation can help meet demand in congested areas, while lowering emissions of greenhouse gases and other pollutants and lower distribution losses. As an example, many states recognize combined heat and power as a type of clean distributed generation since it provides increased efficiency compared to grid-purchased power and on site thermal production, helps meet load in congested areas, and avoids line losses.<sup>2</sup> Other examples of clean distributed generation include solar and localized wind generation. Distributed generation sources can help stave off new larger generation options, reduce line losses, and help to provide alternatives to meeting existing air pollution requirements such as regulations for limiting emissions of nitrogen oxides. Some states consider output-based emission regulations for distributed generation to encourage the use of greater fuel conversion efficiency as an air pollution control measures (EPA, 2004). This is in addition to the policies included in Goal Ten of the Vision.
- **Promote clean energy supply, such as renewable energy.** Several policies help advance both energy efficiency and renewable energy. For example, clean energy portfolio standards are in place in one form or another (e.g., renewable portfolio standards, alternative energy portfolio standards) in more than half the states across the country, and discussions continue at the national level.<sup>3</sup> As energy efficiency is available in many parts of the country, allowing energy efficiency savings to help meet clean energy requirements can help bring clean energy into the resource mix at lower overall costs. For example, by coupling renewable energy with energy efficiency, states have found that the total cost for portfolio standards is reduced (La Capra Associates, 2006). It is recommended that energy efficiency be considered in the development of clean energy portfolio policies. In addition, a number of states are promoting distributed renewable energy such as photovoltaics. Because these systems may best contribute to the overall energy system when properly sized to meet local energy demand, it may be important to promote them as part of efforts that first reduce the demand for energy through cost-effective energy efficiency. It is recommended that cost-effective energy efficiency be explored as an important first step to programs that incentivize investment in distributed renewable energy.
- **Modernize and maintain the nation's electric transmission and distribution system.** Economic and environmental benefits from modernizing the electric grid will come from enabling demand-side resources to provide supply and ancillary services, facilitating the dispatch of the most energy-efficient supply, and reducing line losses. As advanced metering infrastructure is deployed, recognizing opportunities to leverage energy efficiency through new rate designs and customer education campaigns will increase the benefits achieved by the technology. It is recommended that advancements in grid-connected appliances, controls, transformers, energy storage, and on site generation incorporate energy-efficient design. This is in addition to the policies included in Goal Nine of the Vision.
- **Maintain a sufficient reserve margin for reliable electricity supply.** The level of investment needed by the utility sector to maintain system reliability can be lowered through the delivery of cost-effective energy efficiency, clean distributed generation, demand response, grid advancements, and advancements in storage capabilities. It is recommended that energy efficiency be recognized as a high priority resource in energy resource planning and that this suite of demand-related efforts be incorporated in resource planning and reliability efforts. Increasing investment in energy efficiency will also increase the diversity of fuels and resources used to meet electricity demand and maintain resource adequacy.

In addition to these policies, there are several technology areas to monitor under the Action Plan for inclusion in future updates. These technologies have not yet achieved enough penetration to determine how to effectively incorporate energy efficiency, but are anticipated to make significant progress over the coming years. These technologies include plug-in hybrid vehicles and “smart” appliances.

- **Plug-in hybrid vehicles.** These vehicles use the same technology as electric/gas hybrid vehicles today, but include a larger battery that can be recharged by plugging it into an electric outlet.<sup>4</sup> Currently, they are not mass-produced, so consumers cannot purchase them. However, many believe that they will be available on a large scale in the future, providing owners the opportunity to charge the battery with grid electricity. Studies are in place at universities to examine how plug-in hybrids might be integrated into the network to provide demand response options—using battery-charged electricity when the load curve is at its highest point, a version of pumped storage currently in use by many utilities.
- **Smart appliances.** There is increasing discussion of manufacturing appliances that communicate with the

electric grid. These “smart” appliances “talk” to the grid through technology, sensing grid conditions by monitoring system frequency and providing automatic demand response in times of disruption.<sup>5</sup> This technology is a computer chip that can be integrated during the appliance manufacturing process. Pilots underway in the Pacific Northwest include approximately 200 homes, but this technology is not currently available on a large scale (PNNL, 2006). Many experts believe that this technology will be widely used across the country in the coming years, providing an increased opportunity to leverage energy efficiency.

## Notes

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1. See Appendix B for references to studies that discuss the carbon emissions savings from energy efficiency.
2. States including Connecticut, Hawaii, Maine, North Carolina, Pennsylvania, and Washington include combined heat and power as an eligible resource in their renewable portfolio standards.
3. See EPA's *Guide to Action* and policy tracking resources.
4. For more information on plug-in hybrid vehicles, visit <<http://www.pluginpartners.org>> or <<http://www.calcars.org>>.
5. For more information on “smart” appliances, visit <<http://gridwise.pnl.gov/technologies>> and <<http://www.gridwiseac.org>>.





# 5: Tools and Assistance to Help Realize the Vision



*This chapter discusses the tools and other assistance currently available to help leading parties realize the Vision's long-term goal of achieving all cost-effective energy efficiency by 2025. A lack of familiarity with best practice policy and program options remains a key barrier to increased investment in cost-effective energy efficiency and a number of tools and resources are available to help leading parties, including regulators, utilities, state governments, consumer advocates, environmental groups, and large end-users to explore these options (National Action Plan for Energy Efficiency, 2006). Some of this assistance is available through the Action Plan and some is available through other efforts of the federal government and the private sector.*

## National Action Plan for Energy Efficiency Tools

A number of tools and resources have been developed under the Action Plan to assist organizations as they strive to meet their commitments under the Action Plan. These tools and resources will help state decision-makers and others achieve many of the ten implementation goals outlined in Chapter 2, as shown in Figure 5-1 and available on the Action Plan Web site <[www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan)>.

The Leadership Group will prioritize the development of new tools and assistance based on what is needed to help parties meet the Vision goals within their company, organization, or state. In addition, materials may need to be developed to address some of the challenges to meeting the Vision outlined in Chapter 3 or to facilitate the development of other state, regional, and federal policies so that they complement the achievement of the Vision goals, as outlined in Chapter 4. The Leadership Group will consider these gaps when identifying and prioritizing the Action Plan's future activities. Additional areas for attention to address evolving policies and technologies for achieving the Vision and integrating with other state, regional, and federal policies include:

- Integration of R&D, building codes, appliance standards, and market transformation efforts.
- Integration of energy efficiency into regional energy markets.

- Training on energy efficiency expertise in the utility, regulatory, and private sectors.<sup>1</sup>
- State, regional, and federal carbon policies designed to encourage energy efficiency where cost-effective.

In addition to the development of tools and other resources, the Leadership Group members are helping others through peer-to-peer assistance.

## Federal Government Assistance

A number of federal programs are available to encourage energy efficiency and can be crucial resources for meeting the Vision goals. EPA and DOE's ENERGY STAR program is one such resource. Nationally, ENERGY STAR provides a platform for program implementation across customer classes and defines voluntary efficiency levels for homes, buildings, and products. ENERGY STAR is a voluntary public-private partnership designed to reduce energy use and related greenhouse gas emissions. The program has an extensive network of partners including equipment manufacturers, retailers, builders, energy service companies, private businesses, and public sector organizations.

Since the late 1990s, EPA and DOE have worked with utilities, state energy offices, and regional nonprofit organizations to help leverage ENERGY STAR messaging, tools, and strategies to enhance local energy efficiency programs. Today more than 450 utilities (and other efficiency program administrators), servicing 65

**Figure 5-1. National Action Plan for Energy Efficiency Tools by Implementation Goals**

Goal	Type of Tool or Resource		Detailed Action Plan Tools and Resources
	Introduction to Issues in Action Plan Report	Detailed Guide/How-to Material	
<b>Goal One:</b> Establishing Cost-Effective Energy Efficiency as a High-Priority Resource	X	X	<ul style="list-style-type: none"> <li>• Guide to Resource Planning with Energy Efficiency</li> <li>• Guide for Conducting Energy Efficiency Potential Studies</li> <li>• Communications Kit</li> </ul>
<b>Goal Two:</b> Developing Processes to Align Utilities Incentives Equally for Efficiency and Supply Resources	X	X	<ul style="list-style-type: none"> <li>• Aligning Utility Incentives with Investment in Energy Efficiency Paper</li> </ul>
<b>Goal Three:</b> Establishing Cost-Effectiveness Tests	X		<ul style="list-style-type: none"> <li>• Guide to Resource Planning with Energy Efficiency</li> <li>• Guide for Conducting Energy Efficiency Potential Studies</li> </ul>
<b>Goal Four:</b> Establishing Evaluation, Measurement, and Verification Mechanisms	X	X	<ul style="list-style-type: none"> <li>• Model Energy Efficiency Program Impact Evaluation Guide</li> </ul>
<b>Goal Five:</b> Establishing Effective Energy Efficiency Delivery Mechanisms	X	X	<ul style="list-style-type: none"> <li>• Regional Implementation Meetings Resources Database</li> </ul>
<b>Goal Six:</b> Developing State Policies to Ensure Robust Energy Efficiency Practices		X	<ul style="list-style-type: none"> <li>• Building Codes for Energy Efficiency Fact Sheet</li> </ul>
<b>Goal Seven:</b> Aligning Customer Pricing and Incentives to Encourage Investment in Energy Efficiency	X		
<b>Goal Eight:</b> Establishing State of the Art Billing Systems		X	<ul style="list-style-type: none"> <li>• Sector Collaborative on Energy Efficiency; Overview of Utility Data Availability and Proposed Best Practices to Facilitate Energy Benchmarking</li> </ul>
<b>Goal Nine:</b> Implementing State of the Art Efficiency Information Sharing and Delivery Systems		X	<ul style="list-style-type: none"> <li>• Paper on Coordination of Demand Response and Energy Efficiency (under development)</li> </ul>
<b>Goal Ten:</b> Implementing Advanced Technologies			

percent of U.S. households, participate in the ENERGY STAR program. More information on ENERGY STAR can be found at <http://www.energystar.gov>.

Two other federal resources that provide assistance for energy efficiency measures are the Low Income Home Energy Assistance Program (LIHEAP) and the Weatherization Assistance Program (WAP). The LIHEAP, administered by the U.S. Department of Health and Human Services, helps eligible low-income homeowners and renters pay their heating and cooling bills. The WAP helps reduce the energy bills of low-income households by making their homes more energy efficient. Both of these programs have proven to be very effective. Since 1999, DOE has been encouraging the network of weatherization providers to adopt a whole-house approach whereby they approach residential energy efficiency as a system rather than as a collection of unrelated pieces of equipment (DOE, 2006; National Action Plan for Energy Efficiency, 2006, pp. 6-32, 6-33).

Federal financial grants can also be used by parties to explore energy efficiency policy and program issues. DOE issues many grant solicitations throughout the year that provide funding for R&D activities, for the development of specific types of technologies, and for many other types of activities that promote energy efficiency. The U.S. Department of Agriculture sometimes issues funding for the development of energy efficiency projects that use renewable fuels or for the development of these technologies in rural areas.

There are also federal and state tax credits available for installing energy efficiency projects. Many energy efficiency program administrators are now pointing consumers and businesses to the new federal tax credits and incorporating them in their programs. In addition, program administrators can educate their customers on existing tax strategies, such as accelerated depreciation and investment tax strategies, to help them recoup the costs of their investments faster. Some states offer additional tax credits, and/or offer sales tax "holidays," where sales tax is waived at point of sale for a specified period of time ranging from one day to a year (National Action Plan for Energy Efficiency, 2006, p. 6-37).

## Leveraging Other Resources

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Private sector resources will be critical in achieving the Action Plan Vision for 2025. Private sector resources provide expertise, job training and certification, and additional funding and financing of energy efficiency programs and services. Many organizations provide education and training to their members, including training on energy efficiency. Working with these organizations provides access to their members, and the opportunity to leverage funding or marketing opportunities provided by these organizations (National Action Plan for Energy Efficiency, 2006, p. 6-37). Private foundations often provide grants to fund the exploration of energy efficiency policy and program issues.

In addition, a number of private firms and not-for-profit entities deliver energy efficiency programs throughout the United States or in specific regions. These firms can quickly get a program up and running, as they have the expertise, processes, and infrastructure to handle program activities. New program administrators can contract with these organizations to deliver energy efficiency program design, delivery, and/or implementation support in their service territory (National Action Plan for Energy Efficiency, 2006, p. 6-38). Also, those looking to establish an energy efficiency program can look to well-regarded programs as a reference. Utilities that are starting up or revising existing programs can look to other programs in their area or the country to utilize existing and emerging best programs. Many successful program models have emerged and are being refined to achieve even more cost-effective results (National Action Plan for Energy Efficiency, 2006, p. 6-39). The Consortium for Energy Efficiency has announced a new "Ask an Expert" initiative to help share these best practice program information beyond their membership.

## Engaging All Stakeholders

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To achieve the full potential for energy savings and the related societal benefits, many parties need to work together toward the Vision. Energy efficiency policies and programs affect numerous parties, including local, state,

and federal governments; utilities; customers; energy efficiency product and service providers; manufacturers; builders; architects; environmental groups; energy system operators; labor advocates; and economic development groups. Educating and soliciting input from all key parties, either through local, state, and regional collaboratives or through other outreach efforts, will greatly increase the economic and environmental benefits achieved through energy efficiency.

## Notes

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1. A scope of work is being developed in this area to estimate the size of the workforce required, the skills necessary, and the types of curricula or training that can help develop these skills.

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## Appendix B: Related Studies and Documents



### Studies That Include the Potential Magnitude of Energy Savings From Energy Efficiency

Author/ Source, Date	Title	Magnitude Description (MWh, MW, etc.)	Web Site
William R. Prindle, Anna Monis Shipley, and R. Neal Elliott (ACEEE), 2006	Energy Efficiency's Role in a Carbon Cap-and-Trade System: Modeling Results from the Regional Greenhouse Gas Initiative	Doubling efficiency would cut load growth by about two-thirds in 2024, from about 20% to about 6% above 2006 levels. Electricity generation is measured in GWh; by 2024, under the reference case, generation would reach around 480,000 GWh, and with doubled efficiency it would reach around 430,000 GWh.	<a href="http://aceee.org/pubs/e064.pdf?CFID=3568249&amp;CFTOKEN=25476090">http://aceee.org/pubs/e064.pdf?CFID=3568249&amp;CFTOKEN=25476090</a>
ACEEE, 2007	Energy Efficiency Resource Standards—Summary Paper	ACEEE analysis estimates that EERS requirements now in place could reduce national electricity demand by more than 1% per year by 2013.	<a href="http://aceee.org/energy/state/utpolicy.htm">http://aceee.org/energy/state/utpolicy.htm</a>
McKinsey Global Institute, 2007	Curbing Global Energy Demand Growth: The Energy Productivity Opportunity	By capturing the potential available from existing technologies with an internal rate of return of 10% or more, we could cut global energy demand by half or more over the next 15 years. Collectively, we have the potential to cut global energy demand by 135 quadrillion Btus—the equivalent of 64 million barrels of oil per day, or almost 150% of the entire U.S. energy consumption today.	<a href="http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/index.asp">http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/index.asp</a>
Michael Rufo and Fred Coito, (XENERGY, Inc.), 2002	California's Secret Energy Surplus: The Potential for Energy Efficiency	This study examines the potential energy and peak demand savings from energy efficiency measures in California. The study finds that, if all measures that are economic were implemented, potential peak demand savings would amount to roughly 10,000 MW. Additionally, net program peak savings potential ranges from roughly 1,800 MW under current funding (business as usual) to 3,500 MW if funding is doubled (advanced efficiency), to 5,900 MW if funding is quadrupled (maximum efficiency).	<a href="http://www.ef.org/documents/Secret_Surplus.pdf">http://www.ef.org/documents/Secret_Surplus.pdf</a>

## Studies That Include the Potential Magnitude of Energy Savings From Energy Efficiency

Author/ Source, Date	Title	Magnitude Description (MWh, MW, etc.)	Web Site
Optimal Energy, Inc. (Northeast Energy Efficiency Partnerships, Inc.), 2004, updated 2005	Economically Achievable Energy Efficiency Potential in New England	This paper looks at the economically achievable potential for energy efficiency in New England. If the region were to commit to fully capturing the energy efficiency potential (at an average cost of 3.1 cents per kWh) it could provide energy savings of 17,103 GWh by 2008 and 34,375 GWh by 2013—bringing energy demand back to 1993 levels. This represents a decrease in energy demand of approximately 1.38% a year, as opposed to ISO-New England's forecasted 1.2% annual increase.	<a href="http://www.neep.org/files/Updated_Achievable_Potential_2005.pdf">http://www.neep.org/files/Updated_Achievable_Potential_2005.pdf</a>
R. Neal Elliott, Maggie Eldridge, Anna M. Shipley, John "Skip" Laitner, Steven Nadel, Alison Silverstein, Bruce Hedman, and Mike Sloan (ACEEE)	Potential for Energy Efficiency, Demand Response, and Onsite Renewable Energy to Meet Texas's Growing Electricity Needs	This paper looks at the immediate and long-term future of using energy efficiency, renewables, and demand response in Texas to meet peak demand, to enhance energy security, and to sustain the state's economic growth. Across all sectors, these studies show a median technical potential of 33% for electricity and 40% for gas, and median economic potentials for electricity and gas of 20% and 22% respectively.	<a href="http://www.environmentaldefense.org/documents/6029_ACEEE_Texas_Report.pdf">http://www.environmentaldefense.org/documents/6029_ACEEE_Texas_Report.pdf</a>
Western Governors' Association, 2006	Clean Energy, A Strong Economy and a Healthy Environment: Report of the Clean and Diversified Energy Advisory Committee to the Western Governors	By adopting the WGA's best practices scenario in the 18 WGA states, load growth could be reduced by as much as 75% over the next 15 years (report published in 2006). The best practices scenario shows that it is possible to reduce electricity consumption in 2020 by 20% relative to that in the reference scenario (measured in TWh per year).	<a href="http://www.westgov.org/wga/publicat/CDEAC06.pdf">http://www.westgov.org/wga/publicat/CDEAC06.pdf</a>
Steven Nadel, Anna Shipley, and R. Neal Elliott (ACEEE), 2004	The Technical, Economic and Achievable Potential for Energy-Efficiency in the U.S.—A Meta-Analysis of Recent Studies	This paper summarizes 11 studies on the technical, economic, and/or achievable potential for energy efficiency within the U.S. The studies show, across all sectors, a median technical potential of 33% for electricity and 40% for gas, and median economic potentials for electricity and gas of 20% and 22% respectively.	<a href="http://www.aceee.org/conf/04ss/rnemeta.pdf">http://www.aceee.org/conf/04ss/rnemeta.pdf</a>

## Studies That Include the Potential Magnitude of Energy Savings From Energy Efficiency

Author/Source, Date	Title	Magnitude Description (MWh, MW, etc.)	Web Site
DOE EERE, 2006	Projected Benefits of Federal Energy Efficiency and Renewable Energy Programs, FY 2007–FY 2050	The Office of Energy Efficiency and Renewable Energy (EERE) estimates benefits for each of its nine programs in the mid-term (2010–2025) and long term (2030–2050). If the goals of EERE’s investment portfolio are achieved and the corresponding market outcomes realized, nonrenewable energy consumption will drop by 8 quadrillion Btus by 2025, or about 28% of the expected incremental growth in energy demand over this time period; and by 32 quadrillion Btus by 2050, or about 78% of the expected incremental growth in annual energy demand over this time period. This results in a declining demand for nonrenewable energy consumption starting in 2030, despite a growing economy.	<a href="http://www1.eere.energy.gov/ba/pdfs/39684_01.pdf">http://www1.eere.energy.gov/ba/pdfs/39684_01.pdf</a>

## Studies That Value the Benefits From Energy Efficiency

Author/Source, Date	Title	Magnitude Description (MWh, MW, etc.)	Web Site
Neal Elliott and Anna Monis-Shiple (ACEEE), 2005	Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets: Updated and Expanded Analysis	This study evaluates the potential reduction in natural gas consumption energy efficiency and renewable energy. It projects an annual consumer savings for energy efficiency only of \$32 billion in 2010 and \$54 billion in 2020.	<a href="http://aceee.org/pubs/e052full.pdf?CFID=65288&amp;CFTOKEN=51121347">http://aceee.org/pubs/e052full.pdf?CFID=65288&amp;CFTOKEN=51121347</a>
Anthony Wright, Michaela Martin, Bob Gemmer, Paul Scheihing, and James Quinn (DOE EERE), 2007	Save Energy Now: Results from the U.S. DOE 2006 Save Energy Now Assessment Initiative	<p>DOE, through its 2006 Save Energy Now initiative, trained teams from 200 plants on ways to reduce energy use and carbon emissions. The results from this program show that individual plants can:</p> <ul style="list-style-type: none"> <li>• Cut energy bills by 10% or more each year (over \$2.5 million per plant, on average).</li> <li>• Save an average of 17.3% of natural gas annually.</li> <li>• Save an average of 20,200 metric tons of CO<sub>2</sub> emissions annually.</li> </ul> <p>In all, the 200 assessments found over \$500 million in potential energy savings and 4 million metric tons in potential CO<sub>2</sub> emissions reductions.</p>	<a href="http://www.eere.energy.gov/industry/saveenergynow/partners/pdfs/sen_2006_results_summary_9-20-07.pdf">http://www.eere.energy.gov/industry/saveenergynow/partners/pdfs/sen_2006_results_summary_9-20-07.pdf</a>

## Studies That Value the Benefits From Energy Efficiency

Author/ Source, Date	Title	Magnitude Description (MWh, MW, etc.)	Web Site
DOE EERE	DOE's Save Energy Now Initiative Recognizes High Performing Plants	<p>Through its Save Energy Now initiative, DOE gives manufacturers the opportunity to receive free energy assessments and recognition for energy savings. Manufacturers received awards if they reported their energy savings results within 6 months and met the criteria in one of the following categories:</p> <ol style="list-style-type: none"> <li>1. <b>Energy saver plant</b>—more than 75,000 million Btu total energy savings or more than 7.5% total energy savings.</li> <li>2. <b>Energy champion plant</b>—more than 250,000 million Btu total energy savings or more than 15% total energy savings.</li> </ol>	<a href="http://www1.eere.energy.gov/news/progress_alerts/progress_alert.asp?aid=248">http://www1.eere.energy.gov/news/progress_alerts/progress_alert.asp?aid=248</a>
Martin Kushler, Dan York, and Patti Witte, 2005	Examining the Potential for Energy Efficiency to Help Address the Natural Gas Crisis in the Midwest	<p>This report identifies a number of savings/benefits from energy efficiency:</p> <ol style="list-style-type: none"> <li>1. Potential percentage of natural gas savings by sector in key benchmark years (2006, 2010, 2015, 2020).</li> <li>2. Potential percentage of electricity savings by sector in key benchmark years.</li> <li>3. Projected net natural gas consumption savings (due to energy efficiency) by sector in key benchmark years (MMcf).</li> <li>4. Projected net electricity consumption savings (due to energy efficiency) by sector in key benchmark years (MWh).</li> <li>5. Projected net natural gas customer dollar savings (due to energy efficiency) by sector in key benchmark years.</li> <li>6. Projected net electricity customer dollar savings (due to energy efficiency) by sector in key benchmark years, and some other estimates of dollar savings.</li> </ol>	<a href="http://www.pickocc.org/publications/natural_gas/Natural_Gas_Crisis_Report.pdf">http://www.pickocc.org/publications/natural_gas/Natural_Gas_Crisis_Report.pdf</a>
Mark Bernstein, Christopher Pernin, Sam Loeb, Mark Hanson (RAND), 2002	The Public Benefit of Energy Efficiency to the State of Massachusetts	This study estimates public benefits of energy efficiency in Massachusetts and finds that improvements in energy efficiency in the commercial, industrial, and residential sectors is associated with benefits to the state economy from 1977 to 1997 that range from \$1,664 per capita to \$2,562 per capita in 1998 dollars and approximately 11% lower air emissions from Massachusetts' share of local emissions from power generation.	<a href="http://www.rand.org/pubs/monograph_reports/2005/MR1588.pdf">http://www.rand.org/pubs/monograph_reports/2005/MR1588.pdf</a>

## Studies That Estimate the Carbon Reduction Benefits From Energy Efficiency

Author/ Source, Date	Title	Report Description	Web Site
Charles F. Kutscher (American Solar Energy Society), 2007	Tackling Climate Change in the U.S.: Potential Carbon Emissions Reductions from Energy Efficiency and Renewable Energy by 2030	This report looks at how much energy efficiency and renewable technologies can contribute towards reducing U.S. carbon emissions to atmospheric concentrations of 450 to 500 ppm (levels desired by a number of current legislative proposals). The report summarizes the potential carbon reduction contributions from various areas: energy efficiency, concentrating solar power, photovoltaics, wind, biofuels, biomass, and geothermal. The report found that energy efficiency and renewable technologies could meet most, if not all, of the U.S. carbon emissions reductions that will be needed to help limit the atmospheric concentration of CO <sub>2</sub> to 450 to 500 ppm. "Approximately 57% of the total carbon reduction contribution is from energy efficiency and (EE) about 43% is from renewables. Energy efficiency measures can allow U.S. carbon emissions to remain about level through 2030, whereas the renewable supply technologies can provide large reductions in carbon emissions below current values."	<a href="http://www.ases.org/climatechange/climate_change.pdf">http://www.ases.org/climatechange/climate_change.pdf</a>
Ernst Worrell, Nathan Martin, and Lynn Price (Ernest Orlando Lawrence Berkeley National Laboratory), 1999	Energy Efficiency and Carbon Dioxide Emissions Reduction Opportunities in the U.S. Iron and Steel Sector	This paper focuses on the U.S. iron and steel industry and identifies cost-effective energy and carbon dioxide emissions savings that can be accomplished currently and in the short-term future. In a detailed analysis of U.S. blast furnaces and steel mills (SIC 3312 only), the authors examined over 45 specific energy efficiency technologies and measures and estimated energy savings, carbon dioxide savings, investment costs, and operation and maintenance costs for each of these measures. Based on this information, they constructed a conservation supply curve for U.S. iron and steelmaking that found a total cost-effective reduction of 3.8 GJ/t, equivalent to an achievable energy savings of 18% of 1994 U.S. iron and steel energy use and 19% of 1994 U.S. iron and steel carbon dioxide emissions.	<a href="http://www.energystar.gov/ia/business/industry/41724.pdf">http://www.energystar.gov/ia/business/industry/41724.pdf</a>

## Studies That Estimate the Carbon Reduction Benefits From Energy Efficiency

Author/ Source, Date	Title	Report Description	Web Site
Howard Geller, John DeCicco, and Steven Nadel (ACEEE), 1993	Cost-Effective Carbon Dioxide Reduction Initiatives	This paper proposes and analyzes ten different national energy efficiency measures that could be used to meet President Clinton's former proposal to reduce GHG emissions to 1990 levels by 2000. If these ten initiatives were undertaken, ACEEE projected, national CO <sub>2</sub> emissions would be reduced by nearly 9% in 2000. In addition, national energy use in 2000 would fall by 7% and consumers' energy bills would be reduced by over \$50 billion that year. By 2010, CO <sub>2</sub> emissions would fall by 20%, national energy use would fall by nearly 17%, and consumers' energy bills would be slashed by over \$160 billion per year. These reductions in CO <sub>2</sub> emissions, energy consumption, and energy bills are relative to projected levels based on the reference case in DOE's Annual Energy Outlook 1993.	<a href="http://www.aceee.org/pubs/e934.htm">http://www.aceee.org/pubs/e934.htm</a>
Illinois Governor Rod R. Blagojevich Climate Change Advisory Group, 2007	Modeling of Policy Proposals	This presentation contains an estimate of reductions of MtCO <sub>2</sub> e, changes in electricity sales due to implementing policies, changes in electricity generation, policies' contributions to generation growth, effects on coal generation, greenhouse gas policy impact outside Illinois, and other impacts of adopting a number of policies such as "enhanced energy efficiency programs." The presentation finds that a mixed program could reduce electricity load growth by 100%.	<a href="http://www.epa.state.il.us/air/climatechange/documents/07-09-06/modeling-of-policy-proposals.ppt">http://www.epa.state.il.us/air/climatechange/documents/07-09-06/modeling-of-policy-proposals.ppt</a>
Interlaboratory Working Group (Oak Ridge National Laboratory and Lawrence Berkeley National Laboratory), 1997	Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Efficient and Low-Carbon Technologies by 2010 and Beyond	This report shows the results of a study conducted by five DOE labs on the U.S. potential to reduce greenhouse gas emissions by employing energy-efficient and low-carbon technologies. The study looked at business-as-usual forecasts from the Energy Information Administration's 1997 Outlook, which projected an increase of 390 million metric tonnes of carbon (MtC) per year (from 1340 to 1730 MtC) between 1990 and 2010. The study concluded that, along with utility sector investments, a vigorous national commitment to develop and deploy energy-efficient and low-carbon technologies could cost-effectively reduce U.S. carbon emissions by approximately 390 MtC per year.	<a href="http://enduse.lbl.gov/Projects/5Lab.html">http://enduse.lbl.gov/Projects/5Lab.html</a>

## Studies That Estimate the Carbon Reduction Benefits From Energy Efficiency

Author/ Source, Date	Title	Report Description	Web Site
John Mortensen (National Renewable Energy Laboratory), 2002	Projected Benefits of Federal Energy Efficiency and Renewable Energy Programs: FY 2003–FY 2020	The report summarizes the results of EERE's annual Government Performance and Results Act data for fiscal year 2003. The survey reviewed a number of energy, environmental, and financial metrics including carbon emissions displaced by EERE's programs. The report predicts that "By 2020, EERE's programs could reduce total fossil energy consumption by 9–15% and reduce total carbon emissions by 9–17% compared to the 'No-EE' case. Projected growth in fossil energy consumption could be reduced by 40–67% by 2020. Projected growth in carbon emissions could be reduced by 34–67% by 2020."	<a href="http://www1.eere.energy.gov/ba/pdfs/fy03_benefits_report.pdf">http://www1.eere.energy.gov/ba/pdfs/fy03_benefits_report.pdf</a>

## Studies That Discuss Existing Barriers to Greater Investment in Energy Efficiency

Author/ Source, Date	Title	Report Description	Web Site
Miriam Pye (ACEEE), 2008	Making Business Sense of Energy Efficiency and Pollution Prevention	This paper outlines a number of successful projects that have combined energy efficiency and pollution prevention technologies. The paper also highlights the benefits of energy efficiency in preventing pollution and reducing greenhouse gases, along with energy savings potential and economic benefits. An overview of barriers to energy efficiency is also provided, along with solutions to overcome these barriers.	<a href="http://www.aceee.org/pubs/ie982.htm">http://www.aceee.org/pubs/ie982.htm</a>
Ernest Worrell and Lynn Price (Lawrence Berkeley National Laboratory), 2001	Barriers and Opportunities: A Review of Selected Successful Energy-Efficiency Programs	This paper looks at barriers that prevent the implementation of energy efficiency improvements.	<a href="http://industrial-energy.lbl.gov/node/198">http://industrial-energy.lbl.gov/node/198</a>
Johnathan Garo Koomey, 1990	Energy Efficiency in New Office Buildings: An Investigation of Market Failures and Corrective Policies	This dissertation examines policies used to encourage energy efficiency in commercial buildings. It delves into the technical evidence for market failures and other sources that prevent optimal energy efficiency measures from being used. More specifically, the paper looks at technical evidence for market failures affecting the energy efficiency of new office buildings and looks at the type of market failures and regulatory distortions, such as imperfect competition, economic non-rationality, and regulatory distortions. The paper also provides a number of corrective policies that can be used to encourage energy efficiency.	<a href="http://enduse.lbl.gov/Info/JGKdissert.pdf">http://enduse.lbl.gov/Info/JGKdissert.pdf</a>

## Studies That Discuss Existing Barriers to Greater Investment in Energy Efficiency

Author/ Source, Date	Title	Report Description	Web Site
William H. Golove and Joseph H. Eto (Lawrence Berkeley National Laboratory), 1996	Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency	The report discusses seven different market barriers to investment in energy efficiency: <ol style="list-style-type: none"> <li>1. Misplaced incentives.</li> <li>2. Lack of access to financing.</li> <li>3. Flaws in market structure.</li> <li>4. Mis-pricing imposed by regulation.</li> <li>5. Decision influenced by custom.</li> <li>6. Lack of information or misinformation.</li> <li>7. "Gold-plating" and inseparability of features.</li> </ol>	<a href="http://eetd.lbl.gov/ea/EMS/reports/38059.pdf">http://eetd.lbl.gov/ea/EMS/reports/38059.pdf</a>
Steven Nadel (ACEEE), 1997	Appliance Energy Efficiency: Opportunities, Barriers and Policy Solutions	The study reviews recent progress in improving the energy efficiency of appliances in the United States. Nonetheless, for many products in the United States, appliance energy efficiency has not progressed much in recent years due to market barriers and the lack of certain policies that would require increased efficiency. The paper presents technical opportunities for increasing the energy efficiency of appliances and discusses policies that can overcome barriers to energy efficiency.	<a href="http://www.aceee.org/pubs/a972.htm">http://www.aceee.org/pubs/a972.htm</a>

## Documents That Discuss a Vision for Energy Efficiency and Related Policies, Programs, and Technologies

Author/ Source, Date	Title	Scope	Web Site
Alliance to Save Energy, 2005	Vision 2010: The Alliance Energy Efficiency Plan	This Web site describes legislative provisions that should be implemented to improve energy efficiency in different sectors of the economy: transportation, buildings, industry, and electric and natural gas utilities.	<a href="http://www.ase.org/content/article/detail/2131">http://www.ase.org/content/article/detail/2131</a>
Business Roundtable, 2007	More Diverse, More Domestic, More Efficient: A Vision for America's Energy Future	The Business Roundtable report was developed by a group of chief executives of major U.S. corporations. The report describes the energy challenges the U.S. is facing today and provides specific recommendations on how to solve energy needs such as increasing the efficiency of buildings, appliances, increased use of efficient generating technologies such as CHP.	<a href="http://www.businessroundtable.org/pdf/Energy/Business_Roundtable_Energy_Report_06062007.pdf">http://www.businessroundtable.org/pdf/Energy/Business_Roundtable_Energy_Report_06062007.pdf</a>



## Documents That Discuss a Vision for Energy Efficiency and Related Policies, Programs, and Technologies

Author/ Source, Date	Title	Scope	Web Site
California Energy Commission, 2007	Distributed Generation and Cogeneration Policy Roadmap for California	This report provides a vision for 2020 on how distributed generation and combined heat and power can be utilized. MWh targets are identified for different distributed generation and combined heat and power technologies. Long-term strategies and policies are discussed.	<a href="http://www.energy.ca.gov/2007publications/CEC_500-2007-021/CEC-500-2007-021.pdf">http://www.energy.ca.gov/2007publications/CEC_500-2007-021/CEC-500-2007-021.pdf</a>
California Energy Commission and California Public Utilities Commission, 2005	Energy Action Plan II	The Energy Action Plan sets state goals and identifies policies to help meet the California's future energy needs. The specific action areas addressed in the paper are energy efficiency; demand response; renewables; electricity adequacy, reliability, and infrastructure; electricity market structure; natural gas supply; transpiration fuels; R&D; and climate change.	<a href="http://www.energy.ca.gov/energy_action_plan/2005-09-21_EAP2_FINAL.PDF">http://www.energy.ca.gov/energy_action_plan/2005-09-21_EAP2_FINAL.PDF</a>
Representatives of the commercial building industry (DOE EERE), 2000	High Performance Commercial Buildings: A Technology Roadmap	The paper describes how to improve commercial buildings through new designs, new technologies, improved building codes and standards, and other measures.	<a href="http://www.eere.energy.gov/buildings/info/documents/pdfs/roadmap_lowres.pdf">http://www.eere.energy.gov/buildings/info/documents/pdfs/roadmap_lowres.pdf</a>
Energy Future Coalition	Challenge and Opportunity: Charting a New Energy Future	This report provides recommendations and discussion of what is needed to address today's energy challenges.	<a href="http://www.energyfuturecoalition.org/pubs/EFCReport.pdf">http://www.energyfuturecoalition.org/pubs/EFCReport.pdf</a>
EPA Combined Heat and Power Partnership	Funding Database	This Web site lists a number of state and federal incentives for combined heat and power projects and for projects using biomass/biogas.	<a href="http://www.epa.gov/chp/funding/funding.html">http://www.epa.gov/chp/funding/funding.html</a>
National Energy Technology Laboratory, 2007	A Vision for the Modern Grid	This document expands on the vision for a modern grid that will "revolutionize the electric system by integrating 21st century technology to achieve seamless generation, delivery, and end-use that benefits the nation."	<a href="http://www.netl.doe.gov/moderngrid/docs/A%20Vision%20for%20the%20Modern%20Grid_Final_v1_0.pdf">http://www.netl.doe.gov/moderngrid/docs/A%20Vision%20for%20the%20Modern%20Grid_Final_v1_0.pdf</a>

## Documents That Discuss a Vision for Energy Efficiency and Related Policies, Programs, and Technologies

Author/ Source, Date	Title	Scope	Web Site
National Petroleum Council, 2007	Facing the Hard Truths About Energy	This draft report provides a comprehensive view to 2030 of global oil and natural gas.	<a href="http://downloads.connectlive.com/events/npc071807/pdf-downloads/Facing_Hard_Truths-Report.pdf">http://downloads.connectlive.com/events/npc071807/pdf-downloads/Facing_Hard_Truths-Report.pdf</a>
McKinsey Global Institute, 2007	Curbing Global Energy Demand Growth: The Energy Productivity Opportunity	This paper is a global study on different sectors of the economy: buildings, transportation, and industries. It details how implementing certain policies and technology developments can help reduce forecasted energy use.	<a href="http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/index.asp">http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/index.asp</a>
North American Electric Reliability Council, 2006	2006 Long-Term Reliability Assessment	This report includes an assessment of the reliability of the bulk power systems in North America, as well as key findings and actions needed.	<a href="ftp://www.nerc.com/pub/sys/all_updl/docs/pubs/LTRA2006.pdf">ftp://www.nerc.com/pub/sys/all_updl/docs/pubs/LTRA2006.pdf</a>
PJM, 2007	Bringing the Smart Grid Home	This piece provides a vision of how the U.S. electrical infrastructure will look. The concept of a smart grid is examined and its benefits are identified.	<a href="http://www2.pjm.com/documents/downloads/strategic-responses/letters/smartgrid.pdf">http://www2.pjm.com/documents/downloads/strategic-responses/letters/smartgrid.pdf</a>

## Documents With More Information on Energy Efficiency and Related Policies, Programs, and Technologies

Author/ Source, Date	Title	Scope	Web Site
Appliance Standards Awareness Project		This Web site provides information and resources on federal and state appliance standards.	<a href="http://www.standardsasap.org">http://www.standardsasap.org</a>
Building Codes Assistance Project		This nonprofit organization is dedicated to helping states adopt and implement up-to-date building energy codes.	<a href="http://www.bcap-energy.org">http://www.bcap-energy.org</a>

## Documents With More Information on Energy Efficiency and Related Policies, Programs, and Technologies

Author/ Source, Date	Title	Scope	Web Site
Bonneville Power Administration	Industrial Audit Guidebook	This is a guidebook for performing walk-through energy audits of industrial facilities. It highlights key measures for industrial energy savings.	<a href="http://www.bpa.gov/energy/n/projects/industrial/pdf/audit_guide.pdf">http://www.bpa.gov/energy/n/projects/industrial/pdf/audit_guide.pdf</a>
Chris King and Dan Delurey	Twins, Siblings, or Cousins	Discusses the effect of demand response programs on total energy consumption based on a survey of over 100 demand response programs.	Published in Public Utilities Fortnightly in March 2005
ERG and Energy and Environmental Analysis (EPA)	Output-Based Regulations: A Handbook for Air Regulators	EPA designed this handbook to help air regulators understand and then establish output based regulations. The report details the attributes of output-based regulations, which reward energy efficient projects by allocating allowances or issuing standards based on the productive output of the process instead of how much fuel is used. Output-based regulation design issues are also discussed.	<a href="http://www.epa.gov/cleanrgy/pdf/output_rpt.pdf">http://www.epa.gov/cleanrgy/pdf/output_rpt.pdf</a>
Elliott Roseman and Sandra Hochstetter	Regional Resource Planning Makes Sense	This article gives historical background on the regional resource planning process, discusses recent developments, and provides recommendations for how regional resource planning should be conducted.	<a href="http://www.energypulse.net/centers/article/article_display.cfm?a_id=1416">http://www.energypulse.net/centers/article/article_display.cfm?a_id=1416</a>
Gridwise at PNNL and Gridwise Architecture Council	Information on modernizing the power grid	This Web site provides information on how to update/modernize the power grid. It offers a number of resources on how to transform the grid, including the Gridwise Architecture Council's interoperability checklist (< <a href="http://www.gridwiseac.org/pdfs/gwac_decisionmakerchecklist.pdf">http://www.gridwiseac.org/pdfs/gwac_decisionmakerchecklist.pdf</a> >)	<a href="http://gridwise.pnl.gov/technologies">http://gridwise.pnl.gov/technologies</a>  <a href="http://www.gridwiseac.org">http://www.gridwiseac.org</a>
Michael R. Muller and Kyriaki Papadaratsakis (Industrial Assessment Center at Rutgers University), 2003	Self-Assessment Workbook for Small Manufacturers	This workbook provides information on key measures for industrial energy savings.	<a href="http://www.iac.rutgers.edu/database/technicaldocs/IAC_Manuals/selfassessment.pdf">http://www.iac.rutgers.edu/database/technicaldocs/IAC_Manuals/selfassessment.pdf</a>

## Documents With More Information on Energy Efficiency and Related Policies, Programs, and Technologies

Author/ Source, Date	Title	Scope	Web Site
Innovest Strategic Value Advisors, 2003	Energy Management and Investor Returns: The Real Estate Sector	This paper examines energy efficiency and energy management performance in the real estate sector. It finds that companies that used energy-efficient technologies and other highly efficient products achieved the best stock and financial performance over a 2-year period.	<a href="http://www.energystar.gov/ia/business/guidelines/assess_value/reit.pdf">http://www.energystar.gov/ia/business/guidelines/assess_value/reit.pdf</a>
La Capra Associates, GDS Associates, and Sustainable Energy Advantage (North Carolina Utilities Commission), 2006	Analysis of a Renewable Portfolio Standard for the State of North Carolina	This report identifies the potential for renewable generation in North Carolina and helps identify achievable targets for a statewide renewable portfolio standard.	<a href="http://www.lacapra.com/downloads/NC_RPS_Report.pdf">http://www.lacapra.com/downloads/NC_RPS_Report.pdf</a>
Martin Kushler, Dan York, and Patti Witte (ACEEE), 2005	Examining the Potential for Energy Efficiency to Help Address the Natural Gas Crisis in the Midwest	The Midwest has a significant number of industries that rely on natural gas and many Midwestern homes are heated by natural gas–fueled space heaters. Due to this large reliance on natural gas, the Midwest needs other fuels/technologies to meet its energy needs. This report examines the potential for energy efficiency as a way to curb the Midwest’s dependence on natural gas.	<a href="http://www.aceee.org/pubs/u051.htm">http://www.aceee.org/pubs/u051.htm</a>
Massachusetts Technology Collaborative	Decoupling of Utility Rates	This Web site contains a number of reports and other information related to decoupling of utility rates.	<a href="http://www.mtpc.org/dg/decoupling.htm">http://www.mtpc.org/dg/decoupling.htm</a>
National Action Plan for Energy Efficiency, 2006	National Action Plan for Energy Efficiency	The Action Plan is a strategy developed by a diverse group of stakeholders to realize energy savings and environmental benefits through energy efficiency-related policies and other measures.	<a href="http://www.epa.gov/cleanenergy/actionplan/eeactionplan.htm">http://www.epa.gov/cleanenergy/actionplan/eeactionplan.htm</a>
NYSERDA, 2007	New York Energy \$mart <sup>SM</sup> Program Evaluation and Status Report: Report to the System Benefits Charge Advisory Group	Energy \$mart provides funding for energy efficiency, low-income consumers, R&D, environmental protection programs, and projects in other areas. This report describes how much money has been collected for the program, how the money is allocated, what types of projects have received funding, and identifies the benefits of the program.	<a href="http://www.nyserda.org/Energy_Information/SBC/sbcmar07coverTOC.pdf">http://www.nyserda.org/Energy_Information/SBC/sbcmar07coverTOC.pdf</a>

## Documents With More Information on Energy Efficiency and Related Policies, Programs, and Technologies

Author/ Source, Date	Title	Scope	Web Site
Optimal Energy (Natural Resources Defense Council and Ceres), 2007	Power to Save: An Alternative Path to Meet Electric Needs in Texas	This report presents the potential for energy efficiency and demand reductions in Texas and recommends strategies to meet this potential.	<a href="http://www.ceres.org/pub/docs/Ceres_texas_power.pdf">http://www.ceres.org/pub/docs/Ceres_texas_power.pdf</a>
Plug-in Partners National Campaign and The California Cars Initiative	Information on plug-in hybrid vehicles	These two Web sites provide information on plug-in hybrids.	<a href="http://www.pluginpartners.org">http://www.pluginpartners.org</a>  <a href="http://www.calcars.org">http://www.calcars.org</a>



# Appendix Energy Efficiency Benefits C: Analysis Assumptions



*The analysis of program benefits for the Action Plan's Vision uses the Energy Efficiency Benefits Calculator, a tool that demonstrates the benefits to customers, utilities, and society of implementing energy efficiency programs. The Calculator was developed for the Leadership Group and is one of the resources available to aid users in educating stakeholders on the benefits of energy efficiency programs.*

For this analysis, the Calculator was used to estimate the benefits of displacing more than 50 percent of load growth through 2025, or 20 percent of electricity consumption and 10 percent of gas consumption in 20 years. These savings were assumed to be achieved by broad adoption of a range of conventional energy efficiency programs. The estimates are based on assumptions of average program spending levels by utilities or other program administrators, with conservatively high numbers for the cost of energy efficiency programs. The economic and environmental savings estimate are extrapolations of the results from existing utility and state programs to a national scope. Emission savings are based on a marginal generation factor that is double that of the annual average.

The key assumptions are summarized in Figure C-1. Total consumption, load growth, peak demand, and retail rate assumptions are based on current data as tabulated by the Energy Information Administration (EIA) or as projected in the EIA Annual Energy Outlook 2007.

The levelized program cost of \$35.00/MWh for electricity and \$3.00/MMBtu for gas is assumed. (Energy efficiency program costs are based on assumptions of average program spending levels by utilities and other program administrators, as well as program participants. For electric programs, the analysis administrator costs are assumed at \$20.00/MWh and \$1.50/MMBtu. Participant costs are assumed at \$15.00/MWh and \$1.50/MMBtu. Many of today's programs deliver energy savings for less than these assumed costs.)

## Figure C-1. Assumptions and Inputs

### Electric

- Annual consumption 2008: 3,992,000 GWh
- Peak load 2008: 971.926 MW
- Annual growth in consumption: 1.6%/year
- Annual revenue (customer bills) 2008: \$351,129 million
- Efficiency program cost: \$35.00/MWh
- Power plant capital cost: \$1,000/kW
- Average CO<sub>2</sub> emission factor: 0.52 tonne/MWh
- Annual cost escalation: 2%/year

### Natural Gas

- Annual consumption 2008: 22,497 Tcf
- Annual growth in consumption: 0.7%/year
- Annual revenue (customer bills) 2008: \$190,726 million
- Efficiency program cost: \$3.00/MMBtu
- Average CO<sub>2</sub> emission factor: 0.053 tonne/MMBtu
- Annual cost escalation: 2%/year

### Other

- Discount rate for net present value: 5%
- Energy efficiency measure life: 15 years





# Appendix Initial Strawman Approach D: for Measuring Progress



*Appendix D provides an explanation of an initial approach for how progress toward the vision goals can be measured, as presented in Figures 2-1 and 2-2. An initial summary of existing state policies and actions that can assist in achieving the Vision goals has been developed and is described below. This appendix describes how the information was collected at the state and regional level, as well as describing an initial approach for determining if a state has completed a step in whole or in part. This initial summary approach will be reviewed and refined by the Action Plan Leadership Group in 2008.*

## Collection of Information

As part of the Action Plan's Regional Implementation Meetings, the status of 40 policy and program options to promote cost-effective energy efficiency was collected at the state level and grouped into five regions: West, Mid-Atlantic, New England, Midwest, and Southeast. This detailed information has been used to develop an initial summary approach as of 2006/2007 for the ten implementation goals and the 28 policies or program steps presented in Figures 2-1 and 2-2. In some cases, this information was supplemented with additional sources as noted in the specific program step. Further, this information was sent to state organizations for further comment.

## Determining the Status of a Policy

Figures 2-1 and 2-2 summarize the status of a state-level policy or program based on it being considered to be "complete" or "partial/some elements of policy in place." These two categories have been developed from more detailed information that reflects, for a given policy at the state level, a "Y" for complete, a "P" for action is pending/possible, and an "S" for some elements of policy in place. If information was not readily available at the state level it is not included. If additional information on these policies is available based on a review of the regional summary tables, please send it to Katrina Pielli at [pielli.katrina@epa.gov](mailto:pielli.katrina@epa.gov) and it will be included as the information is updated in the future.

A more detailed explanation of the assessment for each of the implementation goals and the key policies or program steps in Figures 2-1 and 2-2 is provided below.

### Goal One: Establishing Cost-Effective Energy Efficiency as a High-Priority Resource

1. **Process in place, such as a state and/or regional collaborative, to pursue energy efficiency as a high-priority resource.** A state where stakeholders were involved in an advisory or collaborative role with program administrators, while developing energy resource plans and/or energy efficiency program plans or determining the best use of efficiency or sustainable energy funds, was considered as having "completed" this step. The sources for this information included interviews with regulators and program administrators, as well as online materials such as utility commission orders and rules. The totals in Figures 2-1 and 2-2 represent those that have been positively confirmed. There is no "partially complete" for this step.
2. **Policy established to recognize energy efficiency as high-priority resource.** A state was considered to have "completely" established energy efficiency as a high-priority resource, equivalent or superior to supply resources, if there was a clearly established policy to that effect (such as an integrated resource planning objective of acquiring all cost-effective energy efficiency). A state was considered to have "partially completed" this step if it was found to have a "Y," "P," or "S" for four

out of the following seven possible policies that states are pursuing in this area:

- Energy efficiency is integrated into an active integrated resource planning, portfolio management, or other planning process.
  - Energy efficiency is procured as a resource for default service/standard offer customers.
  - Energy efficiency is an alternative to transmission based on a long-term transparent integrated resource planning or transmission system plan.
  - Energy efficiency is a biddable commodity.
  - State implementation plans include energy efficiency set-asides.
  - Energy efficiency commitment is in statute.
  - Energy efficiency can be used to fulfill requirements of a renewable portfolio standard or similar standard.
3. **Potential identified for cost-effective, attainable energy efficiency over the long term.** A state was considered to have “completely” established the potential for cost-effective energy efficiency through a potential study, if there was a recent, comprehensive study available for attainable energy efficiency. A state was considered to have “partially completed” this step if, for example, it had announced plans for a study but not yet completed it.
4. **Energy efficiency savings goals established consistent with cost-effective potential.** A state was considered to have “completed” this step if it had established the potential for cost-effective energy efficiency through a potential study, and also established at least one of the following:
- Funding requirements for all long-term, cost-effective energy efficiency.
  - Quantitative MW and MWh savings goals established and producing incremental investment.

If a state had completed one or even both of the above items, but had not established the potential for cost-effective energy efficiency by completing a potential study, then that state was considered to have “partially completed” this step.

5. **Energy efficiency savings goals integrated into state energy resource plan, with provisions for regular updates.** A state was considered to have “completed” this step if both of the following have been accomplished:
- Energy efficiency was integrated into an active integrated resource planning, portfolio management, or other resource planning process.
  - Resource plans were regularly updated.

A state was considered to have “partially completed” this step if it had completed only one of the above items.

6. **Energy efficiency savings goals integrated into a regional energy resource plan.** Progress will be measured for this step in the future as regional resource planning efforts evolve across the country.

## **Goal Two: Developing Processes to Align Utilities Incentives Equally for Efficiency and Supply Resources**

7. **Utility throughput incentive is addressed and disincentives are removed.** A state was considered to have “completed” this step if it had addressed the utility throughput incentive and removed disincentives, such as through decoupling or lost revenue recovery. A state was considered to have “partially completed” this step if it had addressed the throughput incentive and removed disincentives for one or more utilities, but not for all utilities. If a state had an open docket on these issues but had not yet issued a final decision, it was not considered to have “partially completed” this step.
8. **Utility incentives for energy efficiency savings reviewed and established as necessary.** An

approach for measuring progress on this step is currently being developed.

9. **Timely cost recovery in place.** Progress on this policy is not currently being measured, but it is hoped that in each state's process of exploring additional energy efficiency, the timeliness of program cost recovery will be addressed.

### Goal Three: Establishing Cost-Effectiveness Tests

10. **Cost-effectiveness tests adopted which reflect the long-term resource value of energy efficiency.** For the purposes of initial policy tracking, a state was considered to have "completed" this step if it included a testing method such as the total resource cost or societal cost test to evaluate energy efficiency programs. A state was considered to have "partially completed" this step if, for example, these testing methods were allowed to be used but had not been to date, or if a docket was open that was looking at cost-benefit evaluation.

### Goal Four: Establishing Evaluation, Measurement, and Verification Mechanisms

11. **Robust, transparent EM&V procedures established.** A state was considered to have "completed" this step if it had a robust EM&V process in place. A state was considered to have "partially completed" this step if, for example utilities were required to develop a measurement and verification process by commission order but this action was pending, or if a docket was open that was looking at EM&V procedures.

### Goal Five: Establishing Effective Energy Efficiency Delivery Mechanisms

12. **Administrator(s) for energy efficiency programs clearly established.** A state was considered to have "completed" this step if the energy efficiency delivery structure had been established. A state was considered to have "partially completed" this step if, for example, a docket was open that was looking at which entity would be the energy efficiency program administrator.

13. **Stable (multi-year) and sufficient funding in place consistent with energy efficiency goals.** A state was considered to have "completed" this step if funding requirements for all long-term, cost-effective energy efficiency had been established. If a state had completed three of the following five items, it was considered to have "partially completed" this step:
  - Cost recovery process exists.
  - Funding is for multi-year periods.
  - A base energy efficiency spending level exists, with opportunity to justify higher level.
  - Percentage of net (retail) utility revenue presently used for energy efficiency [no unit = %; m/k = mils/kWh].
  - Funds from carbon trading program support energy efficiency.
14. **Programs established to deliver energy efficiency to key customer classes and meet energy efficiency goals.** A state was considered to have "completed" this step if it had established energy efficiency programs that reach all customer classes. A state was considered to have "partially completed" this step if, for example, there was an open docket that was exploring energy efficiency programs.
15. **Strong public education programs on energy efficiency in place.** An approach for measuring progress on this step is currently being developed.
16. **Energy efficiency program administrator engaged in developing and sharing program best practices at the regional and/or national level.** A state was considered to have "completed" this step if over two-thirds of its energy efficiency budget was administered by entities that belong to the Consortium for Energy Efficiency, or that belong to or serve on the board of a regional energy efficiency market transformation organization or a regional organization dedicated to the promotion of energy efficiency.

## Goal Six: Developing State Policies to Ensure Robust Energy Efficiency Practices

17. **State policies require routine review and updating of building codes.** A state was considered to have “completed” this step if it had building energy codes in place and these codes were regularly updated. A state was considered to have “partially completed” this step if it had building energy codes in place but they were not regularly updated.
18. **Building codes effectively enforced.** States do not regularly conduct evaluations on code enforcement, so this information is not available. The few evaluations done to date are dated and assess the enforcement landscape very differently. Few states have plans to conduct future evaluations, given the cost of conducting these studies versus the need to use the codes funding for education and training.
19. **State appliance standards in place.** A state was considered to have “completed” this step if it has appliance and equipment efficiency standards in place that are regularly updated.
20. **Strong state and local government lead-by-example programs in place.** In The State Energy Efficiency Scorecard for 2006 (Eldridge et al., 2007), states are ranked in terms of their enactment of lead-by-example programs. The ranking categories are energy efficiency performance, new and existing state building targets, energy-efficiency procurements, and R&D. A state was considered to have “completed” this step if it received 2 or more points. A state was considered to have “partially completed” this step if received below 2 points but above 0 points.

## Goal Seven: Aligning Customer Pricing and Incentives to Encourage Investment in Energy Efficiency

21. **Rates examined and modified considering impact on customer incentives to pursue energy efficiency.** A state was considered to have “completed” this step if it had considered the impact on energy efficiency when designing retail rates.

If a state had not considered that impact but had completed two of the three following items, it was considered to have “partially completed” this step:

- Declining block rates and fixed variable rate designs have been eliminated.
- Time sensitive rates in place.
- Usage sensitive rates in place.

22. **Mechanisms in place to reduce consumer disincentives for energy efficiency (e.g., including financing mechanisms).** A state was considered to have “completed” this step if it had mechanisms in place such as on-bill financing and benefit sharing to encourage energy efficiency. A state was considered to have “partially completed” this step if the commission had requested that utilities submit proposals for mechanisms to reduce consumer disincentives, such as on-bill financing, or if a utility had submitted a proposal but the commission had not yet issued an order.

## Goal Eight: Establishing State of the Art Billing Systems

23. **Consistent information to customers on energy use, costs of energy use, and options for reducing costs.** Progress on this policy is not currently measured. It is hoped that, in coming years and with further advanced metering infrastructure (AMI) roll-out and increased efforts to benchmark building energy use, progress will be able to be measured.

## Goal Nine: Implementing State of the Art Efficiency Information Sharing and Delivery Systems

24. **Investments in advanced metering, smart grid infrastructure, data analysis, and two-way communication to enhance energy efficiency.** A state was considered to have “completed” this step if it had utilities that had contracted for AMI. A state was considered to have “partially completed” this step if it had utilities that were running AMI pilots, had AMI deployment planned, or

were planning a deployment. Some “partial” states reflect investments in smart grid infrastructure, data analysis and two-way communication. These states were listed as partial if, for example, not all utilities in the state had made investments, if investments were not yet installed, or if only some of the programs had been invested in. Three sources were used for this step: the regional summary tables tracking for AMI deployments; Appendix F of FERC, 2007; and discussion with outside parties, including experts at <<http://www.SmartGridNews.com>> and GridWise Alliance.

25. **Coordinated energy efficiency and demand response programs established by customer class to target energy efficiency for enhanced value to customers.** A state was considered to have “completed” this step if it had coordinated energy efficiency and demand response programs established by customer class. Discussions with outside parties, including experts at Lawrence Berkeley National Laboratory, were used to measure progress.
26. **Programs established to use trained and certified professionals as part of energy efficiency program delivery.** An approach for measuring progress on this step is currently being developed.

## **Goal Ten: Implementing Advanced Technologies**

27. **Policies in place to remove barriers to clean, efficient distributed generation.** Progress was measured on policies associated with interconnection rules; reviewing clean, efficient distributed generation as part of the planning process and

incorporating it where effective; and standby rates. For states with statewide policies on standby rates for distributed generation, the two largest utilities (based on EIA data) were also reviewed to see if the policies were being implemented in a way that valued the costs and benefits of distributed generation. If there was no state policy, the two largest utilities were reviewed to determine if their rates valued the costs and benefits of distributed generation.

A state that had completed two of the three following items was considered to have “completed” the step below, and a state that had completed one of the items was considered to have “partially completed” it:

- A statewide interconnection policy is in place.
  - As part of the resource planning process, clean, efficient distributed generation is reviewed and incorporated where effective.
  - An effective state standby rate policy is in place, or the two largest utilities have implemented rates that “value the costs and benefits of distributed generation.”
28. **Timelines developed for the integration of advanced technologies.** Progress on this policy is not currently measured. It is hoped that, in coming years and with the maturity of energy efficiency technology efforts, progress will be able to be measured.



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