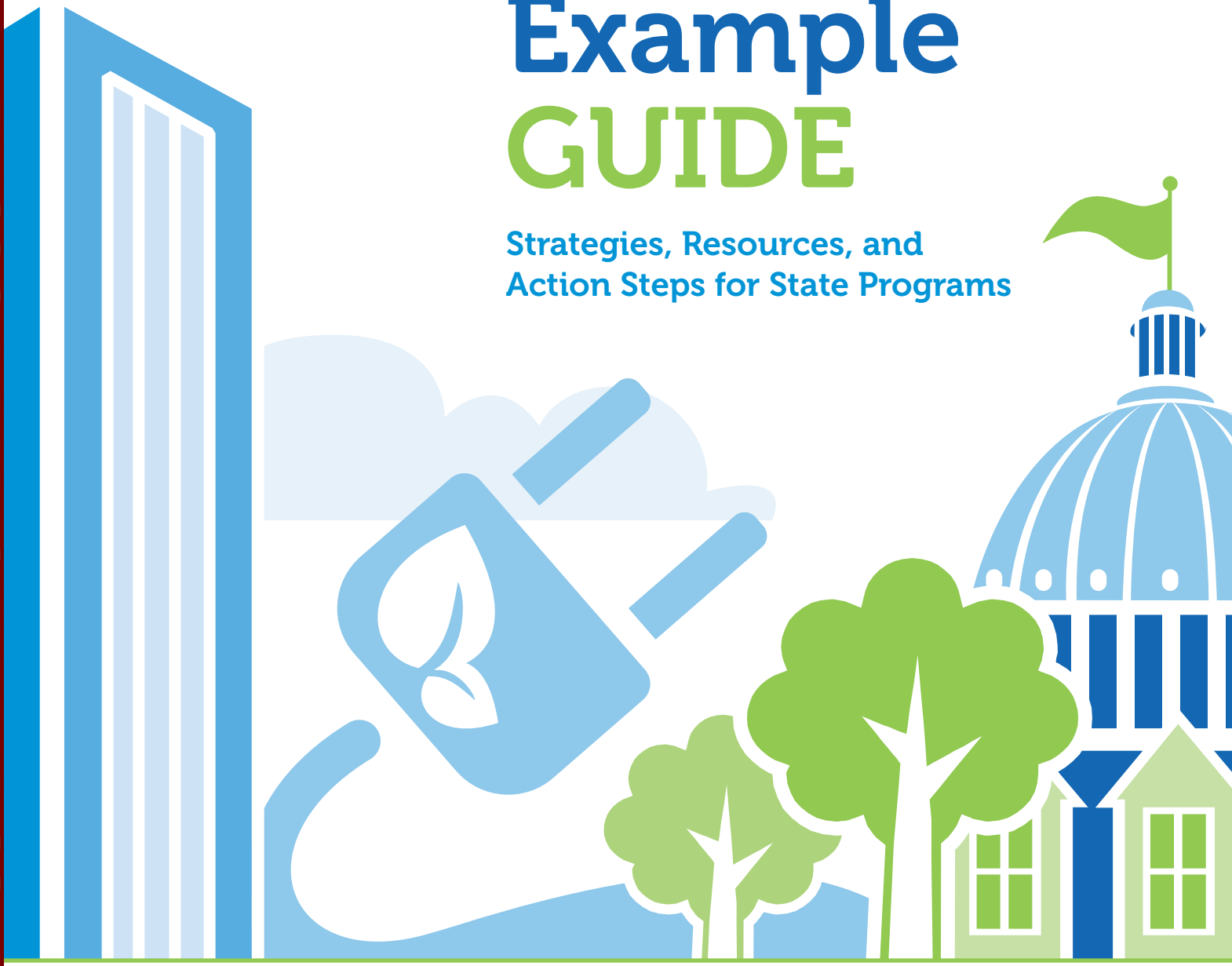
State and Local
Climate and Energy Program

Clean Energy

Lead by Example GUIDE

Strategies, Resources, and Action Steps for State Programs



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Executive Summary

State governments can achieve substantial energy cost savings across their facilities, operations, and fleets through clean energy Lead by Example (LBE) programs.

They can also demonstrate energy and environmental leadership, raise public awareness of the benefits of clean energy technologies, improve air quality, reduce greenhouse gas (GHG) emissions, improve energy supply and reliability, and foster markets for environmentally preferable products. The LBE Guide provides information to assist state governments as they develop and implement effective LBE programs to achieve their clean energy goals. It presents strategies, resources, and tools state decision makers can use throughout the process.

EPA and other organizations recognize leading by example as a key policy option for states seeking to achieve their clean energy goals. For example, the importance of LBE programs is documented in the the National Action Plan for Energy Efficiency "Vision for 2025" report. The Vision identifies LBE as a critical component of achieving the long-term goal of all cost-effective energy efficiency by 2025. Goal Six of the Vision's ten implementation goals is to develop state policies such as LBE for pursuing robust energy efficiency practices.

BACKGROUND

State governments across the country are achieving significant energy, environmental, public health, and

DOCUMENT MAP

financial benefits through a variety of clean energy policies and programs (U.S. EPA, 2006). One of these clean energy strategies is "leading by example," which involves implementing clean energy policies and programs in buildings, facilities, operations, and fleets under their control (U.S. EPA, 2006). State governments are finding that such Lead by Example (LBE) programs produce substantial energy savings while offering a range of other benefits, including: demonstrating leadership and the economic competitiveness of clean energy; reducing emissions of greenhouse gases (GHGs) and air pollutants; increasing fuel diversity; improving energy system reliability; fostering markets for clean energy products, services, and technologies; and promoting sustainable alternatives to conventional practices.

To help states achieve these benefits, EPA has developed the *LBE Guide.* States can use the *LBE Guide* to initiate or expand an LBE program with the objective of establishing a comprehensive LBE program across their buildings, facilities, operations, and fleets. A comprehensive program typically (1) offers greater benefits due to its broader scope, (2) increases the cost-effectiveness of LBE activities, due to economies of scale from bundling individual activities, (3) garners political support by appealing to a variety of constituencies, and (4) increases the visibility of LBE activities.

The *LBE Guide* is an important next step in EPA's efforts to assist states as they develop clean energy portfolios. It extends and supports two other recent state policy assistance documents:

- EPA's *Clean Energy-Environment Guide to Action*, which describes and provides information on sixteen clean energy policies, including LBE (U.S. EPA, 2006).
- *The National Action Plan for Energy Efficiency (Action Plan)*, which is a private-public initiative designed to overcome barriers to energy efficiency. The *Action Plan*'s implementation framework – the *Vision for 2025* – defines implementation goals for achieving all cost-effective energy efficiency by 2025. This document recognizes LBE programs as an important component of this goal, and uses the presence of a strong state LBE program as an indication of progress towards achieving this goal (NAPEE, 2006, NAPEE, 2007).

The *LBE Guide* outlines:

- The value of clean energy LBE programs and activities,
- A set of LBE activities that states are successfully implementing,
- A process for developing, implementing, and tracking a comprehensive LBE program that includes one or more of these LBE activities, and
- Key strategies, resources, and tools for states to use during this process.

Throughout the *LBE Guide* more than 120 sidebars and case studies are provided. These examples describe specific instances in which state and local governments are pursuing and implementing LBE programs. Additional

WHAT IS CLEAN ENERGY?

Clean energy includes demand- and supply-side resources that are less polluting ways to meet energy demand. Clean energy resources include:

Energy efficiency – refers to using less energy to provide the same or improved level of service to the energy consumer in an economically efficient way. Energy efficiency measures include a wide variety of technologies and processes, and can be implemented across all major energy-consuming sectors.

Renewable energy – energy generated partially or entirely from non-depleting energy sources for direct end use or electricity generation. Renewable energy definitions vary by state, but usually include wind, solar, and geothermal energy. Some states also consider low-impact or small hydro, biomass, biogas, and waste-to-energy to be renewable energy sources. Renewable energy can be generated on site or at a central station.

Combined heat and power (CHP) – also known as cogeneration, CHP is a clean, efficient technology that improves the conversion efficiency of traditional energy systems by using waste heat from electricity generation to produce thermal energy for heating or cooling in commercial or industrial facilities. CHP systems typically achieve 60% to 75% fuel use efficiencies, which is a significantly higher than those of conventional power plants.

Clean distributed generation (DG) – refers to non centralized—usually small-scale—renewable energy and CHP.

For more information, visit the U.S. Environmental Protection Agency's (EPA's) Clean Energy Web site (*http://www.epa.gov/cleanenergy*) and the ENERGY STAR Web site (*http://www.energystar.gov/*).

THE LBE GUIDE AND LOCAL GOVERNMENTS

While this *Guide* is designed primarily to assist states in planning, implementing, developing, and operating comprehensive LBE programs, many of the approaches described here can also benefit local governments. Like states, municipalities are involved in developing LBE programs for clean energy, although specific program activities and issues may differ. This *Guide* provides both examples of how certain state activities are relevant to local governments and several cases in which local LBE activities can inform state activities.

state and local examples are presented throughout the text. The structure of the *LBE Guide* and a selection of some of the state and local examples highlighted in each chapter of the *Guide* are summarized in Table ES-1, and a brief summary of the key elements of the *Guide* is provided below.

THE VALUE OF CLEAN ENERGY LBE PROGRAMS

The *LBE Guide* describes a series of activities and strategies that states can adopt to capture significant energy, environmental, economic, and other benefits. An overview of these benefits is provided below, along

TABLE ES-1 LBE GUIDE: ORGANIZATION AND CONTENTS

Chapter Contents and Supporting Information	Selected State and Local Examples
Chapter 1: Introduction	
Contents: Describes the overall benefits of LBE programs and outlines the LBE process.	WI: Efficient Buys Program – VendorNet Montgomery Co., MD: Wind Power Purchases CT: Demand Response Program CT: Developing a State LBE Program
Chapter 2: LBE Activities and Measures	
Contents: Introduces important background information on benefits and implementation issues associated with six key types of LBE activities. The information and examples provided in this chapter can help inform decisions at multiple stages in the LBE program development process, described in subsequent chapters. Supporting Information: Appendix B: State and Local Clean Energy LBE Programs: Examples, Tools, and Information Resources	VA: Energy Efficiency Policy and Advisory Council CA: Benchmarking State Facilities MN: State Sustainable Building Guidelines NY: "Green and Clean" State Buildings MA: Environmentally Preferable Product Procurement CT: Green Power Purchases NJ: Aggregated Green Power Purchase IL: State Agency CHP Activities UT: Solar Power Demonstration CO: Water Conservation in State Agencies CT: Demand Response Program
Chapter 3: Establishing the LBE Program Framework	
Contents: Describes the first steps in establishing a framework for a comprehensive LBE program, including selecting an LBE team and other key participants, obtaining high level support, setting goals, and initiating the program. Supporting Information: Appendix A: State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs Appendix C: Resources for Implementing LBE Programs	Establish LBE Team and Obtain Support MA: LBE Champions GA: Gaining Support for LBE Program CT: Nonprofit Organization Participation Set Clean Energy Goals CA: Benchmarking Initiative NY: "Green and Clean" State Buildings and Vehicles Establish Mechanisms to Implement the LBE Program SC: Energy Efficiency Act WA: King County Model LBE Program

TABLE ES-1 LBE GUIDE: ORGANIZATION AND CONTENTS *(cont.)*

Chapter Contents and Supporting Information	Selected State and Local Examples
Chapter 4: Screening LBE Activities and Measures	
Contents: Provides information on assessing LBE activities and measures to create a portfolio of LBE activities and measures. Supporting Information: Appendix B: State and Local Clean Energy LBE Programs: Examples, Tools, and Information Resources	MI: Energy Reduction Strategy-Financial Criteria MA: Sustainability Program – Selection Criteria UT: Screening Energy Efficiency Options VT: State Agency Energy Plan WI: Wisconsin Energy Initiative NV: Energy Conservation Plan
Chapter 5: Developing a Comprehensive LBE Program	
Contents: Discusses key design and implementation issues for states to consider as they develop their LBE programs. Supporting Information: Appendix C: Resources for Implementing LBE Programs Appendix D: Resources for Funding LBE Programs Appendix E: Resources for Conducting Communications and Outreach for LBE Programs Appendix F: Resources on Technical and Financial Assistance to Local Governments Appendix G: State LBE Programs and Contacts	Integrate Individual Clean Energy Activities into a Program CA: Solar Schools Program Finance the LBE Program VT: Procurement Policy CO and CA: Resources about ESCOs NH: Building Energy Conservation Initiative IA: Iowa Energy Bank IA, SC, CT: States Developing Ways to Share or Retain their Energy Savings Conduct Communications and Outreach: Building and Maintaining Support for an LBE Program CO: State Employee Incentives VT: Emphasizing the Benefits of Clean Energy Provide Technical and Financial Assistance to Local Governments CA: Technical Assistance in Buildings NY: Product Procurement Assistance OR: Energy Audits and Design Reviews PA: Energy Management Plan Assistance TX: Schools and Local Government Program
Chapter 6: Tracking, Evaluating, and Reporting LBE Program Progress	
Contents: Provides information on how to track, evaluate, and report on the performance of LBE programs and activities. Supporting Information: Appendix H: State LBE Tracking Tools and Resources Appendix I: M&V Protocols and Guidance Appendix J: Resources for Reporting the Results of LBE Programs	WY: Energy Conservation Improvement Program: Measurement and Verification Plan Guidelines MA: Data Collection Approach – Energy and CO2 Intensity GA: Energy Tracking System NY: Energy Utilization Index CA and NY: State Applications of the IPMVP CA: Evaluation, Measurement, and Verification of the 2004-2005 San Diego Local Government Energy Efficiency Program

with Table ES-2 that describes the specific benefits of six key LBE activities highlighted in this *Guide*.

- *Demonstrate leadership*. Through good energy management, state governments can proactively address the nation's energy challenge while also being fiscal responsible. Through their direct actions and by sharing their approaches, state governments can help raise awareness of clean energy opportunities, help develop markets for clean energy technologies and services, make technical and financial resources available for local clean energy activities, and help develop and implement programs that directly assist constituents.

- *Reduce energy consumption and costs.* Combined, state and local governments spend more than $11 billion annually on energy costs, which can account for as much as 10% of a typical government's annual operating budget (U.S. DOE, 2007a). State governments can implement a variety of LBE activities that reduce these costs. If a state government that spends 10% of its operating budget on energy reduces its energy consumption by 20% – a goal which many states have adopted – it can reduce operating budget costs by 2% and create significant operating budget flexibility.

- *Reduce air pollutants and GHG emissions.* By implementing LBE activities, state governments can reduce emissions of GHGs and air pollutants (e.g., sulfur and nitrogen compounds) associated with conventional energy generation from fossil fuels.

- *Foster markets for energy-efficient products and encourage economic development in local and regional communities.* LBE activities can support development of in-state markets for clean energy products, manufacturers, and services. Investing in energy efficiency and clean energy can also provide an economic stimulus to the local economy. Across the nation, energy efficiency and renewable energy technologies and services are estimated to have led to the creation of 8.5 million jobs in 2006, with state government spending on energy efficiency responsible for about 64,000 of these jobs (U.S. DOE, 2004; ASES, 2007).

- *Offer improved energy supply reliability.* Many LBE activities can reduce energy demand (kW) and mitigate energy supply constraints during peak periods. Reducing peak demand makes sense from a financial perspective (i.e., due to higher peak energy demand costs and the potential for incentive payments from utility programs) and improves reliability across the transmission and distribution system. Reducing demand can also reduce energy prices, which is a special concern in areas where sales-volume-sensitive gas prices have been steadily increasing. According to one estimate, for every 1% reduction in national natural gas demand, natural gas prices decrease by 0.8% to 2% (Wiser et al., 2005).

- *Offer greater energy price certainty.* State government LBE activities can provide more reliable energy services and help governments hedge against uncertainties associated with future fossil fuel-based energy costs and availability (U.S. EPA, 2006; U.S. EPA, 2004a).

- *Promote sustainable alternatives to conventional practices.* By implementing other energy and environmental activities that complement LBE clean energy activities, states can achieve secondary energy savings benefits. For example, coordinating LBE activities with waste management, water treatment, and other state programs can lead to energy savings due to the energy implications of recycling, solid waste reduction, water conservation, and landscaping strategies (Choate et al., 2005).

- *Provide other benefits.* Clean energy LBE programs can sometimes produce additional benefits, including:
  - Improved indoor air quality and productivity in energy-efficient and green buildings.
  - Increased asset value in energy-efficient buildings.
  - Reduced maintenance costs in energy-efficient buildings.

LBE GOALS AND ACTIVITIES

Many states are pursuing clean energy across their buildings, facilities, operations, and fleets. As a result, they are reaping significant energy, environmental, and economic benefits. These activities are being implemented through executive orders, legislation, plans, and policies to establish one or more LBE goals across their facilities and/or fleets. Examples of state-specific LBE goals referenced in this *Guide* are summarized on Table ES-3. These goals can:

- Encompass all of a state's buildings and operations,
- Encompass some or all of a state's buildings,
- Address some element of a state's buildings and/or operations, such as new construction or energy-efficient product procurement, and/or
- Address state fleets and fuel use.

TABLE ES-2 POTENTIAL BENEFITS OF LBE ACTIVITIES

Activity	Potential Benefits
Improve Energy Efficiency in Government Facilities	Improved energy efficiency in government facilities can decrease energy consumption by 35% in existing buildings and 50% in new and renovated buildings, thus reducing energy costs and GHG and air pollutant emissions (U.S. EPA, 2004b; 2005a; U.S. DOE, 2007b). Reducing state government energy consumption by 20% overall (a common state goal) can reduce the average state government's annual energy bills by as much as $16 million and save nearly 1.2 trillion Btu annually in energy use (ACEEE, 2003). The potential for reducing GHG and air pollutant emissions from state facilities is substantial: energy use in commercial (including state government buildings) and industrial facilities accounts for nearly 50% of U.S. GHG emissions (U.S. EPA, 2008b). Fossil fuel combustion for electricity generation accounts for high percentages of CO2, SOx, and NOx emissions, which can be reduced through improved energy efficiency in state government facilities (U.S. EPA, 2008a). Approximately 60% of expenditures to improve energy efficiency in state facilities is for labor costs, meaning that energy efficiency activities can increase local employment opportunities (U.S. DOE. 2004). $1 spent on improved energy efficiency in a building can result in a $2 to $3 increase in the building's value (U.S. EPA 2004b).
Integrate Energy Efficiency and Renewable Energy Measures in Green Buildings	Incorporating energy efficiency into green building designs (i.e., by following ENERGY STAR guidelines) can reduce energy costs by as much as 50% compared to conventional buildings, producing annual energy savings of about $0.50 per square foot (U.S. EPA, 2008n; U.S. EPA, 2006l). Use of energy efficiency, renewable energy, and environmental measures in green buildings can: Reduce GHG emissions. Enhance biodiversity and ecosystem preservation. Reduce construction and demolition debris and other waste streams. Produce secondary energy saving benefits through water efficiency, recycling, and other activities that require significant amounts of energy.
Procure Energy-Efficient Products	State governments spend on the order of $11 billion on energy bills annually. A state energy-efficient product procurement program can save up to 10% of a state's electric utility bill (LBNL, 2002, Harris et al., 2004; U.S. EPA, Undated; U.S. DOE, 2007a). ENERGY STAR-qualified products typically use 25% to 50% less energy than conventional products and, in some cases, can offer energy cost savings of up to 90% compared to conventional products (U.S. EPA, 2007c; 2008). A typical state or local government that purchases a basket of ENERGY STAR-qualified products (including computers and monitors, vending machines, exit signs, copiers, and traffic signals) can reduce energy costs by more than $200,000 per year, equivalent to lifetime savings of $1.5 million (U.S. EPA, Undated). By procuring these ENERGY STAR products, a state can achieve annual CO2 savings of about 1,900 tons, equivalent to life-cycle savings of about 16,500 tons (U.S. EPA, Undated).
Purchase Green Power	Purchasing green power avoids use of conventional fuels, thus reducing statewide GHG emissions and other environmental impacts (U.S. EPA, 2008s). For example, purchasing 100 million kWh of green power can avoid emissions of about 78,000 metric tons of CO2, equivalent to removing 14,000 passenger vehicles from the road (U.S. EPA. 2008c). States that purchase green power from their utility reduce exposure to volatile fossil fuel prices (U.S. EPA, 2004b; NYSERDA, 2003). Generating green power can lead to local job creation for state and local governments. For example, the manufacture, construction, installation, and maintenance of 1 MW of solar photovoltaics, which is sold as green power, requires and sustains 22 jobs (Apollo Alliance, 2007).

TABLE ES-2 POTENTIAL BENEFITS OF LBE ACTIVITIES *(cont.)*

Activity	Potential Benefits
Use Clean Energy Supply Technologies	Generating clean energy can be cheaper than purchasing electricity through the grid. Generating clean energy supply can substantially reduce statewide GHG emissions and other environmental impacts (U.S. EPA, 2008s). Combined heat and power (CHP) systems are generally 40% more efficient than separate heat and power generation systems, thus requiring 40% less source energy and reducing state wide energy costs (U.S. EPA, 2007b).
Implement Other Energy-Saving Opportunities	Demand response (DR) programs aimed at lowering system peaks can reduce energy costs and produce revenues for state governments through incentive payments from utilities and electricity grid operators. Water efficiency measures preserve a valuable natural resource while potentially saving a significant amount of energy. Nationally, water supply and wastewater treatment account for nearly 1% of total electricity generation (U.S. EPA, 2008d). Improvements in water efficiency in state facilities through the installation of metering and monitoring systems can decrease annual energy consumption by 10% (Watergy, 2002). State recycling programs can result in significant energy savings – diligent recycling can conserve 70% to 90% of the energy required to produce products from virgin materials (Choate et al., 2005). Recycling 1 ton of office paper saves 10.2 million Btu and recycling 1 ton of aluminum cans conserves 206.9 million Btu (Choate et al., 2005).

Descriptions of each of these LBE activities are provided in Table ES-4, Six Key LBE Activities and Selected State Examples Included in the Guide.

To achieve these goals, states are implementing LBE activities that fall into one of six categories. These activities and a selection of the state examples provided in this *Guide* are summarized in Table ES-4. The six categories are:

- Improve energy efficiency in government facilities.
- Integrate energy efficiency and renewable energy measures in green buildings.
- Procure energy-efficient products.
- Purchase green power.
- Use clean energy supply technologies.
- Implement other energy-saving opportunities.

Beyond these six stationary-source energy efficiency and clean energy supply LBE activities, there are opportunities for states to lead by example in the transportation sector. The *LBE Guide* does not address these transportation activities. However, information about EPA's transportation programs, policies, regulations, and tools, is available in the EPA Office of Transportation and Air Quality Planning's State and Local Transportation Resources Web site (*http://www.epa.gov/otaq/stateresources/index.htm*).

ESTABLISHING A LEAD BY EXAMPLE PROGRAM

States can use the *LBE Guide* to initiate or expand an LBE program toward the objective of establishing a comprehensive LBE program across all their buildings, facilities, and operations. The steps involved in the LBE process, and specific actions states can undertake to achieve each of the steps are illustrated in Table ES-5. These steps include:

- Establish the LBE program framework, which includes selecting the LBE team, establishing the business case for the program and obtaining program support, setting LBE goals, and establishing the mechanisms required to initiate the program.
- Screen LBE activities and measures.
- Develop a comprehensive LBE program.
- Track, measure, and report on LBE program progress.

TABLE ES-3 EXAMPLES OF LBE GOALS AND TARGETS FOR STATE LBE PROGRAMS

State/Title	Goal or Target
Overall LBE Energy Savings	
Virginia **Executive Order 48**	Establishes a goal for state agencies to reduce annual energy costs by 20% by 2010. State-owned facilities over 5,000 square feet are required to be designed consistent with LEED and ENERGY STAR rating systems.
Improve Energy Efficiency in Existing and New Government Facilities	
New Hampshire **Executive Order 2005-4**	Requires the state to reduce energy consumption in state facilities by 10% in accordance with the ENERGY STAR Challenge.
Integrate Energy Efficiency and Renewable Energy Measures in Green Buildings	
Washington, D.C. **Green Building Act of 2006**	Requires all publicly-owned and publicly financed buildings to be designed to meet LEED-Silver certification standards for environmental performance and earn 75 points on the EPA energy performance rating system, using the ENERGY STAR Target Finder tool.
Procure Energy-Efficient Products	
Colorado **Executive Order 0012 07**	Requires Department of Personnel and Administration to develop policies for state agencies to purchase ENERGY STAR-qualified equipment.
Use a Clean Energy Supply	
Wisconsin **Wisconsin Act 141**	Requires the Department of Administration to set renewable energy purchase goals for six agencies with an overall goal that renewable energy account for 10% of state energy purchases by 2008 and 20% by 2012.
State Fleets and Fuel Use	
Georgia **Executive Order 2.28.06.02**	Directs state agencies to increase employee commute miles saved by 20% through compressed and alternating work schedules and teleworking.

Best practices for developing and implementing successful and cost-effective programs, which are based on state LBE experiences, are provided in Table ES-6.

LBE GUIDE TOOLS AND RESOURCES

The *LBE Guide* provides a set of tools and resources to assist states in developing and implementing their LBE programs. These include:

- *Preliminary Assessment Tools.* An important task when developing an LBE program is to screen potential LBE activities and measures to determine which ones are most likely to help meet state goals. This can involve evaluating a building's energy performance, tracking GHG and air pollution emissions, and calculating energy and financial savings. Key tools for states to use when assessing LBE options are summarized in Table ES-7. States can use these tools when:
  - Assessing building performance.
  - Developing emissions inventories.
  - Estimating potential energy savings.
  - Assessing financial costs and benefits.
- *Additional Resources*. The *LBE Guide* provides a wealth of additional resources for states to use as they develop their LBE programs. These resources are identified and described throughout the *Guide* and are summarized, by subject area in the appendices. Table ES-8 presents a summary of some of the key resources, organized by *LBE Guide* chapter.

TABLE ES-4 SIX KEY LBE ACTIVITIES AND SELECTED STATE EXAMPLES

Activity	Summary of Activity	Selected Examples Provided in Guide	One State Example
Improve Energy Efficiency in Government Facilities	State and local governments are responsible for more than 16 billion square feet of building space for a total energy cost of about $11 billion (U.S. DOE, 2007a). Energy use in state government facilities can consume operating budgets and account for as much as 90% of a state government's GHG emissions (Massachusetts, 2004). Improving energy efficiency in state government-owned and leased facilities through a comprehensive energy management approach can lead to significant energy, environmental, economic, and other benefits. States are demonstrating annual savings on the order of $1 million – $15 million dollars, depending on efficiency programs and goals.	WI: Wisconsin Energy Initiative VA: Energy Efficiency Policy and Advisory Council CA: Benchmarking State Facilities MI: State Facilities Energy Savings Plan MT: 20 x 10 Initiative NH: ENERGY STAR Challenge Participant OR: Building Commissioning Program WA: Building Commissioning Program NC: Sustainable Energy Efficient Buildings Program CO: Energy Management and Integrated Energy-Efficient Design in K-12 Schools	Wisconsin used ENERGY STAR tools and resources to systematically replace lighting fixtures in state buildings for its "Wisconsin Energy Initiative" which resulted in $7.5 million in annual energy cost savings and an emissions reduction equivalent to the emissions of 20,000 vehicles in one year. The state next pursued comprehensive whole-building retrofits in 60 million square feet of office space at a cost of $35 million which are expected to yield $11 million in annual cost savings with a payback period of less than four years. (NASEO, 2006).
Integrate Energy Efficiency and Renewable Energy Measures in Green Buildings	The planning, design, and construction process for new and renovated buildings offers opportunities to combine energy efficiency and renewable energy design features with other measures that have environmental and health benefits (e.g., selecting sustainable sites, using recycled-content materials, and landscaping to reduce water and energy use). These energy efficiency and renewable energy measures are key ways to reduce GHG emissions and decrease the carbon footprint of new and renovated state facilities.	NY: "Green and Clean" State Buildings AZ: Green Building Policy for Public Buildings HI: Lead by Example Initiative MN: State Sustainable Building Guidelines MA: LEED-Plus Standard NM: Lead by Example Initiative PA: High Performance Green Building Program PA: Cambria State Office Building OR: Portland Green Building Policy WI: Sustainable Facilities Guidelines/ Standards WI: Department of Natural Resources Buildings DC: Washington, D.C. Green Building Policy	In New York, state agencies are required by executive order to follow LEED guidelines for the construction of green buildings and to strive to meet the ENERGY STAR building criteria for energy performance. Several of New York's state agencies have partnered to develop sustainable design guidelines, including High-Performance Design Guidelines for state college and university buildings (NYSERDA, 2001; 2005).

TABLE ES-4 SIX KEY LBE ACTIVITIES AND SELECTED STATE EXAMPLES *(cont.)*

Activity	Summary of Activity	Selected Examples Provided in Guide	One State Example
Procure Energy-Efficient Products	Energy-efficient product procurement can be a cornerstone of a state or local government's energy management strategy and can be particularly helpful for fostering the development of in-state markets for clean energy products. Energy-efficient product procurement can target products as they are replaced, with many energy-efficient products having little or no cost premium. For example, many ENERGY STAR-qualified electronics and office equipment products can be purchased with no cost premium, but produce significant energy cost savings	MA: Environmentally Preferable Products Procurement NY: New York City Energy-Efficient Product Procurement	In FY 2001, Massachusetts spent $92.5 million on environmentally preferable products. The cost savings from the program surpassed $544,000, with savings from energy-efficient office equipment alone accounting for $270,000 (Massachusetts, 2003).
Purchase Green Power	Green power is electricity produced from renewable sources (e.g., wind, solar, biogas, biomass, low-impact hydro, and geothermal resources) that causes no man-made GHG emissions, has a superior environmental profile compared to conventional power generation, and was built after January 1, 1997.a By choosing to purchase green power, state governments reduce reliance on fossil fuel-based energy (U.S. EPA, 2004a; 2007d) and help reduce GHG emissions, reduce vulnerability to conventional energy price volatility, and improve energy supply reliability. The price premium for green power that covers the increased costs of adding green power to the power generation mix varies across the country. In 2006, the national average was about 2¢ per kWh (Bird et al., 2007). Techniques such as aggregated purchasing can lower this premium significantly.	ME: Aggregating Green Power Purchases PA: Green Power Purchase Commitment CT: Green Power Purchases NJ: Aggregated Green Power Purchase MD: Montgomery County Wind Power Purchase	In Maine, the governor's 2003 energy agenda established a goal for the state government to purchase at least 50% of its electricity from renewable power sources, using energy efficiency measures in state buildings to offset the cost of the renewable energy. This goal was originally met by a contract agreement committing over 800 state agency accounts under one service agreement. Maine has now increased its renewable energy purchase to 100% (DSIRE, 2007).

TABLE ES-4 SIX KEY LBE ACTIVITIES AND SELECTED STATE EXAMPLES *(cont.)*

Activity	Summary of Activity	Selected Examples Provided in Guide	One State Example
Use Clean Energy Supply Technologies	States are implementing clean energy generation –such as on-site renewable energy generation and clean DG and CHP – to provide a clean energy-supply alternative that reduces GHG and air pollutant emissions, hedges against conventional energy price volatility, improves energy supply reliability, and can sometimes reduce energy costs.	AZ: Army Aviation Training Site Solar Farm VA: Solar Power at New State Facilities UT: Solar Power Demonstration OR: Solar State Buildings CA: Solar Technology at State Facilities MA: Renewable Energy Initiatives IL: State Agency CHP Activities NJ: Solar Power in Public School District CA: Solar Power at a University OH: CHP at Ohio University TX: CHP at the University of Texas WI: CHP at the University of Wisconsin MN: CHP at a Wastewater Treatment Facility	Arizona developed a solar farm to supplement its energy use at the Army Aviation Training Site. The $196,000 photovoltaic system produces 31 kW of electricity, which has reduced grid-based electricity purchases by 113,000 kWh, or 31%, and saves the department $20,000 in annual energy costs (AZDOC, 2006; Arizona, 2007).
Implement Other Energy-Saving Opportunities	Demand response (DR) programs and environmental activities such as recycling, water efficiency, and sustainable landscaping strategies can also result in significant energy cost savings.	CT: Demand Response Program MA: State Sustainability Program CO: Water Conservation in State Agencies MA: Water Consumption Reduction Goal	As an example of a state DR program, the Connecticut Office of Policy and Management (OPM) administers a Demand Response Program that coordinates demand response activities of eleven state agencies. OPM works with these agencies to reduce peak electrical loads during period of high demand by transferring loads to distributed generation equipment and reducing non-essential electrical loads. These actions enable ISO New England, the regional grid operator, to avoid installing additional infrastructure that would otherwise be needed to meet demand. As compensation, ISO New England provides OPM approximately $300,000 quarterly, through third-party contractors. This payment is allocated to the participating agencies for reinvestment in clean energy projects (Connecticut OPM, 2008).

[a] *January 1, 1997 is the accepted date marking the beginning of the voluntary green power market.*

TABLE ES-5 SUMMARY OF THE LBE IMPLEMENTATION PROCESS

LBE Activities and Measures	Establish the LBE Program Framework			Screen LBE Activities and Measures	Develop a Comprehensive LBE Program	Track, Evaluate, and Report on LBE Program Progress
	Establish LBE Team and Obtain Support	Set Clean Energy Goals	Establish Mechanisms to Implement the LBE Program			
See Chapter 2	See Sections 3.1–3.3	See Section 3.4	See Section 3.5	See Chapter 4	See Chapter 5	See Chapter 6
POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS
Improve energy efficiency in buildings.	Identify lead and supporting LBE clean energy agencies.	Develop energy consumption baseline.	Governor issues an executive order.	Screen LBE activities and measures from the universe of LBE activities.	Integrate clean energy opportunities.	Develop tracking, evaluation, and reporting plan.
Integrate energy efficiency and renewable energy measures in green buildings.	Identify key personnel.	Assess state context.	State legislature enacts LBE legislation.	Develop assessment criteria.	Determine program financing.	Establish baselines.
Purchase energy-efficient products.	Identify and obtain high-level support.	Set state LBE activity goals.	State establishes LBE program through state planning process.	Estimate costs and benefits.	Conduct communications and outreach.	Conduct benchmarking.
Purchase green power.	Identify other key agencies and grvoups to help shape and implement LBE programs	Overall energy savings and GHG emission targets.	State energy office initiates LBE program.	Select and implement LBE activities and measures.	Provide technical and financial assistance to local governments.	Track energy use, emissions, and savings. Conduct impact, process, and/or market effects evaluations.
Use a clean energy supply.		Existing building targets.	Other organizations adopt programs that support or influence the state's adoption of an LBE program.		Share information and access federal, state, and local LBE resources.	Report progress.
Implement other energy-saving activities.		New building targets.				Revise program based on results.
		Energy-efficient product procurement goals.				
		Renewable energy targets.				
		Energy-efficient procurement goals.				
		State fleet and fuel use targets.				

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TABLE ES- 6 ELEMENTS OF A SUCCESSFUL LBE PROGRAM

- **Build a strong LBE team.** A successful LBE program starts with a team that is committed to identifying the mix of activities, measures, and approaches best suited to the individual state. The process of building a strong team includes identifying a state agency to lead the LBE effort and selecting team representatives, from this and other state agencies, who can offer a range of expertise and perspectives (e.g., on facility management, energy efficiency, renewable energy, sustainability, environment). Partners from outside state government can also provide valuable input to the LBE implementation process and/or serve as program champions in the community.
- **Secure high-level support.** The support of top-level leadership is critical to an LBE program's success. Approaches for building and maintaining support include involving policymakers in the early stages of the process, identifying one or more LBE team members with access to key decision-makers, and clearly articulating the value of the LBE initiative.
- **Establish goals.** Set clear, quantifiable LBE goals (through executive orders, state laws, the state planning process, or other state initiatives) to ensure that stakeholders understand the expected outcomes, provide for ease of measurement and reporting, and demonstrate the feasibility of establishing clean energy initiatives.
- **Develop an energy baseline**. To ensure that LBE goals are measurable and achievable, base them on actual past and current state energy consumption data and on projected consumption. This requires collecting state energy consumption data and information on issues that affect energy use (e.g., the number, square footage, and condition of state facilities; fleet size; and current clean energy technologies).
- **Screen LBE options based on energy savings and other criteria**. Develop screening criteria to determine the LBE activities and measures to include in the LBE program. Key criteria include expected energy savings, financial issues (e.g., payback periods and life-cycle costs), environmental benefits, economic benefits, visibility, and feasibility.
- **Implement a systematic approach to energy efficiency**. The most cost-effective approach for improving energy efficiency in state buildings is to follow the systematic process detailed in the ENERGY STAR *Guidelines for Energy Management*. Ideally, it is best applied across a portfolio of government buildings. If resources are limited, states can apply the process as a "pilot" in one or a few buildings and use the results to advocate for further energy efficiency in additional state buildings. A systematic approach to efficiency is a critical element of a comprehensive LBE program.
- **Take advantage of available financing mechanisms**. A range of financing strategies is available to states for LBE initiatives. Because these activities compete for limited financial resources with many other programs, it is helpful to use multiple financing options (e.g., municipal least-purchase agreements, revolving loan funds, aggregated purchases). In some cases, states need to modify their rules to ensure that agencies have access to a broad range of financing mechanisms (e.g., performance contracting) and accounting methods (e.g., life-cycle cost accounting).
- **Conduct communication and outreach.** States can demonstrate leadership and obtain on-going LBE support from state agency personnel, the public, and other community stakeholders by conducting communication and outreach activities that articulate the benefits of their program and encourage participation in, and support for, the program.
- **Learn from local, state, and federal sources.** Many state and municipal governments have implemented LBE programs. Staff from these agencies – as well as the LBE plans, model policies, and guidance they have developed – are key LBE resources. In addition, federal programs provide resources on designing and implementing LBE activities. For example, the ENERGY STAR program provides guidance and tools for incorporating energy efficiency in existing and new buildings.
- **Evaluate, report on, and update the LBE program.** It is important to periodically evaluate the state's LBE efforts and report on the results of these assessments. Based on evaluation results, states can expand successful (and potentially successful) activities and revise or eliminate unproductive LBE activities.

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TABLE ES-7 PRELIMINARY ASSESSMENT TOOLS

Tools/Organization	Description	URL/Source
Tools for Assessing Building Performance		
Portfolio Manager (ENERGY STAR)	▪ Enables states to rate their facilities' energy performance and identify priority opportunities. ▪ Assists states in applying for the ENERGY STAR label for facilities scoring 75 or higher.	*http://www.energystar.gov/index.cfm?c = evaluate_performance.bus_portfoliomanager*
Target Finder (ENERGY STAR)	▪ Allows states to assess the design of new buildings and compare simulations with existing buildings, based on data provided. ▪ Helps set energy performance goals and receive an energy rating for design projects.	*http://www.energystar.gov/index.cfm?c = new_bldg_design.bus_target_finder*
Small Business Calculator (ENERGY STAR)	▪ Estimates a facility's energy intensity and potential energy cost savings from upgrades.	*http://www.energystar.gov/index.cfm?c = small_business.sb_calculate*
Life-Cycle Cost Program (National Institute of Standards/ Technology)	▪ Enables states to evaluate alternative designs that may have higher initial costs, using a life-cycle costing method.	*http://www1.eere.energy.gov/femp/information/download_blcc.html*
Emission Inventory Tools		
Clean Air and Climate Protection Software (National Association of Clean Air Agencies)	▪ Tracks emission reductions and forecasts emissions from proposed reduction measures. ▪ Develops government baseline inventory.	*http://www.cacpsoftware.org/*
Greenhouse Gas Equivalencies Calculator (U.S. EPA)	▪ Translates GHG reductions into terms that are easier to conceptualize. States can also use the calculator "in reverse."	*http://www.epa.gov/cleanenergy/energy-resources/calculator.html*
e-GRID (U.S. EPA)	▪ Allows states to obtain information on power plants. ▪ Develop emissions inventories for buildings.	*http://www.epa.gov/cleanenergy/egrid/index.htm*
State Inventory Tool (U.S. EPA; under development)	▪ Enables states to develop GHG emissions inventories	*http://www.epa.gov/climatechange/wycd/stateandlocalgov/analyticaltools.html*
Emissions Forecasting Tool (U.S. EPA; under development)	▪ Enables states to forecast business-as-usual emissions through 2020	*http://www.epa.gov/climatechange/wycd/stateandlocalgov/analyticaltools.html*
Energy Saving Tool		
Community Energy Opportunity Finder (Rocky Mountain Institute)	▪ Helps identify potential community benefits resulting from energy efficiency upgrades and renewable energy opportunities.	*http://www.energyfinder.org*
Financial and Economic Analysis Tool		
Cash Flow Opportunity Calculator (ENERGY STAR)	▪ Calculates the amount of equipment that can be purchased using anticipated savings. ▪ Compares costs of financing and waiting for cash.	*http://www.energystar.gov/ia/business/cfo_calculator.xls*

TABLE ES-8 KEY RESOURCES FOR DEVELOPING AN LBE PROGRAM

Chapter 2: LBE Activities and Measures	
Databases	
Database of State Incentives for Renewable Energy	*http://www.dsireusa.org/*
DOE State Energy Program	*http://www.eere.energy.gov/state_energy_program/topic_definition_detail.cfm/topic = 115*
Best Practices Resources	
EPA *ENERGY STAR Building Upgrade Manual*	*http://www.energystar.gov/index.cfm?c=business.bus_upgrade_manual*
EPA *Clean Energy-Environment Guide to Action*	*http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-best-practices.html*
EPA Clean Energy-Environment State Partnership Program Technical Forum	*http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-forum.html*
EPA *ENERGY STAR Guidelines for Energy Management*	*http://www.energystar.gov/index.cfm?c = guidelines.guidelines_index*
National Governor's Association Center for Best Practices	*http://www.nga.org/portal/site/nga/menuitem.50aeae5ff70b817ae8ebb856a11010a0/*
Chapter 3: Establishing the LBE Program Framework	
Examples of State Plans and Guidance for Implementing LBE Programs	
Connecticut *Leading by Example Report*	*http://ctclimatechange.com/StateActionPlan.html*
Connecticut Climate Change Web site	*http://www.ctclimatechange.com/rbf_rept.html*
Maine Clean Government Web Site	*http://www.maine.gov/cleangovt/*
Massachusetts *State Agency Sustainability Planning and Implementation Guide*	*http://www.mass.gov/envir/Sustainable/pdf/ss_guide_web.pdf*
New York *"Green and Clean" State Buildings and Vehicles Guidelines* for Executive Order 111	*http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf*
State Executive Orders for Initiating LBE Programs	
Massachusetts *Executive Order 484*	*http://www.mass.gov/Agov3/docs/Executive%20Orders/Leading%20by%20Example%20EO.pdf*
Virginia *Executive Order 48*	*http://www.governor.virginia.gov/initiatives/ExecutiveOrders/pdf/EO_48.pdf*
Resources for Implementing LBE Programs	
California *Local Energy Efficiency Program Workbook*	*http://www.caleep.com/workbook/workbook.htm*
National Governors' Association *Securing A Clean Energy Future* Initiative	*http://www.nga.org/portal/site/nga/menuitem.751b186f65e10b568a278110501010a0/?vgnextoid=f080dd9ebe318110VgnVCM1000001a01010aRCRD&vgnextchannel=92ebc7df618a2010VgnVCM1000001a01010aRCRD*
Chapter 4: Screening LBE Activities and Measures	
California Local Energy Efficiency Program Workbook	*http://www.caleep.com/workbook/workbook.htm*
Massachusetts State Agency Sustainability Planning and Implementation Guide	*http://www.mass.gov/envir/Sustainable/pdf/ss_guide_web.pdf*
Colorado Greening Government Planning and Implementation Guide	*http://www.colorado.gov/greeninggovernment/guide/Guide.pdf*

TABLE ES-8 KEY RESOURCES FOR DEVELOPING AN LBE PROGRAM *(cont.)*

Chapter 5: Developing a Comprehensive LBE Program	
EPA ENERGY STAR Innovative Financing Solutions: Finding Money for Your Energy Efficiency Projects	*http://www.energystar.gov/ia/business/COO-CFO_Paper_final.pdf*
New York "Green And Clean" State Buildings and Vehicles Guidelines	*http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf*
Green California Web site	*http://www.green.ca.gov/default.htm*
Colorado Greening Government Web site	*http://www.colorado.gov/greeninggovernment/index.html*
Chapter 6: Tracking, Evaluating, and Reporting LBE Program Progress	
EPA Model Energy Efficiency Program Impact Evaluation Guide	*http://www.epa.gov/cleanenergy/documents/evaluation_guide.pdf*
LBNL Measurement and Verification Documents	*http://ateam.lbl.gov/mv/*
California Technical, Methodological, and Reporting Requirements for Evaluation Professionals	*http://www.calmac.org/publications/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf*
DOE Impact Evaluation Framework for Technology Deployment Programs	*http://www.eere.energy.gov/ba/pba/km_portal/docs/pdf/2007/impact_framework_tech_deploy_2007_main.pdf*
New York Executive Order No. 111 "Green And Clean" State Buildings and Vehicles Annual Energy Report	*http://www.nyserda.org/programs/pdfs/execorder111finalreport7-03.pdf*

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CHAPTER ONE

Introduction

Many state governments are pursuing clean energy Lead by Example (LBE) programs to save energy and money and reduce greenhouse gas emissions across their facilities, operations, and fleets.

These LBE programs also demonstrate leadership on energy and environmental issues, raise public awareness of the benefits of clean energy technologies, improve air quality, improve energy supply and reliability, and foster markets for environmentally preferable products and services.

The LBE Guide provides information to assist state governments as they develop and implement effective LBE programs to achieve clean energy goals. It presents strategies, resources, and tools that state decision makers can use throughout the process.

State governments across the nation are pursuing clean energy policies and programs to help meet the growing demand for energy and to address the environmental, public health, and financial challenges associated with conventional energy generation and use. Advancing clean energy can provide many benefits including reduced energy costs, lower emissions of air pollutants and greenhouse gases (GHGs), increased fuel diversity, and improved reliability and security of the energy system (U.S. EPA, 2006b).

A key strategy for state governments is implementing clean energy activities and measures in their facilities,

WHAT IS CLEAN ENERGY?

Clean energy includes demand- and supply-side resources that are less polluting ways to meet energy demand. Clean energy resources include:

Energy efficiency – refers to using less energy to provide the same or improved level of service to the energy consumer in an economically efficient way. Energy efficiency measures include a wide variety of technologies and processes, and can be implemented across all major energy-consuming sectors.

Renewable energy – energy generated partially or entirely from non-depleting energy sources for direct end use or electricity generation. Renewable energy definitions vary by state, but usually include wind, solar, and geothermal energy. Some states also consider low-impact or small hydro, biomass, biogas, and waste-to-energy to be renewable energy sources. Renewable energy can be generated on site or at a central station.

Combined heat and power (CHP) – also known as cogeneration, CHP is a clean, efficient technology that improves the conversion efficiency of traditional energy systems by using waste heat from electricity generation to produce thermal energy for heating or cooling in commercial or industrial facilities. CHP systems typically achieve 60% to 75% fuel use efficiencies, which is a significantly higher than those of conventional power plants.

Clean distributed generation (DG) – refers to non centralized—usually small-scale—renewable energy and CHP.

For more information, visit the U.S. Environmental Protection Agency's (EPA's) Clean Energy Web site (http://www.epa.gov/cleanenergy) and the ENERGY STAR Web site (http://www.energystar.gov/).

operations, and fleets. These "lead by example" (LBE) programs frequently include actions such as:

- Improving how buildings are operated and maintained to maximize energy efficiency,
- Procuring energy-efficient products, and
- Purchasing green power.

In addition to the energy, environmental, and financial benefits of LBE programs, states are demonstrating leadership on clean energy issues and documenting the economic feasibility of clean energy strategies. This helps to develop markets for clean energy technologies and services, raises awareness of clean energy opportunities, and promotes the adoption of clean energy measures in other sectors of the state economy.

To pursue these benefits, states may need to overcome several persistent market barriers that limit investment in clean energy programs. These barriers include:

- Limited knowledge about clean energy or LBE programs,
- Limited high-level and agency-level support,
- Insufficient funding, and
- Insufficient staff availability.

THE LBE GUIDE AND LOCAL GOVERNMENTS

While the LBE Guide is designed primarily to assist states in planning, implementing, developing, and operating comprehensive LBE programs, local governments can also benefit from the Guide. Like states, municipalities are also actively involved in developing clean energy LBE programs, although specific program activities and issues may differ. While this Guide focuses on how states can develop LBE programs, it also highlights examples of local LBE activities that states can adopt and describes how certain state activities are relevant to local governments.

The *Lead by Example Guide* is designed to help states overcome these barriers. It provides a compilation of information to assist governments in developing their LBE programs, including step-by-step guidance, examples of successful state and local LBE programs, and resources and tools targeted at key LBE activities. An overview of the *LBE Guide* is presented in this section and includes:

- Background on the importance of LBE programs as part of state clean energy efforts,
- The key LBE activities that state governments are successfully implementing,
- The major benefits associated with LBE programs, and
- An overview of how the *Guide* is structured and the LBE program development and implementation process, and
- A list of the state and local government examples provided in the *LBE Guide*.

1.1 LBE IS A CRITICAL STATE CLEAN ENERGY POLICY

Leading by example is a key policy option for states seeking to achieve clean energy goals. The *LBE Guide* is an important next step in EPA's efforts to assist states as they develop clean energy strategies for their own facilities and operations. It extends and supports two other recent state policy assistance documents:

- EPA's *Clean Energy-Environment Guide to Action,* which describes and provides information on sixteen clean energy policies, including LBE (U.S. EPA, 2006).
- *National Action Plan for Energy Efficiency (Action Plan)*, which is a private-public initiative designed to overcome barriers to energy efficiency. The Action Plan's implementation framework – the *Vision for 2025* – defines ten implementation goals for achieving all cost-effective energy efficiency by 2025, recognizes LBE programs as an important component of this goal, and uses the presence of a strong state LBE program as an indication of progress towards achieving this goal (see text box on page 1-3) (NAPEE, 2006, NAPEE, 2007). The *Vision* also highlights the value of LBE strategies as an option for leveraging purchasing power, control of significant energy-using resources, and the high visibility of public facilities to demonstrate clean energy technologies and approaches that lower energy costs and reduce emissions. It further stresses that strong LBE programs involve establishing goals and processes necessary for program implementation and periodic reporting on progress.

The *LBE Guide* is offered as a tool to assist states and local governments in making progress towards their goals, consistent with the goals and recommendations of these documents.

1.2 WHAT STATE GOVERNMENTS CAN DO

State LBE activities typically fall into one of the following areas:

1. **Improve the energy efficiency of existing and new government-owned and -leased facilities.** State governments operate many facilities, including office buildings, public schools, colleges, and universities, which consume large amounts of energy. These governments are responsible for more than 16 billion square feet of building space and spend more than $11 billion annually on building energy costs, which can account for as much as 10% of a typical government's annual operating budget (U.S. DOE, 2007). Improving energy efficiency in these structures can substantially reduce energy consumption, decrease GHG and air pollutant emissions, and lead to economic and other benefits. In addition, states can assist local governments, which can, in turn, reach out to assist their communities in improving building energy efficiency.

2. **Integrate energy efficiency and renewable energy measures in green buildings.** The planning, design, and construction process for new and renovated buildings offers opportunities to integrate energy efficiency features with additional measures that achieve environmental and health benefits (e.g., purchasing green power, developing on-site renewable energy, selecting sustainable sites, using recycled-content materials, and landscaping to reduce water and energy use). Implementing energy efficiency and renewable energy measures are key ways to reduce GHG emissions and decrease the carbon footprint of new state facilities. By making this link between energy efficiency, renewable energy, and climate change, states are in a better position to achieve results and gain support for their programs.

3. **Procure energy-efficient products.** Energy-efficient product procurement can be a cornerstone of a state's overall energy management strategy. State and local governments spend $50 to $70 billion a year to purchase energy-related products, and could save a combined total of more than $750 million annually through energy-efficient product procurement (CEE, 2004; Harris et al., 2004; U.S. DOE, 2006.) This can be particularly helpful for fostering the development of in-state markets for clean energy products.

THE NATIONAL ACTION PLAN FOR ENERGY EFFICIENCY AND VISION FOR 2025: ACHIEVING ALL COST-EFFECTIVE ENERGY EFFICIENCY BY 2025

The National Action Plan for Energy Efficiency (Action Plan) recognizes that improving energy efficiency in our homes, businesses, schools, governments, and industries – which consume more than 70% of the natural gas and electricity needs in the country – is one of the most constructive, cost-effective ways to address our nation's energy challenges. The Action Plan, developed in July 2006 by more than 50 leading organizations representing key stakeholder perspectives, describes policy recommendations for creating a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations.

In 2007, Action Plan leaders defined a vision that provides the framework for implementing the Action Plan. This Vision establishes a goal of achieving all cost-effective energy efficiency by 2025; describes ten implementation goals for states, utilities, and other stakeholders; describes what 2025 might look like if the goal is achieved; and provides a means for measuring progress. The ten Vision goals are:

1. Establish cost-effective energy efficiency as a high-priority resource.
2. Develop processes to align utilities incentives equally for efficiency and supply resources.
3. Establish cost-effectiveness tests.
4. Establish evaluation, measurement, and verification mechanisms.
5. Establish effective energy efficiency delivery mechanisms.
6. Develop state policies to ensure robust energy efficiency practices.
   Key step: Develop and implement lead-by-example energy efficiency programs at the state and local levels.
7. Align customer pricing and incentives to encourage investment in energy efficiency.
8. Establish state of the art billing systems.
9. Implement state of the art efficiency information sharing and delivery systems.
10. Implement advanced technologies.

Web site: http://www.epa.gov/cleanenergy/documents/vision.pdf

4. **Purchase green power.** Green power is electricity produced from renewable sources (e.g., wind, solar, biogas, biomass, low-impact hydro, and geothermal resources) that is produced with no man-made GHG emissions, has a superior environmental profile compared to conventional power generation, and was built after January 1, 1997.[1] By choosing to purchase green power, states can reduce reliance on conventional fossil fuel-based energy, which can help stabilize energy prices and reduce GHG emissions. Increased use of green power can also provide economic benefits and improve national security.

5. **Use clean energy supply technologies.** Clean energy generation technologies, such as on-site wind and photovoltaic (PV) systems and clean DG and CHP, provide a clean energy alternative to conventional fuels that reduces the amount of energy lost in transmission from source to site, thereby reducing total energy demand, and lowers emissions of GHG and air pollutants. Increasing use of clean energy supply can also help state governments hedge against volatile fossil fuel-based energy prices.

6. **Implement other energy-saving opportunities.** Implementing other environmental activities, such as recycling, water efficiency, and sustainable landscaping activities, frequently has the secondary effect of reducing energy use. For example, using products made from recycled or renewable materials through non-energy-intensive methods can prevent unnecessary depletion of natural resources and reduce the energy required to manufacture new products and dispose of used ones. Improving the efficiency of water and wastewater treatment systems can reduce the amount of energy needed to convey, treat, and distribute water.

   In addition, some states are reducing energy costs and improving energy system reliability by incorporating demand response activities as part of their strategic approach to energy management. These activities involve changing electricity use patterns in order to reduce demand during times of peak energy use or when electricity system reliability is uncertain. States can sometimes earn additional revenue through payments from utilities and grid operators as compensation for the system reliability benefits of their demand response activities.

   These LBE activities are described in more detail in Chapter 2: *Lead By Example Activities and Measures* and Appendix B: *State and Local Clean Energy LBE Programs: Examples, Tools, and Information Resources*. .

   Beyond these six stationary-source energy efficiency and clean energy supply LBE activities, there are opportunities for states to lead by example in the transportation sector, which in some states (e.g., California) can account for more than 50% of the state government's energy expenditures. State LBE transportation policies and initiatives include increasing the use of alternative fuels, purchasing efficient vehicles for state fleets, developing a fueling infrastructure for

WISCONSIN EFFICIENT BUYS PROGRAM—VENDORNET SYSTEM

The Wisconsin VendorNet system serves as the purchasing authority for the state. Additionally, VendorNet allows for cooperative purchasing by counties, cities, school districts, and utility districts. These entities are provided with access to state bids and contracts through a common Web site that is monitored by the Department of Administration's Energy Division staff. Staff members work with purchasing agents to specify ENERGY STAR-qualified products, where available.

Source: Harris et al., 2004; Wisconsin, 2008.

MONTGOMERY COUNTY, MARYLAND—WIND POWER PURCHASE

In 2004, Montgomery County, Maryland represented a group of six county agencies, 11 municipalities, and a neighboring county in completing the largest ever local government purchase of wind energy. The agreement with Washington Gas Services and their wind energy supplier, Community Energy, Inc., is for more than 38.4 million kWh annually over two years, representing 5% of the group's aggregate energy demand. The deal will produce significant environmental benefits. The emissions avoided through this purchase include over 19,000 metric tons of CO2 (equivalent to 36 million miles not driven) and 43 tons of NOx (equivalent to 2.9 million trees).

Sources: Montgomery County, 2006; U.S. EPA, 2007.

CONNECTICUT DEMAND RESPONSE PROGRAM

The Connecticut Office of Policy and Management (OPM) administers a Demand Response Program that coordinates demand response activities among eleven state agencies. OPM works with these agencies to reduce peak electrical loads during period of high demand by transferring loads to distributed generation equipment and reducing non-essential electrical loads. These actions enable ISO New England, the regional grid operator, to avoid installing additional infrastructure that would otherwise be needed to meet demand. As compensation, ISO New England provides OPM approximately $430,000 quarterly, through third-party contractors. This payment is allocated to the participating agencies for reinvestment in clean energy projects

Source: Connecticut OPM, 2008.

alternative fuel vehicles, and encouraging commuting options such as ride-sharing and mass transit. For more information about EPA's transportation programs, policies, regulations, and tools, visit the EPA Office of Transportation and Air Quality Planning's State and Local Transportation Resources Web site (*http://www.epa.gov/otaq/stateresources/index.htm*) (U.S. EPA, 2006b; U.S. EPA, 2006c).[1]

1.3 BENEFITS OF LBE PROGRAMS

Clean energy LBE programs can produce significant energy, environmental, economic, and other benefits for state governments. Specifically, LBE activities can help states to:

- **Demonstrate leadership.** Clean energy LBE programs can educate policymakers and stakeholders and raise public awareness about the multiple energy, environmental, and economic benefits that clean energy offers. Governments that practice good energy management are demonstrating a proactive approach to addressing the nation's energy challenge while practicing fiscal responsibility.

- **Reduce energy consumption and costs.**[2] State governments have implemented a variety of clean energy LBE activities that are saving energy. In many buildings, energy efficiency upgrades can reduce energy costs by 35%, while designing new and renovated buildings to achieve superior energy performance can lead to energy savings of as much as 50% when compared to conventional buildings (U.S. EPA, 2008b; U.S. EPA, 2004).

  EXAMPLES: *In North Carolina, from fiscal year (FY) 2002 through 2006 the North Carolina Utility Savings Initiative for State Facilities saved the state an estimated $53 million through a number of energy investments, including energy efficiency measures that saved almost $900,000 for switching to LED traffic lights and $3 million for incorporating a bundle of energy efficiency measures recommended by the State Energy Office (North Carolina, 2007).*

  In New York, an executive order in 2003 directed state facilities to achieve a 35% reduction in energy consumption by 2010 relative to 1990 levels. By the end of FY 2001/2002, state agencies had reduced energy consumption by 9%, saving $52 million in FY 2001/2002 alone (New York, 2003).

- **Reduce GHG emissions and air pollutants.** Energy use in commercial and industrial facilities account for nearly 50% of all U.S. GHG emissions (U.S. EPA, 2008b). By implementing clean energy activities to decrease their use of conventional fossil fuel-based energy, state governments can reduce their emissions of GHGs and air pollutants (e.g., sulfur and nitrogen compounds, ozone precursors, particulate matter) associated with fossil fuel combustion.

  EXAMPLE: *A 660 kW wind turbine at the Massachusetts Maritime Academy, which supplies 25% of the academy's electricity demand, help avoid 556 tons of GHG emissions (Massachusetts EOEA, 2006).*

- **Foster markets for energy-efficient products and encourage economic development in local and regional communities.** Clean energy LBE activities support the development of in-state markets for clean energy products, manufacturers, and services (e.g., energy service companies, renewable energy equipment installers, and energy-efficient product manufacturers). In addition, investing in energy efficiency and local clean energy typically provides a greater economic stimulus to the local economy than traditional energy purchases, particularly when that energy comes from out of state. Energy cost savings resulting from energy efficiency are also available to reinvest and further spur local economic development. State governments can provide

ASSESSING THE MULTIPLE BENEFITS OF CLEAN ENERGY

EPA is currently developing guidance for state energy, environmental, and economic policy makers on assessing the many benefits of clean energy. This guidebook will address energy savings, energy system benefits, environmental quality and related human health benefits, and economic benefits of clean energy. While they are sometimes reported in qualitative terms, these benefits can also be estimated using computer simulations of a state's economy (e.g., job creation, reduction in trade deficits), public health models (e.g., reductions in asthma), and other analytic tools.

Assessing the Multiple Benefits of Clean Energy, will describe each type of benefit; present methods, tools, and resources for estimating each type of benefit; and provide information on how states can use the results to build support for their clean energy programs.

Source: U.S. EPA, Forthcoming.

[1] *January 1, 1997 is the accepted date marking the beginning of the voluntary green power market.*

[2] *Throughout the LBE Guide, energy savings resulting from clean energy LBE programs and activities are expressed in terms of total dollars (i.e., energy cost savings in $) and/or kilowatt hours (i.e., energy savings in kWh), depending on the source of information.*

a starting point for broader implementation of these clean energy technologies and practices.

- **Offer improved energy supply reliability.** Many LBE activities are designed to reduce demand or enhance distributed supply during periods of peak demand. Reducing demand at peak demand times is sensible financially (i.e., due to significantly higher on-peak energy or power demand costs) and improves transmission and distribution system reliability.

  EXAMPLE: *Twice during the summer of 2002, the New York State Public Service Commission (PSC) requested state entities to curtail their energy demand during the day to help avoid brownouts and blackouts. Agencies were able to reduce peak load by approximately 100 MW during these times of strain on the electric grid. The PSC load-curtailment campaign is an important component of the state's efforts to assure reliable electric service for all New Yorkers (New York, 2003).*

- **Offer greater energy price certainty.** Using a clean energy supply can provide more reliable energy services and help government energy consumers hedge against uncertain future energy costs and availability (U.S. EPA, 2006b).

  EXAMPLE: *Electricity from renewable sources provide 100% of state government needs in Maine, making state government less susceptible to price volatility that may accompany future constrained supply of conventional fossil fuels (DSIRE, 2007).*

  Reducing demand for conventional energy can also reduce energy prices, which is a special concern in areas where sales-volume-sensitive gas prices have been steadily increasing. According to one estimate, for every 1% reduction in national natural gas demand, natural gas prices decrease by 0.8% to 2% (Wiser et al., 2005).

- **Promote sustainable alternatives to conventional practices.** By implementing other energy and environmental activities that complement LBE clean energy activities, states can achieve secondary energy savings benefits. For example, coordinating LBE activities with waste management, water treatment, and other state programs can lead to energy savings due to the energy benefits of recycling, solid waste reduction, water conservation, and landscaping strategies. In terms of recycling, the amount of energy saved from recycling one ton of office paper or one ton of aluminum cans is equal to more than 10 million BTU and nearly 207 million BTU, respectively (Choate et al., 2005).

  EXAMPLE: *In North Carolina, reported purchases of recycled content office paper by state agencies totaled $12 million in 2005. This effort conserved 115,000 trees and reduced the CO2 equivalent of 900 cars while saving enough BTUs to supply energy to 900 homes (North Carolina DENR, 2005).*

- **Provide other benefits.** Clean energy LBE programs can sometimes produce additional benefits, including:

  - *Improved indoor air quality and productivity in energy-efficient and green buildings.* Energy efficiency upgrades can improve occupant health by enhancing indoor air quality. Installing energy recovery ventilation equipment, for example, can reduce infiltration of air contaminants from outdoors while significantly reducing HVAC energy loads (U.S. EPA, 2003). One study on building performance found that the average reduction in illness as a result of improving air quality in buildings is approximately 40% (Carnegie Mellon, 2005).

    Enhanced indoor air quality along with well-designed lighting, greater use of daylighting, and comfortable heating, cooling, and ventilation, can improve employee comfort and reduce fatigue, accidents, absenteeism, turnover, and health costs—all of which can contribute to employee morale and productivity (U.S. EPA, 2008). Use of environmentally preferable building materials in green buildings can also help improve indoor air quality.

  - **Increased Asset Value in Energy-Efficient Buildings.** Improving energy efficiency can increase a building's lifetime and overall value. EPA estimates that for every $1 spent on energy efficiency improvements, a building's value increases by $2 to $3 (U.S. EPA, 2004). In addition, energy-efficient products often have longer lifetimes than conventional products.

  - **Reduced Maintenance Costs in Energy-Efficient Buildings.** Because energy-efficient products may require less-frequent maintenance or replacement, cost savings over the lifetime of the product can be significant. Reducing the number of times a product needs to be replaced can be especially important when replacement involves handling valuable or antique items, which can be found in many state government facilities (U.S. EPA, 2004).

1.4 OVERVIEW OF THE LBE GUIDE AND THE LBE IMPLEMENTATION PROCESS

States can use the *LBE Guide* to initiate or expand an LBE program with the objective of establishing a comprehensive LBE program across their buildings, facilities, and operations. They can use the *LBE Guide* for guidance on both simple and more complex approaches, selecting and applying strategies appropriate to their situation. The steps involved in the LBE process, and specific actions states can undertake to achieve each of the steps are illustrated in Table 1.4.1. These key steps include

- Establish the program framework;
- Screen LBE activities and measures;
- Develop a comprehensive program; and
- Track, evaluate, and report on program progress.

The *Guide* includes strategies, resources, and tools for states to use throughout this process. Table 1.4.2 describes how one state, Connecticut, has followed these steps in developing its clean energy LBE program. A list of all the state and local government examples provided in the *Guide* through text boxes and case studies is provided in Table 1.4.3. These examples are organized according to the step in the LBE process that they address and by section of the *Guide*.

The *Guide* is organized as follows:

- Chapter 2, *LBE Activities and Measures,* introduces key background information on benefits and implementation issues associated with six key types of LBE activities. Information on the specific measures that comprise an LBE activity is provided where appropriate. The information and examples provided in this chapter can help inform decisions at multiple stages in the LBE program development process, described in subsequent chapters.

- Chapter 3, *Establishing the LBE Program Framework*, describes the first steps in establishing a framework for a comprehensive LBE program, including selecting an LBE team and other key participants, obtaining high level support, setting goals, and initiating the program.

- Chapter 4, *Screening LBE Activities and Measures,* provides information on assessing the universe

OVERVIEW OF CONTENTS OF THE LEAD BY EXAMPLE GUIDE

DOCUMENT MAP

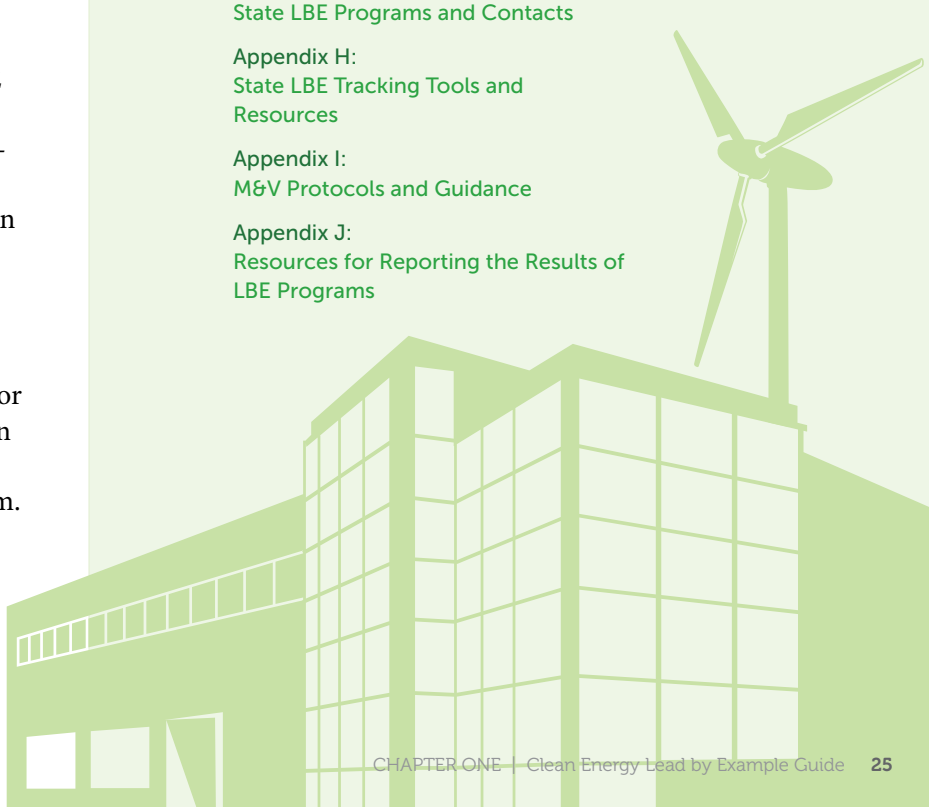


TABLE 1.4.1 SUMMARY OF THE LBE IMPLEMENTATION PROCESS

LBE Activities and Measures	Establish the LBE Program Framework			Screen LBE Activities and Measures	Develop a Comprehensive LBE Program	Track, Evaluate, and Report on LBE Program Progress
	Establish LBE Team and Obtain Support	Set Clean Energy Goals	Establish Mechanisms to Implement the LBE Program			
See Chapter 2	See Sections 3.1–3.3	See Section 3.4	See Section 3.5	See Chapter 4	See Chapter 5	See Chapter 6
POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS	POSSIBLE ACTIONS
Improve energy efficiency in buildings.	Identify lead and supporting LBE clean energy agencies.	Develop energy consumption baseline.	Governor issues an executive order.	Screen LBE activities and measures from the universe of LBE activities.	Integrate clean energy opportunities.	Develop tracking, evaluation, and reporting plan.
Integrate energy efficiency and renewable energy measures in green buildings.	Identify key personnel.	Assess state context.	State legislature enacts LBE legislation.	Develop assessment criteria.	Determine program financing.	Establish baselines.
Purchase energy-efficient products.	Identify and obtain high-level support.	Set state LBE activity goals.	State establishes LBE program through state planning process.	Estimate costs and benefits.	Conduct communications and outreach.	Conduct benchmarking.
Purchase green power.	Identify other key agencies and grvoups to help shape and implement LBE programs	Overall energy savings and GHG emission targets.	State energy office initiates LBE program.	Select and implement LBE activities and measures.	Provide technical and financial assistance to local governments.	Track energy use, emissions, and savings. Conduct impact, process, and/or market effects evaluations.
Use a clean energy supply.		Existing building targets.	Other organizations adopt programs that support or influence the state's adoption of an LBE program.		Share information and access federal, state, and local LBE resources.	Report progress.
Implement other energy-saving activities.		New building targets.				Revise program based on results.
		Energy-efficient product procurement goals.				
		Renewable energy targets.				
		Energy-efficient procurement goals.				
		State fleet and fuel use targets.				

of LBE activities and measures to formulate a portfolio of high-priority LBE activities and measures.

- Chapter 5, *Developing a Comprehensive LBE Program* discusses key design and implementation issues for states to consider as they develop their LBE programs, including integrating multiple LBE activities, financing the LBE program, conducting communications and outreach, and providing technical and financial assistance to local governments.
- Chapter 6, *Tracking, Evaluating, and Reporting LBE Program Progress,* provides information on how to track, evaluate, and report on the performance of LBE programs and activities.
- The *LBE Guide's* appendices provide examples, resources, and tools that can assist state governments in developing an effective LBE program.

DEVELOPING A STATE CLEAN ENERGY LBE PROGRAM: CONNECTICUT CASE STUDY

Connecticut's LBE program was developed as an integral part of the Climate Change Action Plan, the blueprint for achieving cost-effective GHG emissions reductions across the state. The Governor's Steering Committee recognized the importance of including a strong LBE component in the plan and stated that "only by leading by example can the state of Connecticut encourage its corporations and residents to make comparable decisions" (Connecticut 2002).

A summary of the process involved in developing the Climate Change Action Plan, with specific reference to the LBE components of this plan, is presented below.

Getting Started: Initiate Program Planning Framework and Set Goals Connecticut's LBE program got its start in 2002 when the state held a Climate Change Action Plan Summit to establish a process for developing a GHG emissions reduction plan. The specific objectives of this meeting were to:

- Develop a framework for a participatory process for developing a plan to address climate change;
- Identify opportunities for state agencies to initiate this program by "leading by example."
- Twenty-two participants, representing 13 state agencies, attended the summit. The framework adopted at the summit is summarized in the figure. Working groups developed a short list of GHG reduction options which included the following LBE activities:
- Transportation—state vehicle fleet to turnover to alternative, hybrid, fuel-efficient vehicles;
- Energy—state purchase of renewable energy;
- Buildings/Facilities—state buildings to meet U.S. Green Building Council LEED-rated silver green building standards.

Identify and Screen Options

In 2003, nearly 100 organizations, including businesses, nonprofit organizations, state and local government agencies, and academic institutions, worked together to develop a set of 55 recommended actions for reducing Connecticut's GHG emissions. Many of these recommendations involved LBE activities, including:

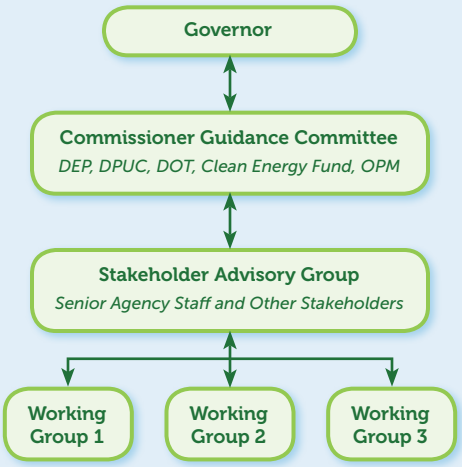
- Fleet vehicle incentives and initiatives;
- High performance schools and state-funded buildings;
- Shared savings program for government agencies;
- Green campus initiative;
- Energy benchmarking and tracking program for municipal buildings;
- Pilot fuel-switching project;
- State procurement of environmentally preferable services and products;
- Government clean energy purchase.

Develop a Comprehensive Program

The state developed the following LBE activities to implement the Connecticut Climate Change Action Plan recommendations:

- State Agency Energy Roundtable: a quarterly meeting of state agency facility managers to help them implement cost- and energy-saving actions;
- Purchase Climate Friendly Products: Governor Rell's Executive Order 17 (February, 2008) requires that all future equipment and appliances purchased by and for executive branch state agencies shall be ENERGY STAR® certified, provided such equipment and appliances are commercially available.
- Use the State Fleet's Hybrid Vehicles: the Department of Administrative Services has purchased approximately 300 hybrid gas-electric vehicles, which comprise 7% of the state fleet.
- Buy Locally Grown Foods: many state agencies, including the Department of Corrections, the Department of Mental Retardation, and public universities are reducing emissions resulting from long-distance food transport by buying locally grown produce;
- Purchase Clean Energy: most state agencies currently meet their electricity needs through a state contract for electricity that provides for an average of 17.5% Class 1 clean energy (plus clean energy through CT's Renewable Portfolio Standard). From July 2009 – 2013, the electric supply contract for all CT state agencies will average 19.35% Class I plus clean energy provided through CT's Renewable Portfolio Standard;
- Increase Recycling and Composting: the Departments of Correction and Environmental Protection have had effective recycling and composting programs;
- Encourage Clean Commuting and VMT Reduction: agencies are encouraging employees to use cleaner commuting options, such as ride sharing, mass transit, and biking to work. In addition, several state agencies have active telecommuting programs;

PLANNING PROCESS FRAMEWORK



- Energy efficiency improvements to state buildings: many state buildings are upgrading energy systems and seeing energy and cost savings. Projects include lighting and exit sign retrofits; installation of energy management systems; pump, motor, boiler, and chiller replacements; vending machine and computer energy saving devices; and water treatment system upgrades.

Track, Evaluate, and Report on the Program

Connecticut established an emissions baseline forecast for each policy recommendation, set a reductions goal (with respect to the baseline), and evaluated each measure in the context of the goal. The state also established the following procedures to build on this existing analysis, track progress, and maintain support:

- Track progress on each measure;
- Continue to calculate GHG benefits and costs;
- Continue to analyze the co-benefits of priority policy options;
- Obtain stakeholder feedback on the Action Plan and its implementation;
- Assess progress on each measure and report on results.

Connecticut's progress reports include a section describing the specific LBE actions the state has taken to install clean energy systems, purchase renewable energy, construct green buildings, benchmark and reduce energy consumption in state buildings, reduce vehicle miles traveled by state vehicles, and purchase hybrid vehicles.

Sources: Connecticut 2002, 2004, 2005, 2006a, 2006b, 2006c.

TABLE 1.4.2 STATE EXAMPLES IN THE LEAD BY EXAMPLE GUIDE

Chapter One: Introduction		
▪ **WI:** Efficient Buys Program – VendorNet ▪ **MN:** State Agency Recycling Challenge	▪ **MD:** Montgomery County Wind Power Purchase	▪ **CT:** Developing a State LBE Program ▪ **CT:** Demand Response Program
Chapter Two: LBE Activities and Measures		
2.1 Energy Efficiency in Buildings		
▪ **SC:** Energy Use in State Facilities in FY 2004 ▪ **VA:** Energy Efficiency Policy and Council ▪ **CA:** Benchmarking State Facilities ▪ **MI:** State Facilities Energy Savings Plan	▪ **MT:** 20 x 10 Initiative ▪ **NH:** ENERGY STAR Challenge Participant ▪ **OR:** Building Commissioning Program ▪ **WA:** Building Commissioning Program	▪ **WI:** Wisconsin Energy Initiative ▪ **NC:** Sustainable Energy Efficient Buildings Program ▪ **CO:** Energy Management and Integrated Energy-Efficient Design in K-12 Schools
2.2 Energy Efficiency and Renewable Energy Measures in Green Buildings		
▪ **AZ:** Green Building Policy ▪ **HI:** Lead by Example Initiative ▪ **MN:** State Sustainable Building Guidelines ▪ **MA:** LEED-Plus Standard ▪ **NM:** Lead by Example Initiative ▪ **NY:** "Green and Clean" State Buildings	▪ **NY:** Collaborative for High-Performance Schools ▪ **PA:** High Performance Green Building Program ▪ **PA:** Cambria State Office Building ▪ **OR:** Portland Green Building Policy	▪ **WI:** Sustainable Facilities Guidelines/ Standards ▪ **WI:** Department of Natural Resources Building ▪ **DC:** Washington, D.C. Green Building Policy
2.3 Energy-Efficient Product Procurement		
▪ **MA:** Environmentally Preferable Products Procurement	▪ **NYC:** Energy-Efficient Product Procurement	
2.4 Green Power Procurement		
▪ **PA:** Green Power Purchase Commitment ▪ **CT:** Green Power Purchases	▪ **ME:** Aggregated Green Power Purchase ▪ **NJ:** Aggregated Green Power Purchase	▪ **MD:** Montgomery County Wind Power Purchase
2.5 Clean Energy Supply		
▪ **VA:** Solar Power at New State Facilities ▪ **AZ:** Army Aviation Training Site Solar Farm ▪ **UT:** Solar Power Demonstration ▪ **OR:** Solar State Buildings ▪ **CA:** Solar Technology at State Facilities	▪ **MA:** Renewable Energy Initiatives ▪ **IL:** State Agency CHP Activities ▪ **NJ:** Solar Power in Public School District ▪ **CA:** Solar Power at a University ▪ **OH:** CHP at a University	▪ **TX:** CHP at a University ▪ **WI:** CHP at a University ▪ **MN:** CHP at a Wastewater Treatment Facility
2.6 Other Energy Saving Opportunities		
▪ **CT:** Demand Response Program ▪ **MA:** State Sustainability Program	▪ **CO:** Water Conservation in State Agencies ▪ **MA:** Water Consumption Reduction Goal	
Chapter Three: Establishing the LBE Program Framework		
3.1- 3.3 Establish LBE Team and Obtain Support		
▪ **MA:** LBE Champions ▪ **GA:** Gaining Support for LBE Program ▪ **IA:** Executive Branch Participation	▪ **CA:** Local Government Participation ▪ **WA:** School Participation ▪ **NH:** ESCO Participation	▪ **CT:** Nonprofit Organization Participation
3.4 Set Clean Energy Goals		
▪ Executive Order Establishes Federal LBE Goals	▪ **MA:** Energy and CO2 Inventory ▪ **CA:** Benchmarking Initiative	▪ **NY:** "Green and Clean" State Buildings and Vehicles

TABLE 1.4.2 STATE EXAMPLES IN THE LEAD BY EXAMPLE GUIDE *(cont.)*

3.5 Establish Mechanisms to Implement the LBE Program		
▪ **MA:** Executive Order Builds on Earlier Executive Order and Administrative Bulletins	▪ **SC:** Energy Efficiency Act ▪ **WA:** King County Model LBE Program	
Chapter Four: Screening LBE Activities and Measures		
▪ **MI:** Energy Reduction Strategy – Financial Criteria	▪ **MA:** Sustainability Program – Selection Criteria ▪ **UT:** Screening Energy Efficiency Options	▪ **VT:** State Agency Energy Plan ▪ **WI:** Wisconsin Energy Initiative ▪ **NV:** Energy Conservation Plan
Chapter Five: Developing a Comprehensive LBE Program		
5.1 Integrate Individual Clean Energy Activities into a Program		
▪ California Solar Schools Program		
5.2 Finance the LBE Program		
▪ **VT:** Life-Cycle Accounting ▪ **CO and CA:** Performance Contracting Resources ▪ **NY:** City of Amherst Using ESCOs ▪ **WA:** Energy Performance Contracting Program	▪ **NY:** Financing New Heating Systems ▪ **NH:** Building Energy Conservation Initiative ▪ **IA:** Iowa Energy Bank ▪ **OR:** State Business Tax Credit for Efficiency and Renewables	▪ **TX:** LoanSTAR Revolving Loan Program ▪ **UT:** Policy to Advance Energy Efficiency ▪ **IA, SC, CT:** States Developing Ways to Share or Retain their Energy Savings ▪ **WA:** King County – Win Win Program
5.3 Conduct Communications and Outreach: Building and Maintaining Support for an LBE Program		
▪ **MA:** Obtaining LBE Support from State Agencies ▪ **CO:** State Employee Incentives	▪ **VT:** Emphasizing the Benefits of Clean Energy ▪ **CO:** Rebuild Colorado Training Sessions	▪ **MA:** Sustainability Planning and Implementation Guide
5.4 Provide Technical and Financial Assistance to Local Governments		
▪ **CA:** Technical Assistance in Buildings ▪ **NY:** Product Procurement Assistance ▪ **OR:** Energy Audits and Design Reviews ▪ **PA:** Energy Management Plan Assistance	▪ **TX:** Schools and Local Government Program ▪ **WV:** Building Professionals Energy Training ▪ **CA:** Energy Efficiency Financing Program	▪ **KS:** Facility Conservation Improvement Program ▪ **OR:** State Energy Loan Program ▪ **PA:** Local Government Handbook
5.5 Information Sharing: Federal, State, and Local LBE Resources		
▪ California ▪ **CA:** Local Energy Efficiency Program Workbook ▪ Colorado ▪ Massachusetts ▪ New York	▪ Pennsylvania ▪ Vermont ▪ Alameda County, California ▪ Boulder, Colorado ▪ Hennepin Ccounty, Minnesota	▪ King County, Washington ▪ Madison, Wisconsin ▪ Philadelphia, Pennsylvania ▪ San Antonio, Texas ▪ San Francisco, California
Chapter Six: Tracking, Evaluating, and Reporting LBE Program Progress		
▪ **WY:** Energy Conservation Improvement Program: Measurement and Verification Plan Guidelines ▪ **MA:** Data Collection Approach – Energy and CO2 Intensity ▪ **GA:** Energy Tracking System ▪ **NY:** Energy Utilization Index	▪ **CA and NY:** State Applications of the IPMVP ▪ **CA:** Evaluation, Measurement, and Verification of the 2004-2005 San Diego Local Government Energy Efficiency Program	

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CHAPTER TWO

Potential Lead By Example Activities and Measures

State governments are planning and implementing LBE programs with the goals of:

- Reducing energy use and energy costs,
- Demonstrating the cost competitiveness of clean energy activities,
- Reducing greenhouse gas (GHG) emissions and other environmental impacts,
- Improving energy supply reliability, and
- Achieving additional energy, environmental, economic, and other benefits.

Comprehensive programs typically include multiple LBE activities and measures, six of which are described in this chapter. The following information is provided for each:

- The benefits of LBE activities and measures,
- Planning and implementation strategies, and
- State and local government examples associated with the activity.

The descriptions of the six key activities presented in this chapter provide information for states to use as they develop their LBE program. For example, when setting LBE program goals and establishing an LBE team (see Chapter 3, *Establish the LBE Program Framework*), a state can draw on information about the key goals, objectives, and participants for each of the activities being considered for inclusion in the overall LBE program. States can likewise use the activity-specific information on costs, benefits, and feasibility when screening potential activities for incorporation into the

DOCUMENT MAP

CHAPTER TWO CONTENTS

Related appendices:

Appendix B, State and Local Clean Energy LBE Programs: Examples, Tools, and Information Resources. This appendix presents examples of state and local LBE activities, as well as resources for each of the activities described in this chapter.

LBE program (see Chapter 4, *Screen LBE Activities and Measures*). Similarly, this chapter presents information on implementation strategies and best practices that can be incorporated into a comprehensive LBE program (see Chapter 5, *Develop a Comprehensive LBE Program*).

To assist states in applying the information provided here, Table 2.6.1 (at the end of this chapter) presents a suite of LBE-related databases and best-practice resources.

THE LBE GUIDE AND THE CLEAN ENERGY-ENVIRONMENT GUIDE TO ACTION

Leading by example is a key policy option for states seeking to achieve clean energy goals. For a primer on LBE actions and opportunities, readers can view Section 3.1 of EPA's Clean Energy-Environment Guide to Action, a recent document that describes and provides core information on sixteen clean energy policies.

This Section provides an overview of how to develop a state LBE program, including information on program objectives and benefits; best practices for designing, implementing, and evaluating an LBE program; state examples; and resources.

The LBE Guide is an important next step in EPA's efforts to assist states as they develop clean energy policies and projects. It extends and supports the information presented in EPA's Clean Energy-Environment Guide to Action.

Source: U.S. EPA, 2006a.

2.1 ENERGY EFFICIENCY IN GOVERNMENT BUILDINGS

Owned and leased facilities are an important focus of many states' comprehensive LBE programs. State and local governments are responsible for more than 16 billion square feet of building space, with state facilities (including office buildings, libraries, prisons, universities, and other facilities) accounting for approximately 5% of the nation's non-residential building space). Combined, state and local governments spend more than $11 billion annually[1] on energy costs, which can account for as much as 10% of a typical government's annual operating budget (ACEEE, 2003, U.S. DOE, 2007h).

[1] *Estimates of combined state and local government energy expenditures range from $10 billion annually to $19 billion annually (EIA, 2003a, U.S. DOE, 2007h; U.S. EPA, 2008v; Harris et al., 2003). Estimates of square footage of state and local building space also vary by source. The U.S. DOE Energy Information Administration, for example, estimated that in 2003, state and local governments account for about 13 billion square feet of floor space (EIA, 2003a).*

A state government's building portfolio makeup can have a significant influence on its total energy use and costs. For example, energy consumption per square foot can vary by type of facility. As shown in the text box on the right, state universities typically use more energy per square foot than state office buildings and other state facilities (e.g., prisons, courthouses) (EIA, 2003; South Carolina, 2006).

As shown in the text box on page 2-3, *Energy Use in Government Buildings*, state facility energy consumption is largely used for lighting, space conditioning, water heating, office equipment and other miscellaneous purposes that can account for as much as 90% of the GHG emissions from state government operations (Massachusetts, 2004). Thus, the growing number of states taking steps to manage their energy use and increase the energy efficiency of their building portfolios are achieving significant financial and environmental results.

STATE GOVERNMENT BUILDING PORTFOLIOS

State governments own and operate several types of facilities, including office buildings, libraries, prisons, and universities, that each has unique energy use characteristics. According to data from the 1999 Commercial Building Energy Consumption Survey, conducted by the Energy Information Administration and updated in 2003, the average government-owned office buildings uses 114,000 Btu per square foot, while the average university and public order/safety buildings (e.g., courthouses, prisons, reformatories) use 145,000 Btu per square foot and 87,000 Btu per square foot, respectively.

Thus, the composition of a state government's building portfolio can have a significant influence on its total energy use and costs. The table below shows the breakdown of energy use in state-owned facilities in South Carolina for FY 2004.

Institution	Total Square Feet (in millions)	Total Energy Costs (in millions)	Average Cost per Square Foot	Average kBtu per Square Foot
School Districts	107	$104	$0.96	46
State Agencies	24	$38	$1.58	118
Public Colleges with Housing	30	$47	$1.39	124
Colleges without Housing	8	$10	$1.25	72
Total	169	$199	$1.12	70

Sources: EIA, 2003; South Carolina, 2006.

2.1.1 BENEFITS OF IMPROVING ENERGY EFFICIENCY IN GOVERNMENT BUILDINGS

Government leadership in improving energy efficiency across state facility portfolios can produce significant energy, environmental, economic, and other benefits, including:

- *Reduced energy costs*. Significant cost savings can be achieved by improving energy efficiency in existing buildings, leasing energy-efficient buildings, and designing new buildings to be energy efficient. For a typical office building, energy represents 30% of the variable costs of the building and constitutes the single largest controllable operating cost (NAPEE, 2008).

The lifetime energy cost savings produced by an energy-efficient building compared to a conventional one can reach millions of dollars (NAPEE, 2008). Information on the potential energy savings from improving energy efficiency in government buildings includes:

- Energy cost savings on the order of 35% or more are possible for many existing buildings (U.S. EPA, 2008x).
- Many new and renovated buildings designed for energy efficiency offer energy cost savings of as much as 50% compared to conventional buildings (U.S. EPA, 2008n).
- For some buildings, responsible operations and maintenance (O&M) practices, which can often be implemented at low- or no-cost, can account for 5% to 20% of total energy cost savings (U.S. DOE, 2006b).
- Buildings that have achieved the ENERGY STAR label for superior energy efficiency use 40% less energy than average buildings, and offer savings of about $0.50 per square foot per year in lower energy costs, based on a conservative estimate (U.S. EPA, 2006l; U.S. EPA, 2006m).

For an average state, reducing state government energy consumption by 20% overall – a common state target (see Table 3.4.1, *Examples of LBE Goals and Targets*) – could reduce annual state government energy costs by about $16 million while saving nearly 1.2 trillion Btu annually in energy use (ACEEE, 2003). In New York, where a 2001 executive order directed state agencies to reduce energy consumption by 35% by 2010 relative to 1990 levels, the state saved $54.4 million in energy costs from energy efficiency improvements between FY 2001/2002 and FY 2003/2004 (NYSERDA, 2005).

ENERGY USE IN GOVERNMENT BUILDINGS

This table presents average annual energy use by federal, state, and local government-owned commercial buildings (any building that is not residential, industrial, manufacturing, or agricultural).*

End Use	Consumption (trillion Btu)**	As Percentage of Whole
Space heating	498	36
Lighting	294	21
Water heating	239	17
Miscellaneous	94	8
Office equipment	78	6
Space cooling	75	5
Ventilation	42	3
Cooking	28	2
Refrigeration	22	2
Total	1,370	100

*Data are from the 2003 Commercial Buildings Energy Consumption Survey (CBECS), conducted by the Energy Information Administration quadrennially. As of July 2008, data collection for the 2007 CBECS is in progress.

**Figures are rounded to the nearest trillion Btu.

Source: U.S. DOE, 2006a.

- *Reduced GHG emissions and other environmental impacts*. Improving energy efficiency in government buildings can help reduce GHG emissions and other environmental impacts by decreasing consumption of fossil fuel-based energy. Energy use in commercial and industrial facilities accounts for nearly 50% of all U.S. GHG emissions, and fossil fuel combustion for electricity generation accounts for 40% of the nation's CO_2 emissions, a principle GHG, 67% of the nation's SO_x emissions, and 23% of the nation's NO_x emissions (U.S. EPA, 2008n; U.S. EPA, 2008s). SO_x and NO_x emissions can lead to smog and acid rain, and result in emissions of trace amounts of airborne particulate matter that can cause respiratory problems for many people (U.S. EPA, 2008s). At the state level, energy use in buildings can account for as much as 90% of a state government's GHG emissions (Massachusetts, 2004).
- *Increased asset value*. Improving energy efficiency can increase a building's lifetime and overall value. EPA estimates that for every $1

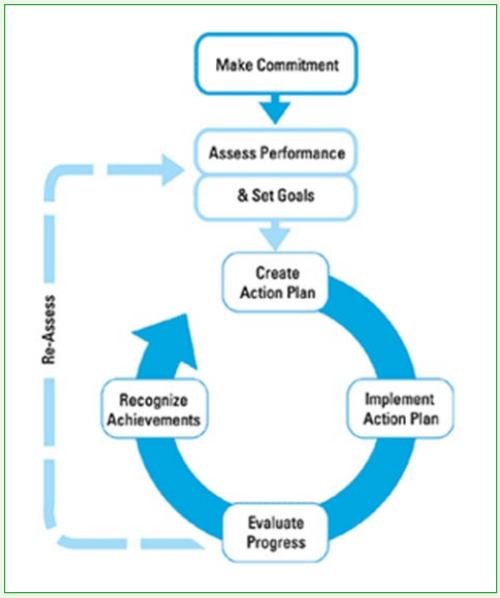


FIGURE 2.1.1 OVERVIEW OF ENERGY STAR GUIDELINES FOR ENERGY MANAGEMENT

The ENERGY STAR *Guidelines for Energy Management* present a seven-step approach to achieving superior energy management and savings across a portfolio of buildings. The steps include:

1. Make Commitment
   - Establish an Energy Team
   - Institute an Energy Policy
2. Assess Performance
   - Collect and Manage Data
   - Establish Baselines and Benchmark
   - Analyze Data and Conduct Technical Assessments and Audits
3. Set Goals
   - Estimate Potential for Improvement
   - Establish Goals
4. Create Action Plan
   - Define Technical Measures and Targets for Each Building
   - Determine Roles and Resources
5. Implement Action Plan
   - Create a Communication Plan, Raise Awareness and Build Capacity
   - Track and Monitor Progress
6. Evaluate Progress
   - Measure Results
   - Review Action Plan
7. Recognize Achievements
   - Internal Recognition
   - External Recognition

For detailed descriptions of the above steps, see *http://www.energystar.gov/index.cfm?c=guidelines.guidelines_index*. (U.S. EPA. 2008e)

spent on energy efficiency improvements, a building's value increases by $2 to $3 (U.S. EPA, 2004).

- *Increased economic benefits through job creation and market development*. Investing in energy efficiency can stimulate the local economy and encourage development of energy efficiency service markets. According to DOE, approximately 60% of energy efficiency investments goes to labor costs and half of all energy-efficient equipment is purchased from local suppliers (U.S. DOE, 2004). Across the nation, energy efficiency technologies and services are estimated to have created more than eight million jobs in 2006 (ASES, 2007).

- *Other*. Other benefits from improving energy efficiency in state government facilities include reduced summer peak energy demand and improved indoor air quality and productivity for occupants (U.S. EPA, 2003; U.S. EPA, 2006b).

2.1.2 PLANNING AND IMPLEMENTATION STRATEGIES FOR IMPROVING ENERGY EFFICIENCY IN GOVERNMENT BUILDINGS

The most cost-effective approach for meeting a state government's building energy needs is to engage in a systematic process for improving energy efficiency in portfolios of owned and leased building space and to design energy efficient new and renovated buildings. A portfolio-wide approach results in greater total reductions in state government energy costs and GHG emissions and enables states to offset the costs of more substantial energy efficiency projects in buildings that have higher up-front costs with the savings from projects in other buildings. In addition, adopting a portfolio-wide approach can help states generate greater momentum for energy efficiency activities, leading to sustained implementation and continued savings.

However, in cases where resources for portfolio-wide improvements are not available, this process can be applied to one or a few government buildings. Experiences from such demonstration projects can then be used to make the case for further energy efficiency improvements in buildings and subsequently can be applied to the broader buildings portfolio when additional support and/or resources become available.

A systematic approach to adopting an energy management strategy has been developed under EPA's ENERGY STAR program, and is summarized in the *Guidelines for Energy Management* and in Figure 2.1.1, *Overview of ENERGY STAR Guidelines for Energy*

Management. The *Guidelines for Energy Management* present the following seven-step approach to achieving superior energy management and savings in buildings:

- Step 1. Make Commitment
- Step 2. Assess Performance
- Step 3. Set Goals
- Step 4. Create Action Plan
- Step 5. Implement Action Plan
- Step 6. Evaluate Progress
- Step 7. Recognize Achievements

These steps for improving building-level energy management are similar to the steps for developing a comprehensive LBE program. Given the significant potential benefits that implementing energy efficiency in buildings can have, especially with respect to reductions in energy costs and GHG emissions, this section of the *LBE Guide* describes the steps of the ENERGY STAR *Guidelines for Energy Management* in detail, and identifies where these steps coincide with the steps for developing a comprehensive LBE program. When developing their LBE programs, states can identify opportunities to incorporate information provided in the *Guidelines for Energy Management*, which will ensure that LBE programs lead to superior energy management in state government buildings.

TABLE 2.1.1 ENERGY STAR PROGRAM RESOURCES

Title/Description	Web Site
ENERGY STAR Tools and Guidance for Existing and New Buildings	
Guidelines for Energy Management. EPA provides the seven-step Guidelines for Energy Management to assist in developing and implementing energy efficiency action plans.	*http://www.energystar.gov/index.cfm?c = guidelines.guidelines_index*
Guidelines for Energy Management Assessment Matrices. EPA has developed an assessment matrix to help energy managers determine if their organization's energy management practices are consistent with the Guidelines for Energy Management. A second matrix allows energy managers to compare current energy management practices to the Guidelines for Energy Management at the site-specific facility level.	*http://www.energystar.gov/ia/business/guidelines/assessment_matrix.xls* *http://www.energystar.gov/ia/business/guidelines/Facility_Energy_Assessment_Matrix.xls*
Portfolio Manager. Local governments can use the ENERGY STAR Portfolio Manager tool to measure and track the energy intensity of their buildings, normalized for weather and square footage. For certain building types, Portfolio Manager can be used to rate building performance on a scale of 1 to 100 relative to similar buildings nationwide, enabling facility managers to assess their own facilities and identify priority energy efficiency improvements.	*http://www.energystar.gov/index.cfm?c = evaluate_performance.bus_portfoliomanager*
ENERGY STAR Label. Buildings that achieve a rating of 75 or higher using Portfolio Manager, and are professionally verified to meet current indoor environment standards, are eligible to apply for the ENERGY STAR label. The ENERGY STAR label is available for office buildings, schools, hospitals, courthouses, and other facilities.	*http://www.energystar.gov/index.cfm?c = evaluate_performance.bus_portfoliomanager_intro*
Profiles of ENERGY STAR Labeled Buildings and Plants. EPA has compiled profiles of ENERGY STAR-labeled government buildings, accessible at its Web page, ENERGY STAR Labeled Buildings and Plants.	*http://www.energystar.gov/index.cfm?fuseaction = labeled_buildings.showBuildingSearch*
Building Upgrade Manual. The ENERGY STAR Building Upgrade Manual describes a five-step systematic approach to improving energy efficiency in existing buildings, including recommissioning/commissioning, lighting, supplemental load reductions, fan systems upgrades, and heating and cooling system upgrades.	*http://www.energystar.gov/index.cfm?c = business.bus_upgrade_manual*

TABLE 2.1.1 ENERGY STAR PROGRAM RESOURCES *(cont.)*

Title/Description	Web Site
Target Finder. Target Finder lets a user establish an energy performance target for a design project or major building renovation based on similar building types and desired energy performance. By entering the project's estimated energy consumption, users can then compare the estimated energy use with the target to see if the project will achieve its goal.	*http://www.energystar.gov/index.cfm?c = new_bldg_design.bus_target_finder*
"Designed to Earn the Energy Star" Label. Building designs that achieve a rating of 75 or higher using the ENERGY STAR Target Finder tool are eligible to receive the "Designed to Earn the ENERGY STAR" designation. These buildings can apply for the ENERGY STAR label if they remain in the top quarter of the rating scale after one year of operation.	*http://www.energystar.gov/index.cfm?c = new_bldg_design.new_bldg_design_benefits*
Target Finder Opportunities Flowchart. A flow chart detailing opportunities to use Target Finder to assess projected design performance is available at:	*http://www.energystar.gov/ia/business/tools_resources/new_bldg_design/Design_process_flow_diagram_101404.pdf*
Integrated Energy Design Guidance. EPA provides guidance on planning and designing buildings that integrate energy efficiency improvements. This guidance includes information on how to use tools such as Target Finder to design buildings that achieve energy performance goals.	*https://www.energystar.gov/index.cfm?c = new_bldg_design.new_bldg_design_guidance*
Integrated Energy Design Guidance Checklist. A checklist that highlights components in the design process that can lead to ENERGY STAR labeling is available at:	*http://www.energystar.gov/ia/business/tools_resources/new_bldg_design/BuildingDesignGuidanceChecklist_101904.pdf*
ENERGY STAR Financial Calculators	
Cash Flow Opportunity Calculator. This tool can be used to: determine how much new energy-efficient equipment can be purchased based on estimated cost savings; determine whether equipment should be purchased now using financing, or if it is better to wait and use cash from a future year's budget; and determine whether money is being lost by waiting for lower interest rates.	*http://www.energystar.gov/index.cfm?c = assess_value.financial_tools*
Financial Value Calculator. This tool presents energy efficiency investment opportunities in terms of key financial metrics. It can be used to determine how energy efficiency improvements can affect organizational profit margins and returns on investments.	*http://www.energystar.gov/index.cfm?c = assess_value.financial_tools*
Building Upgrade Value Calculator. This calculator can be used to estimate the financial benefits of improving energy efficiency in office buildings.	*http://www.energystar.gov/index.cfm?c = assess_value.financial_tools*
Additional ENERGY STAR Resources and Tools	
ENERGY STAR for Government. This Web site provides resources for state and local governments to use as they plan energy efficiency activities, including energy management guidelines, information on financing options, and tools and resources to measure and track energy use.	*http://www.energystar.gov/index.cfm?c = government.bus_government*
The ENERGY STAR Challenge. The ENERGY STAR Challenge — Build a Better World 10% at a Time program calls on governments, schools, and businesses across the country to identify energy efficiency improvements in their facilities and improve energy efficiency by 10% or more. EPA estimates that if each building owner accepts this challenge, by 2015 Americans would save about $10 billion and reduce GHG emissions by more than 20 million metric tons of carbon equivalent — equivalent to the emissions from 15 million vehicles.	*http://www.energystar.gov/index.cfm?c = challenge.bus_challenge*
ENERGY STAR Free Online Training. ENERGY STAR offers free online training sessions on a variety of energy performance topics.	*http://www.energystar.gov/index.cfm?c = business.bus_internet_presentations*
Off the Charts. Off the Charts is EPA's ENERGY STAR e-newsletter on energy management developments and activities.	*http://www.energystar.gov/ia/business/guidelines/assess_value/Off_the_Charts_Summer_2007.pdf*

The following sections provide information on key policy and implementation strategies for each of the *Guidelines for Energy Management* steps. Table 2.1.1, *ENERGY STAR Program Resources*, summarizes the many tools and resources available to states as they plan and implement energy efficiency improvements in their government buildings.

Step 1: Make Commitment

Committing to improving energy efficiency in a specified portfolio of buildings is an important first step for ensuring success. This step involves 1) identifying a team of qualified personnel to further develop the policy, with team members responsible for coordinating activities, securing funding, and regularly assessing progress, among other things, and 2) establishing and committing to an energy policy to improve energy efficiency in buildings. Successful state efforts also frequently involve securing a commitment from the governor's office.

These actions can be implemented as part of the larger LBE program: for example, the "energy efficiency in buildings" team can be a part of, or work with, the broader LBE team, and promoting energy efficiency in buildings can be a component of a broader LBE program. For more information on selecting members for a team to develop this policy, see Section 3.1, *Select an LBE Team*.[2] For more information on establishing an energy policy, see Section 3.4, *Set LBE Goals*.

Many state governments have included in their energy policies a range of commitments to specific actions that can lead to easier and more effective implementation of an overall energy efficiency program. These commitments include:

- *Use life-cycle cost analysis*. Because state governments are concerned with long-term – as well as short-term – benefits and costs, they are well-positioned to adopt life-cycle cost analyses when making decisions about purchasing energy-using products. Traditional methods for assessing project cost-effectiveness typically focus on the initial design and construction costs. The life-cycle cost of a product or service is the sum of the present values of the costs of investment, capital, installation, energy, operation, maintenance, and disposal over the life of the product (U.S. DOE, 2003). Because life-cycle cost analysis accounts for the lower energy costs that can result from a somewhat larger initial investment, it can be an important feature of an overall energy policy. Many states use life-cycle cost analyses to identify energy-efficient products that have shorter payback periods, typically less than five years. More information on life-cycle costing is provided in Section 5.2, *Fund the LBE Program*.

- *Purchase energy-efficient products*. Committing to purchasing energy-efficient products is key to improving energy efficiency across a portfolio of buildings. Purchasing energy-efficient products can make comprehensive energy efficiency upgrades more cost-effective by reducing building energy loads, typically by as much as 5% to 10% (LBNL, 2002). Some state and local governments are making a procurement policy for efficient products an explicit part of their building energy efficiency policy. More information on energy-efficient product procurement is provided in Section 2.3, *Energy-Efficient Product Procurement*.

- *Ensure energy efficiency is a key component of green building strategies*. Energy efficiency can be integrated with other green buildings measures to achieve additional energy, environmental, indoor air quality, and water savings benefits. Designing for superior energy

VIRGINIA ENERGY EFFICIENCY POLICY AND ADVISORY COUNCIL

In 2007, the governor of Virginia issued an executive order committing the state government to improve energy efficiency in its facilities and operations and setting a goal for executive branch agencies and institutions to reduce the annual cost of non-renewable energy purchases by at least 20 percent of fiscal year 2006 expenditures by fiscal year 2010. To meet this goal, the state adopted a policy directing state agencies and institutions to pursue a number of activities, including:

- Design all new and renovated state-owned facilities to meet energy performance standards at least as stringent as those prescribed by ENERGY STAR or the LEED rating system.
- When leasing facilities for state use, give preference to buildings that meet ENERGY STAR or LEED standards.
- Identify performance contracting opportunities.
- Purchase ENERGY STAR-qualified equipment and supplies.
- Implement all possible low-cost energy-saving activities (i.e., with payback periods of one year or less).
- Pursue alternate energy procurement options.

To provide guidance in implementing this policy, the executive order created an Energy Policy Advisory Council, led by a Senior Advisory for Energy Policy.

Source: Virginia, 2007.

[2] *Section 3.2, Identify and Obtain High-Level Support, presents suggestions for how to obtain the governor's support or other high-level backing for an LBE program.*

management is often the first step in green building, and can improve environmental performance and overall cost-effectiveness of a green building strategy (U.S. EPA, 2003; U.S. EPA, 2006c). More information on developing green building policies is provided in Section 2.2, *Energy Efficiency in Green Buildings*.

- *Coordinate energy efficiency in buildings with climate change goals*. Many state and local governments are taking active roles in developing climate policy by committing to reduce GHG emissions. Incorporating energy efficiency activities into their climate policies can help governments meet their GHG emission reduction commitments. In addition, by making the link between climate change and energy efficiency, states are in a better position to gain support for both programs.

Steps 2 and 3: Assess Baseline Energy Performance and Set Goals

After making a commitment, the next two steps to improve energy efficiency across a portfolio of buildings are to assess baseline energy performance and set goals. Assessing energy performance involves looking at how energy is used in existing buildings and identifying opportunities to improve energy efficiency. Setting goals involves looking at potential savings in new and renovated buildings as well as existing ones.

Understanding improvements in energy performance involves periodically comparing a building's energy usage to its baseline energy use (established at a specified time in the past). This is a key step in establishing an effective strategy to improve energy efficiency in buildings and set goals for future energy performance. Key approaches for assessing baseline building energy performance in existing buildings include:

- *Use available, standardized tools for baseline energy use assessments*. Standardized tools can be used to help assess baseline energy use and track building energy data. For example, EPA's ENERGY STAR Portfolio Manager is an on-line tool that can be used to assess baseline energy performance in existing buildings and compile data across a portfolio of buildings (U.S. EPA, 2008m).

- *Benchmark buildings*. Benchmarking involves comparing a building's energy performance to the performance of similar buildings across the county. For certain building types, EPA provides an energy performance rating in Portfolio Manager to compare buildings against similar buildings nationwide on a scale of 1 to 100. For example, a rating of 75 means that the evaluated building performs better than 75% of similar buildings nationwide. This information can help states prioritize which buildings to target for their energy efficiency investments and/or to be the focus of a comprehensive energy audit strategy (see the next bullet, below).

- *Conduct technical assessments and audits*. In addition to establishing baseline energy performance and determining a building's relative performance compared to its peers, a thorough energy performance assessment includes comparing the actual performance of a building's systems and equipment with their designed performance level or the performance level of top-performing technologies. These technical assessments can be conducted as part of a whole-building energy audit conducted by an energy professional and used to identify potential energy-saving opportunities. Many states have incorporated these energy audits into energy performance contracts, which are contracts that offer a one-stop process for purchasing, installing, maintaining,

LOCAL AND STATE ASSOCIATIONS - INTEGRATING ENERGY EFFICIENCY AND CLIMATE CHANGE

The U.S. Conference of Mayors (USCM), the National Association of Counties (NACo), and the National Governors Association (NGA) are promoting actions that link the need for global climate protection with energy efficiency (e.g., via building standards and practices). For example:

USCM and NACo passed resolutions supporting EPA's ENERGY STAR Challenge to reduce energy consumption in public and private buildings by 10% or more. They promote ENERGY STAR tools and resources to members working to meet their climate protection and energy efficiency goals.

The USCM Climate Protection Agreement commits mayors to reduce GHG emissions in their cities to at least 7% below 1990 levels by 2012. The Climate Protection Center provides guidance to mayors on leading their cities' efforts to reduce GHG emissions linked to climate change, and publishes best practices, including examples of cities that are taking the lead in this effort by improving energy efficiency in their buildings and operations.

NACo launched the Green Government Initiative to provide resources for local governments on sustainability issues, including energy efficiency and air quality. NACo's Climate Protection Program provides counties with best practices, tools, and resources on developing and implementing climate change programs.

The NGA recently launched an initiative – Securing a Clean Energy Future – to enlist governors' support in reducing the impacts of climate change through energy efficiency, clean technology, energy research, and deployment of alternative fuels.

Sources: NACo, 2002, 2005, 2005a; NGA, 2008; USCM, 2006, 2007, and 2008.

and often financing energy-efficiency upgrades at no up front cost. EPA has developed a directory of energy professionals, energy service companies (ESCOs), and other companies that can provide states with expert advice and technical assistance on conducting energy audits and entering energy performance contracts.[3] For more information on energy performance contracting, see Section 5.2, *Fund the LBE Program*.

State governments can establish specific energy efficiency goals for existing and new buildings to help maintain momentum for energy management activities and to guide daily decision-making. Setting clear and measurable goals is also critical for tracking and measuring progress. Goals for existing buildings can be based on the results of the baseline energy performance assessment, while goals for new buildings can be based on the output of energy performance projection tools and best practices. Key considerations for setting goals for improving energy efficiency in existing and new buildings include:

- *Consider potential savings*. As described above, states can use information collected during energy performance assessments and technical audits to determine potential energy savings and set appropriate goals for improving energy efficiency in existing buildings. States can also evaluate a building's benchmarking results to estimate potential savings based on the energy performance of similar buildings. For new and renovated buildings, state governments can use tools such as the ENERGY STAR Target Finder to set energy performance targets and assess building designs. In addition, states can consider the targets achieved by similar buildings by reviewing other organizations' and governments' experiences. Through July 2008, 31 states have accepted the ENERGY STAR Challenge, establishing goals of improving energy efficiency in their buildings by at least 10% (U.S. EPA, 2008w).

- *Determine appropriate scope*. Goals for improving energy efficiency in new and existing buildings can be established at different levels, ranging from process- or equipment-specific goals, to facility-level and portfolio-wide goals. These goals can also be established over varying time periods. Many states have established both short-term and long-term goals for improving energy efficiency in buildings that can lead to quick cost savings that continue to accrue far into the future.

[3] *See http://www.energystar.gov/index.cfm?c = spp_res.pt_spps for a directory of energy service and product providers.*

Goals for improving energy efficiency in state buildings can be part of a larger LBE goal that incorporates multiple clean energy LBE activities. For more information on setting LBE goals, see Section 3.4, *Set LBE Goals*.

Steps 4 and 5: Create and Implement An Action Plan

A regularly updated action plan for improving energy efficiency in existing and new buildings can serve as a

STATE AND LOCAL GOVERNMENTS USING ENERGY STAR TO MEET ENERGY SAVINGS GOALS

Many state and local governments are using ENERGY STAR to meet their energy savings goals.

- About two-thirds of the nation's states, and more than 200 local governments, have adopted the ENERGY STAR Challenge to improve energy efficiency in their buildings by at least 10% (U.S. EPA, 2008o).
- Some states, such as California and Hawaii, have directed state agencies to give priority to ENERGY STAR-labeled buildings when pursuing new leases (California, 2004a; Hawaii, 2006).
- Minnesota has established a goal for the state to achieve 1,000 ENERGY STAR-labeled commercial buildings, including state government facilities, by 2010 (Minnesota, 2007).
- New Hampshire has entered the ENERGY STAR Challenge, through which participants commit to reduce energy use by 10% (U.S. EPA, 2005c).

BENCHMARKING STATE FACILITIES IN CALIFORNIA

California Executive Order S-20-04, issued in 2004, established a number of energy efficiency goals for public and commercial facilities, including state government buildings and schools. Among these goals was a directive to state agencies to reduce grid-based energy purchases for state-owned buildings by 20% by 2015 from 2003 levels.

An *Green Building Action Plan* that accompanied the executive order directed the California Energy Commission (CEC) to coordinate with EPA to develop a system to benchmark and track energy consumption in state facilities. The CEC developed a system based on the ENERGY STAR Portfolio Manager tool and tailored to California's unique needs. In August 2008, the state reported that it had benchmarked more than 100 million square feet of its facilities, which revealed a 4% decrease in energy consumption in state facilities since 2003.

In addition, a bill passed by the state legislature in 2007 will make it easier for state agencies to update energy consumption data for benchmarked facilities. Assembly Bill 1103 requires electric and gas utilities in the state to maintain at least 12 months of data for all non-residential buildings to which they provide services, beginning in 2009. This data must be maintained such that it can be uploaded into Portfolio Manager at the building owner's request.

Sources: California, 2004a; California, 2004b; California, 2007; California GAT, 2008.

roadmap for implementing energy efficiency measures through a systematic process. Step 4, creating an action plan involves establishing energy performance targets for each building, identifying the technical measures that can help meet that performance target, identifying resources necessary to implement the action plan, and determining roles and responsibilities of internal and external parties.

Key strategies for developing an action plan for improving energy efficiency in buildings include:

- *Develop whole building energy performance targets.* Once a state government has evaluated its portfolio's performance and set portfolio-wide goals (based on the energy savings potential of priority investments in existing buildings and the anticipated energy savings potential for new building designs), it can establish energy performance targets for each existing and new building. Establishing energy performance targets for each building allows states to clearly articulate to building occupants and other key personnel the expected results of energy efficiency investments in each facility, and enables state governments to track progress and measure results. Whole building energy performance targets can be developed for existing buildings using the ENERGY STAR Portfolio Manager tool, which enables users to identify baseline energy performance and set targets based on EPA's national energy performance rating system (U.S. EPA, 2008m). For new buildings, a complementary tool called the ENERGY STAR Target Finder can be used to set whole building performance targets (U.S. EPA, 2008c). For building types not covered by these tools, EPA has developed a list of reference energy performance targets based on national averages.[4]

- *Use a staged approach to identify technical measures for improving energy efficiency*. For *existing* buildings, a staged approach, which sequences building upgrades in a logical, systems-oriented way, can lead to the greatest energy savings for the available budget. When following this approach, states can identify, for each step in the process, appropriate technical measures that are most likely to improve energy efficiency in a cost-effective way. The staged approach recommended by EPA's ENERGY STAR program involves implementing the following steps in sequence (see the text box on page 2-15 for a more detailed description of this approach):
  - Conduct recommissioning.
  - Install energy-efficient lighting.
  - Purchase ENERGY STAR-labeled office equipment and building envelope components to reduce the supplemental load.
  - Install fan system upgrades.
  - Install heating and cooling system upgrades.

Figure 2.1.1 illustrates the benefits of implementing energy efficiency upgrades based on several of these EPA-recommended stages. As shown in the figure, cooling capacity can be reduced by up to 5% for a typical office building when implementing HVAC measures *after* all other upgrades. The figure also shows that implementing upgrades in appropriate stages reduces the overall cooling capacity needed, which can enable state governments to purchase "right-sized" equipment. "Right-sized" equipment is sized to meet the necessary load after efficiency measures are implemented, as opposed to oversized equipment that serves the load, but at a higher up-front cost.

Figure 2.1.2 illustrates how implementing upgrades in a staged fashion can reduce a building's energy loads,

[4] *See 2003 CBECS National Average Source Energy Use and Performance Comparisons by Building Type (http://www.energystar.gov/ia/business/tools_resources/new_bldg_design/2003_CBECSPerformanceTargetsTable.pdf) for a list of reference energy performance targets for building types not currently eligible to receive ratings under EPA's building energy performance rating system.*

FIGURE 2.1.1. BENEFITS OF INTEGRATING ENERGY EFFICIENCY MEASURES

Sequence of Upgrade Measures	1st Upgrade	2nd Upgrade	3rd Upgrade	Cooling Capacity (Tons)	Reduction in Cooling Capacity (%)
Good	HVAC	O&M	Lighting	760	0%
Better	O&M	HVAC	Lighting	752	1%
Best	O&M	Lighting	HVAC	722	5%

Source: NAPEE, 2008.

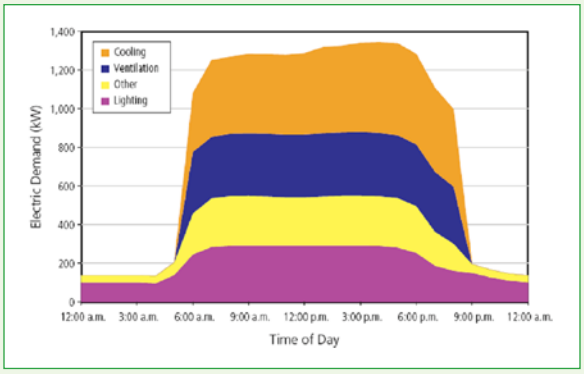
and result in an overall energy consumption reduction of 30% (NAPEE, 2008).

While the preceding staged approach makes sense for existing buildings, states follow a different approach for *new* buildings. To help states design new building systems and materials as an integral network that will improve energy performance, EPA has developed the ENERGY STAR *Integrated Energy Design Guidance to Design* (U.S. EPA, 2008b). This guidance document can help states identify cost-effective energy measures that consider the environment, climate, building orientation, and other features that affect performance in new facilities. It is important to note that for new buildings, it is essential to conduct commissioning during the construction process and to continue commissioning through occupancy to verify that the new building functions as intended. Several resources are available to help states identify energy efficiency measures for existing buildings and new buildings, including:

- *Upgrade and design guidance materials*. Energy efficiency upgrade and design guidance materials are helpful for identifying and prioritizing technical measures to incorporate into a state's energy efficiency action plan. For example, the ENERGY STAR *Building Upgrade Manual* provides guidance on using the staged approach for upgrading existing buildings (see the text box on page 2-15). For new buildings, states can use energy-efficient design guidelines such as the ENERGY STAR *Integrated Energy Design Guidance*. This document provides a strategic management approach for incorporating energy performance considerations into the building design process, and can be used by design professionals to establish and achieve energy performance goals (U.S. EPA, 2008b). States can also use the *Whole Building Design Guide*, a resource developed with EPA and DOE support by the National Institute of Building Sciences, which provides information on energy-efficient building design and offers numerous case studies, tools, and guidance documents (WBDG, 2008).
- *Best practices*. States can obtain information on best practices from other organizations that have upgraded buildings and achieved superior energy performance. For example, *ENERGY STAR Labeled Buildings and Plants* is an EPA-maintained list of the more than 4,000 buildings that have earned the ENERGY STAR label for energy performance (U.S. EPA, 2008r).

FIGURE 6.1.3 TYPICAL OFFICE BUILDING LOAD PROFILE

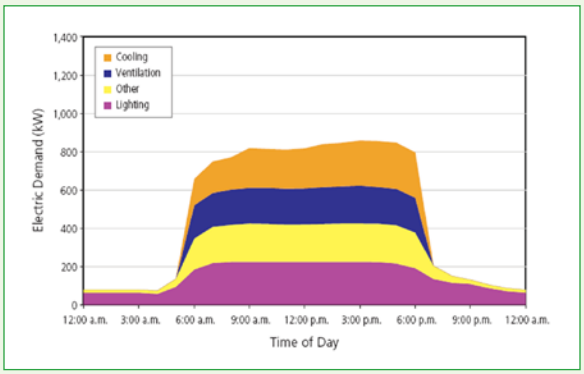
The graphic below illustrates a typical 250,000 ft² office building's load profile for cooling, ventilation, lighting, and other energy demand on a summer day in Chicago, Illinois.



Implementing a suite of energy efficiency upgrades could significantly reduce the building's energy consumption. The graphic below illustrates the energy loads for the same building after implementing several staged upgrades, including:

1. O&M/re-commissioning measures (e.g., optimizing temperature setpoints, HVAC scheduling, etc.)
2. Lighting measures (compact fluorescents, daylighting controls, etc.), and
3. HVAC measures (high efficiency chillers, premium efficiency motors, etc.).

Implementing these upgrades noticeably reduces each energy load. The total resultant energy decrease is approximately 30%.



Source: NAPEE, 2008

Many ESCOs have experience with proven technical energy efficiency measures, and can incorporate these measures into an action plan through the energy performance contracting process. EPA has developed a directory of service product providers that can provide states with expert advise and technical assistance on entering energy performance contracts.[5] For more information on energy performance contracting, see Section 5.2, *Fund the LBE Program*.

- *Secure necessary funding*. When creating an action plan for improving energy efficiency in state buildings, it is important to identify the capital costs of implementing the action plan, and to evaluate funding opportunities. The following financial tools are available through EPA's ENERGY STAR program to help prioritize energy efficiency investments and make the case for these investments:

  - *Cash Flow Opportunity Calculator*. This tool can be used to determine how much new energy-efficient equipment can be purchased based on estimated cost savings, whether equipment should be purchased now using financing or if it is better to wait and use cash from a future year's budget, and whether money is being lost by waiting for lower interest rates.

  - *Financial Value Calculator*. This tool presents energy efficiency investment opportunities in terms of key financial metrics. It can be used to determine how energy efficiency improvements can affect organizational profit margins and returns on investments.

  - *Building Upgrade Value Calculator*. This calculator can be used to estimate the financial benefits of improving energy efficiency in office buildings.

Once a state government has determined the size of the investment required to implement priority energy efficiency upgrades, it can consider a range of financing options. Financial assistance for improving energy efficiency in state buildings can be secured through a number of sources. Many states administer programs that provide incentives to state departments or agencies that invest in energy efficiency, while a number of states have identified and secured funding resources from external sources. Energy performance contracts, for example, can be used to implement energy efficiency upgrades at no up-front cost, often through a financial arrangement with an ESCO. For more information on funding LBE programs, see Section 5.2, *Finance the LBE Program*.

In cases where states do not have sufficient resources to improve energy efficiency across a broad portfolio of buildings, they can concentrate resources to systematically improve energy efficiency in one or a few buildings. Experiences from such pilot projects can be applied to a broader suite of buildings when additional resources become available.

CASH FLOW OPPORTUNITY CALCULATOR

The ENERGY STAR Cash Flow Opportunity Calculator is a decision-making tool that can be used to influence the timing of energy-efficient product purchases. The tool can be used to determine:

- The quantity of energy-efficient equipment that can be purchased and financed using anticipated savings;
- Whether it is most cost-effective for the purchase to be financed now, or to be paid for using future operating funds; and
- The cost of delay: whether money is being lost while waiting for a lower interest rate.

www.energystar.gov/ia/business/cfo_calculator.xls

Source: U.S. EPA, 2003c.

Steps 6 and 7: Evaluate Progress and Recognize Success

Implementing an action plan for improving energy efficiency does not in itself guarantee that a building will achieve its intended energy performance target. State governments can verify that they are making progress toward achieving their overall energy efficiency goal by using tools such as the ENERGY STAR Portfolio Manager to monitor energy performance and identify new opportunities for energy efficiency improvements across their portfolio (Step 6, Evaluate Progress). Chapter 6, *Track, Evaluate, and Report on Progress*, provides additional guidance on options for evaluating the performance of an LBE program, including information specific to tracking and evaluating energy performance in government buildings.

Another way to sustain momentum and support for energy efficiency activities is to obtain recognition for achieving performance goals (Step 7, Recognize Success). In addition to recognizing success internally, third-party recognition opportunities include:

[5] *See http://www.energystar.gov/index.cfm?c = spp_res.pt_spps for a directory of energy service and product providers.*

OVERVIEW OF EPA BUILDING UPGRADE MANUAL STAGED APPROACH FOR IMPROVING ENERGY PERFORMANCE

The staged approach outlined in the 2008 *ENERGY STAR Building Upgrade Manual* provides a systematic method for planning energy efficiency upgrades in buildings that accounts for interactions between building energy systems, enabling organizations to achieve greater energy savings. This approach involves the following stages:

1. Commissioning and Recommissioning: Commissioning a new building before it becomes operational to ensure energy systems were constructed as designed can produce energy cost savings of $0.02 to $0.19 per square foot (Mills et al., 2004). Commissioning can also produce non-energy benefits, such as improved occupant comfort and indoor air quality. One study estimates that the average value of non-energy benefits for every $1 spent on commissioning ranges from $1 to as high as $2.30, when accounting for energy efficiency rebates. Non-energy benefits resulting from commissioning are estimated to be $0.50 per square foot (Mills et al., 2004; Jennings and Skumatz, 2006).

Recommissioning is a key activity in identifying technical measures for a staged approach to improving energy efficiency and involves periodically examining building equipment, systems, and maintenance procedures and comparing them to initial design intentions and current operational needs. This process can identify no- and low-cost technical measures for improving energy efficiency and can result in energy cost savings between $0.11 and $0.72 per square foot.

2. Lighting: Improving the energy efficiency of the building lighting system can reduce lighting energy costs. Lighting systems can account for up to 30% of a building's total energy use, and savings from going beyond standard equipment selection can be significant: 20% to 40% for lamps and ballasts, 30% to 50% for new fixtures, 40% to 60% for using task/ambient lighting strategies, and 30% to 50% for outdoor lighting. Improving lighting system energy efficiency can also improve lighting quality and reduce unwanted heat gain. Technical measures for improving lighting system energy efficiency include:

- Design light quantity and quality to meet task and occupant needs
- Maximize lamp and ballast efficiency
- Install automatic controls to turn off or dim lighting
- Establish schedules for group re-lamping and fixture cleaning
- Purchase ENERGY STAR-qualified lighting products
- Use responsible disposal practices.

3. Supplemental Load Reductions: Purchasing ENERGY STAR labeled office equipment and improving the energy efficiency of building envelope components (e.g., installing window films and adding insulation or reflective roof coating) reduces supplemental load energy consumption. Reducing supplemental loads enables organizations to install smaller fan, heating, and cooling systems that cost less and use less energy.

4. Fan Systems Upgrades: Fan systems can account for as much as 11% of an office building's total energy use. Technical measures, such as properly sizing fan system equipment, installing variable speed drives, and converting to a variable-air-volume system, can significantly reduce fan system energy costs from 50% to 85%.

5. Heating And Cooling System Upgrades: Heating and cooling systems typically account for one-third of a building's energy use. Improving energy efficiency in these systems can produce significant savings. Cooling system energy savings can range from 15% to 33% for central chiller systems and 20% to 35% for unitary air conditioning systems. Heating system energy savings can range from 10% to 30% for systems that use boilers and 5% to 25% for systems that use furnaces. A strategy for improving heating and cooling system efficiency involves:

- Measure heating and cooling loads
- Right size heating and cooling systems
- Install energy-efficient chillers
- Upgrade other heating and cooling system components
- Install variable speed drives on pumps and cooling tower fans
- Optimize operations.

Source: U.S. EPA, 2008x.

- *ENERGY STAR Qualified Buildings*. Buildings achieving an energy performance rating of 75 or greater are eligible to apply for the ENERGY STAR label. Buildings that have earned the ENERGY STAR label use, on average, 40% less energy as compared to conventional buildings, (U.S. EPA, 2008h).

- *ENERGY STAR Awards*. EPA also provides recognition to organizations that meet important energy savings milestones, such as improvements of 10%, 20% and 30% relative to their initial baselines.

2.1.3 EXAMPLES OF STATE AND LOCAL ACTIVITIES FOR IMPROVING ENERGY EFFICIENCY IN BUILDINGS

State and local governments are using a variety of approaches to improve energy efficiency in individual buildings and in their portfolio of government facilities. The following examples provide brief descriptions of some of these approaches. Additional examples are provided in, Section 4.5, *State Examples of Screening LBE Activities and Measures*.

Energy Efficiency in Existing Buildings

Michigan – State Facility Energy Savings Plan

The Michigan Department of Management and Budget is working to implement an energy savings plan with the goal of reducing energy expenditures in department-managed facilities by 10% by 2009, based on 2002 levels. This plan, which involves coordinating with the Department of Labor and Economic Growth's Energy Office to benchmark state facilities using EPA's ENERGY STAR tools, is expected to save the state $1.6 million annually beginning in 2009. To help state agencies reduce energy use in their facilities, the Energy Office provides assistance in securing energy performance contracts. Since 1987, the state has invested $17 million in energy performance contracts that it estimates have generated more than $22 million (Michigan, DLEG, 2008 and Michigan, DLEG, 2008a).

For example, Lake Superior State University (LSSU), a small public university in Sault Ste Marie, Michigan, became an ENERGY STAR partner and contracted with an energy service provider to help measure, track, and benchmark its energy performance, develop and implement a plan to improve its facilities and operations, and educate its staff and the public about its ENERGY STAR program and achievements. This process identified 184 facility improvement measures providing total annual energy and operational savings of almost $430,000 with a payback of about 11 years. The improvements included lighting retrofits, mechanical retrofits, steam trap retrofits, roof and window replacements, water saving measurements, and other enhancements to the 42 building campus. (Michigan Energy Office, Undated).

Web site: ***http://www.michigan.gov/dleg/0,1607,7-154-25676_25689_33337-103911--,00.html***

Montana – 20 X 10 Initiative

Created by the governor in 2007, the 20 X 10 Initiative calls on executive branch agencies to reduce their energy consumption by 20% by 2010, based on 2007 levels. Agencies can achieve this goal following various paths, but the state encourages them to adopt an energy management strategy that first capitalizes on the savings provided by measures with short payback periods. Specifically, state agencies are encouraged conduct a comprehensive energy audit of their facilities, and then focus on improving the energy efficiency of their operating practices (e.g., making adjustments to lighting and heating settings) and purchasing ENERGY STAR-qualified equipment.

The state Department of Environmental Quality is collecting past energy bills and using these data to assess each agency's baseline energy performance. In addition, this database will be used to provide agencies with regular energy use reports so they can track their progress in reducing energy consumption. The state's executive branch agencies spent approximately $12 million on energy in its baseline year (2007), meaning the initiative could potentially save the state $2.4 million in 2010 (Montana, 2008).

Web site: ***http://governor.mt.gov/20x10/***

New Hampshire – ENERGY STAR Challenge Participant

In 2004, the governor of New Hampshire issued an executive order directing the Department of Administrative Services to develop an energy information system that state government agencies could use to track and report their energy use. In addition, the order requires agencies to train staff in using EPA's ENERGY STAR tools and to use these tools to benchmark state government facilities. It created an Energy Efficiency in State Government Steering Committee to develop plans to reduce energy use in state facilities, including a plan to conduct energy audits on all state facilities achieving scores between 40 and 60 on EPA's national energy performance rating system (using the ENERGY STAR benchmarking tools) and a plan to purchase ENERGY STAR-qualified products. The steering committee was also responsible for developing a state government-wide energy use reduction goal, which resulted in a 2005 executive order that entered the state as a participant in the ENERGY STAR Challenge, with the goal of improving state government energy efficiency by 10%. This second executive order also directs state agencies to implement the steering committee's plans for reducing energy use (New Hampshire, 2004; New Hampshire 2005).

In 2006, the renovated Department of Justice building became the first office building in the state to receive the ENERGY STAR label. The state has conducted an energy efficiency upgrade of the facility under a performance contract that enabled the state to pay for the upgrade using energy cost savings. The building received new lighting and lighting controls, an advanced energy management system, energy-efficient hot water pumps and air conditioners, and water-efficient plumbing

fixtures. The upgrades resulted in a 37% reduction in energy consumption and annual energy cost savings of over $24,000. These energy savings translate to the avoidance of more than 900 metric tons of CO_2 emissions annually (New Hampshire, Undated).

Web site: ***http://www.des.state.nh.us/ard/climatechange/index.html#state***

Oregon – Building Commissioning Program

Under its Building Commissioning program, the Oregon Department of Energy provides technical assistance to managers of both public and private facilities. The state requires recommissioning or commissioning for specified energy-related projects funded through the state's Public Purpose Fund. These projects include HVAC and direct digital control projects exceeding $50,000, boiler and chiller projects exceeding $100,000, and other energy-related projects (e.g., lighting and lighting controls, building envelope) exceeding $150,000 (Oregon, 2006).

Recommissioning a newly-constructed school facility in the Silver Falls, Oregon School District revealed discrepancies in the installation and operation of the HVAC systems that were causing energy costs to exceed expected costs by 32%. The school district estimated that the recommissioning findings and corrective actions would save approximately $15,000 per year in energy costs and that the full cost of the process would be recouped in about five years (Oregon, 2004).

Web site: ***http://www.oregon.gov/ENERGY/CONS/BUS/comm/bldgcx.shtml***

Washington – Building Commissioning Program

The Washington General Administration (GA) operates a Building Commissioning Program to assist publicly-owned or -operated facilities in conducting building commissioning. The GA partners with these facilities and provides resources to help them build a commissioning team, negotiate the scope of work and commissioning cost, and ensure that both new and existing buildings are designed and operated so that the operational needs are met, the building performs efficiently, and building operators are trained (Washington, 2006).

In 2003, the energy management and control system of the Washington Department of Ecology headquarters facility, which was designed in 1993 to exceed state energy code by 30%, received a substantial upgrade. This involved multiple improvements to the building's ventilation systems, including a new digital control system, building pressure controls, CO_2 controls, outside airflow instrumentation, and interactive kiosks throughout the building to provide system feedback to occupants. Following these upgrades, the entire building was re-commissioned to ensure that all equipment was operating correctly. Once completed, these upgrades reduced the building's energy intensity to 54.6 kBtu per square foot, considerably lower than the average 82 kBtu per square foot intensity of conventional buildings. This achievement earned the building the ENERGY STAR label in 2005 (U.S. EPA, 2008f).

Web site: ***http://www.ga.wa.gov/EAS/bcx/index.html***

Wisconsin – Wisconsin Energy Initiative

As part of its Wisconsin Energy Initiative, the state has partnered with EPA's ENERGY STAR program to implement energy efficiency measures in existing and new state buildings. Beginning with a lighting retrofit, the state used ENERGY STAR tools and resources to systematically replace lighting fixtures in 53 million square feet of office space in state government buildings. The results of this initial measure were substantial: over 108 million kWh of annual energy savings, approximately $7.5 million in annual energy cost savings, and emission reductions equivalent to removing nearly 20,000 vehicles from state roads for one year.

The state followed this initial retrofit with whole-building examinations, pursuing new strategies for improving energy efficiency and reducing water usage. Under the expanded initiative, the state retrofitted an additional 60 million square feet of office space at a total expected cost for the upgrades of $35 million. The annual savings achieved as a result of these comprehensive assessments are expected to total $11 million. Projected additional energy and emissions savings are significant: 15.6 million kWh; 11,472 tons of carbon, 1,156 pounds of NO_x, and 537 pounds of CH_4 (NASEO, 2006).

Web site: ***http://www.naseo.org/tforces/energystar/casestudies/.***

Energy Efficiency in New Buildings

North Carolina – Sustainable Energy Efficient Buildings Program

North Carolina joined the ENERGY STAR Challenge in 2005 and is working with EPA'S ENERGY STAR program to improve its facilities' energy efficiency by 10%. In 2007, the state legislature passed a bill

requiring that the combined energy consumption for all state government buildings be reduced by 20% by 2010, and 30% by 2015, based on FY 2004 levels. The 2007 legislation also created the *Sustainable Energy Efficient Buildings Program*. Under this program, all new buildings greater than 20,000 square feet, and renovated buildings greater than 20,000 square feet with renovation costs greater than 50% of the insurance value, must be designed, constructed, and certified to exceed the ASHRAE 90.1-2004 Standard by 30% (for new buildings) and 20% (for renovations), and must be commissioned to verify energy-efficient design. The bill includes a provision that after one year of operation, the new building energy performance must be verified. If at this time energy performance is 85% or less than the target, corrections and modifications must be explored (North Carolina, 2007; U.S. EPA, 2008q).

The *Sustainable Energy Efficient Buildings Program* is a component of the state's *Utility Savings Initiative*, a multi-program approach to reducing utility expenditures in state buildings that involves strategic energy planning, agency personnel training, and performance contracting.

Web sites: ***http://www.energync.net/programs/usi.html*** ***(Utility Savings Initiative)***

http://www.energync.net/programs/docs/usi/SessionLaw2007-546.pdf ***(Sustainable Energy Efficient Buildings Program Enabling Legislation)***

Fort Collins, Colorado – Energy Management and Integrated Energy-Efficient Design in K-12 Schools

The Poudre School District in Fort Collins, Colorado began an energy management program in 1994 with a goal of reducing energy costs district-wide. As part of this program, the district has implemented nearly 150 energy efficiency upgrades through 2007, producing annual energy cost savings of nearly $440,000. To help evaluate and track district-wide energy performance, the district has used ENERGY STAR tools to benchmark each of its buildings.

As of FY 2007, 17 schools and two administrative offices had earned the ENERGY STAR label, including the new Operations Building. This building's design integrated a number of energy efficiency measures, including daylighting, automated lighting systems with dimmers, on-site solar electricity generating panels, and a geo-exchange heating system. To achieve optimum energy efficiency measure integration, the design team used EPA's ENERGY STAR Target Finder tool to set energy targets multiple times during the early stages of the building design process. These early evaluations allowed the design team to use Target Finder's energy simulation software to make adjustments to building orientation, envelope, materials, internal systems, and equipment. As the design process progressed, the team was able to achieve consistent design performance ratings in the 80s. The building was completed in 2002, and after 12 months of energy use data were compiled, the building earned a rating of 97 on the EPA national energy performance rating system, qualifying the building for the ENERGY STAR label. In 2005, the Operations Building achieved a perfect rating (U.S. EPA, 2008d).

Web site: ***http://www.psdschools.org/services/operations/facilities/energymanagement.aspx***

2.2 ENERGY MANAGEMENT IN GREEN BUILDINGS

Many states have found that the new and renovated building planning, design, and construction processes offer opportunities to integrate energy efficiency measures with other "green" features (e.g., lowering GHG emissions, improving indoor air quality and sustainable site selection) that provide additional environmental, economic, and health benefits. Energy efficiency, a critical element of green building that is often considered first in green building design, has become the cornerstone of many state government green building programs. In addition to enhancing a building's

GREEN BUILDING AND ENERGY STAR

When upgrading existing buildings or designing new buildings, states are looking to green building certification programs such as U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) design-based rating system and the Green Globes rating system. These rating systems standardize the elements of green building by conferring design certification based on requirements for (1) energy and atmosphere, (2) site sustainability, (3) water efficiency, (4) materials and resources, (5) indoor air quality, and (6) innovative design process.

Depending upon the rating system, it can be important to add requirements for energy performance, such as achieving EPA's ENERGY STAR program levels. It is also important to require third-party verification, which is required to earn the ENERGY STAR label on commercial buildings.

Some states and cities, such as Pennsylvania and Washington, D.C., have found that using a combination of ENERGY STAR and LEED is key to ensuring that new and renovated buildings meet both energy and environmental performance criteria.

environmental profile (e.g., through reduced GHG emissions), states have found that incorporating energy efficiency can improve the cost-effectiveness of green buildings.

Many terms are used to describe buildings that incorporate energy efficiency and other environmental features. These terms include *green buildings, high performance buildings*, and *sustainable buildings*, among others. There is not yet a consensus on the definitions of these terms, and energy and environmental experts sometimes use the terms interchangeably. Regardless of the definitions, there is often a public perception that energy efficiency and "green" are interchangeable, and that green buildings are energy efficient. However, this is not always the case; some "green" buildings do not adequately incorporate energy efficiency.

The *LBE Guide* uses the term "green building" as an all-encompassing description of buildings that incorporate *energy efficiency* plus other energy and environmental features where cost effective and practical, including:

- Renewable energy supply
- Combined heat and power (CHP)
- Sustainable site design that minimizes stress on the local landscape
- Water efficiency and quality
- Green materials and resources that minimize consumption and waste
- Indoor air quality

This section of the *LBE Guide* focuses on approaches for ensuring that green building policies and activities are designed to achieve energy efficiency and the associated environmental and financial benefits that come with combining superior energy performance and other green features.

2.2.1 BENEFITS OF GREEN BUILDINGS

Green buildings provide the benefits of energy efficiency (see Section 2.1.1.) plus additional energy and environmental benefits. For example, ENERGY STAR-labeled buildings can reduce energy costs by as much as 50% compared to conventional buildings, producing savings of about $0.50 per square foot per year. These energy efficiency savings are the key driver for achieving overall cost-effectiveness in green building design (U.S. EPA, 2008n; U.S. EPA, 2006l).

In addition, green buildings can provide environmental benefits, such as lowering GHG emissions, reducing construction and demolition debris, ecosystem protection, and conserving natural resources. The actual benefits depend upon the environmental features pursued by the building owner and developer, which can depend on the rating system adopted (e.g., LEED, Green Globe) and whether the building operates as designed.

Some of these environmental features can have secondary energy saving benefits. For example, many green buildings incorporate water efficiency measures, which can save heating energy while conserving a natural resource (U.S. EPA, 2008t). For more information on activities that can have secondary energy saving benefits, see Section 2.6, *Other Energy Saving Opportunities*.

2.2.2 PLANNING AND IMPLEMENTATION STRATEGIES FOR GREEN BUILDINGS

When planning and implementing strategies for green buildings, states can follow the energy management steps described in Section 2.1, *Energy Efficiency in Buildings*. Other key strategies include:

- *Ensure that energy efficiency is specifically included in green building policies.* Energy efficiency is a critical element of green building and is a key feature of the design process. States have found that requiring a

ARIZONA GREEN BUILDING POLICY

In 2007, Arizona passed legislation requiring the state's largest agencies to reduce energy consumption per square foot by 30% by July 1, 2020 based on FY 2002 levels. To help meet this goal, the legislation included a requirement that all new state-funded buildings be designed to meet LEED certification.

The new Arizona Department of Environmental Quality building was designed to achieve optimal energy performance with minimal impact on the environment. Using a 25-year lease-to-own financing agreement, the agency was able to use a life-cycle costing approach in designing the building. Building design energy efficiency and renewable energy measures include:

- A reflective roof to minimize "heat island effect"
- Variable frequency drives for motors
- Low-e glass to reduce reliance on cooling system
- Efficient lighting, including dimmers and LED exit signs
- Electrical system with ENERGY STAR transformers
- A 100-kW PV system connected to the grid.

The energy efficiency, renewable energy, and green measures incorporated into the building's design have earned it both LEED-Silver certification and the ENERGY STAR label.

Sources: ADEQ, 2006a, 2006b.

INCORPORATING ENERGY EFFICIENCY INTO GREEN BUILDING POLICIES

Energy efficiency can be incorporated into green building policies in different ways, depending on the green building rating system used. States can take the following steps to incorporate energy efficiency into green building policies.

LEED for Existing Buildings (LEED-EB)

- Require that the actual energy use of buildings meets aggressive energy performance targets, based on the most energy-efficient existing buildings in the market.
- For building types covered by EPA's ENERGY STAR Portfolio Manager rating system, the target should be at least 75, the level at which a building is eligible to earn the ENERGY STAR label. This is more stringent than the LEED-EB requirement and will result in greater energy efficiency. See *Develop Whole Building Performance Targets* in Section 2.1.2*, Planning and Implementation Strategies for Improving Energy Efficiency in Government Buildings*, for more detailed guidance and strategies for building types not covered by Portfolio Manager.
- Strive to achieve the greatest possible quantity of credits in the LEED energy and atmosphere section.
- Once a building has been operating for one year, compare the building's actual performance to the energy target used during the design phase and confirm that the building is eligible for the ENERGY STAR, where available.

LEED for New Construction (LEED-NC)

- Require design teams to meet an aggressive energy performance target, based on the most energy-efficient existing buildings in the market. For building types covered by EPA's ENERGY STAR Target Finder, the target should be at least 75, the level at which a building is "Designed to earn the ENERGY STAR." See *Develop Whole Building Performance Targets* in Section 2.1.2*, Planning and Implementation Issues for Improving Energy Efficiency in Government Buildings*, for more detailed guidance and strategies for building types not covered by Target Finder.
- Strive to achieve the greatest possible quantity of credits in the LEED energy and atmosphere section.
- Once a building has been operating for one year, compare the building's actual performance to the energy target used during the design phase and confirm that building is eligible for the ENERGY STAR, where available.

Green Globes Rating System for New Buildings or Significant Renovation

- Strive to achieve the highest possible rating using the Green Globes rating system, which requires new building designs to achieve a rating of 75 (to be eligible for the ENERGY STAR) or better using EPA's ENERGY STAR Target Finder. See *Develop Whole Building Performance Targets* in Section 2.1.2*, Planning and Implementation Issues for Improving Energy Efficiency in Government Buildings*, for more detailed guidance and strategies for building types not covered by Target Finder.
- Once a building has been operating for one year, compare the building's actual performance to the energy target used during the design phase and confirm that the building is eligible for the ENERGY STAR, where available.

combination of energy performance tools and green building approaches from the onset can ensure that new and renovated buildings meet both energy performance and environmental criteria. An increasingly common strategy is to use the EPA'S ENERGY STAR platform in conjunction with the USGBC's LEED rating system for green building design. For example, Pennsylvania is exploring the possibility of establishing a system that would mandate minimum point requirements in certain LEED categories in addition to requiring new state buildings to receive at least 85 points under ENERGY STAR certification (IEc, 2005). For more information on incorporating energy efficiency in green building polices, see the text box on page 2-24.

- *Evaluate opportunities for renewable energy sources.* While energy efficiency investments are typically a low-cost approach to reducing GHG and air pollution emissions in buildings, additional reductions can be achieved with on-site renewable energy sources (e.g., solar photovoltaics, geothermal heating). Green buildings that incorporate renewable energy generation as backup power systems can also benefit from improved power supply reliability. For more information about on-site renewable energy generation, see Section 2.5, *Clean Energy Supply*.

- *Integrate energy efficiency and renewable energy into climate change goals.* Implementing energy efficiency and renewable energy measures are key options for reducing GHG emissions. Thus, as governments adopt climate change goals, it is critical to develop a cost-effective and robust strategy for advancing clean energy within the government sector. By coordinating climate change, energy efficiency, and renewable energy activities, states are in a better position to achieve results and gain support for these programs.

- *Include requirements for third-party verification of energy performance.* Third-party verification is an important step towards ensuring that green buildings are energy efficient. While some green building certification only considers a building's design, third-party verification of energy performance can determine whether a building is performing as intended. States can obtain third-party verification from a number of sources, including ESCOs and energy service providers.[6]

A number of states have included provisions in their green building policies requiring third-party

[6] *See http://www.energystar.gov/index.cfm?c = spp_res.pt_spps for a directory of energy service and product providers.*

verification to confirm that, once they become operational, buildings meet the energy performance targets established during the planning and design phases. For example South Carolina established a goal to optimize energy performance in state buildings and pursue the ENERGY STAR label wherever possible. The legislation also includes a green building policy requiring all new state facilities to be designed to receive either the LEED-Silver certification or two globes using the Green Globes Rating System. The policy specifies that facilities designed to achieve these standards must earn at least 40% or 20%, respectively, of the available points for energy performance under the LEED and Green Globes rating systems. To ensure that new facilities achieve their intended energy performance, the legislation requires third-party verification in the fifth, tenth, and fifteenth years of operation. Commissioning agents must report on each building's energy performance relative to the performance anticipated during the design phase (South Carolina, 2007).

- *Consider conducting a demonstration project*. When resources and/or support for implementing a green building policy for state government facilities are limited, states can develop a single green building to serve as a demonstration project. These projects can be used to showcase the energy efficiency and environmental benefits of green buildings, while helping to make the case for implementing a portfolio-wide green building approach as additional support and/or resources become available.

2.2.3 EXAMPLES OF STATE AND LOCAL GREEN BUILDING ACTIVITIES

Many states and local governments have made green building activities the cornerstone of a comprehensive LBE program. Examples of state green building activities are provided below.

Hawaii – Lead by Example Initiative

The Hawaii Lead by Example Initiative began in 2006 with an executive order (later codified by the state legislature in Act 96) directing state agencies to improve energy, water, and resource efficiency in their facilities. The order established a green building policy, mandating that all state-funded newly constructed and renovated buildings be designed to meet LEED certification and achieve LEED-Silver certification where possible. To ensure that these buildings achieve superior energy performance, the state is following a strategic energy management approach that involves benchmarking, conducting whole-building energy audits, and recommissioning buildings in stages. In addition, a state energy coordinator is working to achieve energy performance certification for several state buildings through EPA's ENERGY STAR program. Through 2007, four state government buildings had earned the ENERGY STAR label (Hawaii, 2008).

In addition, the Hawaii Lead by Example Program is providing innovative solutions to the end-use efficiency strategy of the Hawaii Clean Energy Initiative (HCEI), a partnership established by the U.S. Department of Energy (DOE) and the State of Hawaii on January 28, 2008. The goal of the HCEI is to achieve a least a 70% clean energy basis for Hawaii within a generation.

Web site: ***http://hawaii.gov/dbedt/info/energy/efficiency/state/lbe***

Minnesota – State Sustainable Building Guidelines

The Minnesota Energy Security and Reliability Act of 2001 requires that new buildings receiving state bond funding be designed consistent with sustainable building design guidelines developed by the Departments of Administration and Commerce. The state legislature determined that these guidelines should require buildings to exceed existing energy codes by at least 30%. The resultant *State Sustainable Building Guidelines* are adapted from LEED rating system requirements (Minnesota, 2006). Preliminary analysis of three new state buildings constructed according to the guidelines indicated that the buildings' sustainable measures would result in a combined estimated reduction of more than 2.5 metric tons of air pollutants such as CO_2, NO_x, and SO_x (IEc, 2005; Minnesota PCA, 2006; Minnesota, 2001).

The guidelines are part of the broader statewide Buildings, Benchmarks, and Beyond (B3) project, through which the state is working with EPA's ENERGY STAR program to improve the energy efficiency of its own buildings and the buildings of the state's public school districts. The state government is a participant in the

MASSACHUSETTS GREEN BUILDING STANDARD

Massachusetts has adopted a green building standard for new buildings of 20,000 ft² or greater. This standard requires affected buildings to achieve basic LEED certification and meet a number of optional credits referenced in the LEED-New Construction rating system guidelines, including that energy performance must exceed Massachusetts Energy Code requirements by at least 20%.

Source: Massachusetts, 2007.

ENERGY STAR Challenge, with a goal of improving energy efficiency by 10% (U.S. EPA, 2008p) These LBE efforts will contribute to the governor's Next Generation Energy Initiative, issued in 2006, which sets a goal of 1,000 ENERGY STAR commercial buildings throughout the state by 2010 (Minnesota, 2006a) .

Web site: ***http://www.pca.state.mn.us/oea/greenbuilding/index.cfm.***

New Mexico – Lead by Example Initiative

In 2006, the governor of New Mexico issued an executive order that requires new and renovated public buildings to meet energy-efficient green building standards. The executive order requires adherence to the LEED-Silver standards in new and renovated public buildings that are greater than 15,000 square feet and/or use more than 50 kW peak electrical demand. These buildings, and smaller new and renovated buildings between 5,000 and 15,000 square feet, must also achieve a minimum energy performance standard of 50% of the average consumption for that building type.[7]

The 2006 building performance standards have become an essential component of the state's strategy for meeting the energy use reduction goal established by executive order in November 2007. This second order created the state government *Lead by Example Initiative* and directed all executive branch agencies to reduce energy use in state government buildings by 20% below 2005 levels by 2015. To ensure that the state's green buildings contribute to the energy goal, the state is developing a database to track government facility energy use. In addition, as a participant in the ENERGY STAR Challenge, the state is working with EPA's ENERGY STAR program to benchmark its facilities and train its facility managers to use ENERGY STAR tools, such as Portfolio Manager and Target Finder (U.S. EPA, 2008p; New Mexico, 2007; New Mexico, 2006).

Web site: ***http://www.emnrd.state.nm.us/ecmd/GovernmentLeadByExample/State-Government.htm***

New York – "Green and Clean" State Buildings

Executive Order 111, *"Green and Clean" State Buildings and Vehicles*, signed in 2001 and re-authorized in 2007, requires state agencies to follow LEED guidelines for the construction of green buildings and to strive to meet the ENERGY STAR building criteria for energy performance. Executive Order 111 also requires that all new buildings achieve at least a 20% improvement in performance relative to the State Energy Conservation Construction Code, and that all affected entities seek to ensure that 20% of their annual electricity needs in 2010 are met by renewable energy sources (NYSERDA, 2001). NYSERDA issued guidelines for government entities in developing implementation plans to meet the requirements of the order. Further guidance is offered through the state's Green Building Services program, which assists government agencies in design and LEED certification for new and renovated buildings (NYSERDA, 2004a).

NYSERDA has partnered with several state agencies to develop sustainable design guidelines for specific facility types within the state system, including *High-Performance Design Guidelines* for state college and university buildings and guidelines for Metropolitan Transportation Authority buildings (NYSERDA, 2005). The State University of New York at Binghamton constructed two buildings using these guidelines. Designed using green building design charrettes (i.e., collaborative brainstorming processes between the green building team members and other stakeholders), these buildings include variable speed drives, additional building envelope insulation, and energy-efficient lighting and HVAC systems. The buildings were designed to be 25%

[7] *Based on averages for each building type determined by the Department of Energy.*

NEW YORK COLLABORATIVE FOR HIGH-PERFORMANCE SCHOOLS (NY-CHPS)

NYSERDA worked with the New York State Education Department to develop NY-CHPS, a program based on the Collaborative for High-Performance Schools, originally started in California. The program is designed to provide an outstanding learning environment; a healthy, safe place to work; durability; cost-effectiveness over the life of a building; optimization of resources; and the long-term benefits of energy efficiency.

The NY-CHPS *High-Performance Schools Guidelines* include a score sheet for benchmarking high-performance schools. The score sheet allows for a maximum of 133 credits, and includes the following sections:

- Site (15 points)
- Energy (26 points)
- Materials (26 points)
- Water (3 points)
- Indoor Environmental Quality (32 points)
- Operations and Maintenance (15 points), and
- Extra Credit (16 points)

Source: NYSERDA, 2007.

more energy-efficient than state building energy code requires.

Web site: *http://www.nyserda.org/programs/state.asp.*

Pennsylvania – High Performance Green Building Program

The Pennsylvania Governor's Green Government Council (GGGC) works in partnership with over 40 state agencies to stimulate the development and continuous improvement of environmentally sustainable practices in planning, policymaking, and regulatory operations. The GGGC established a High Performance Green Building Program that focuses on education, promotion, and demonstration of high-performance green buildings. Its *Guidelines for Creating High Performance Green Buildings* describe how the design and construction of high performance green buildings represent the best possible course for combining environmental responsibility and economic opportunity. The Department of Environmental Protection occupies six LEED-certified buildings, and the state Housing Finance Authority and Turnpike Commission headquarters both occupy LEED-certified buildings. Six additional buildings are expected to earn LEED certification in the near future (Pennsylvania DEP, 1999; Pennsylvania DEP, 2002; GGGC, 2006; GGGC, 2006b; GGGC, 2008).

In implementing and reviewing the results of its High Performance Green Building Program, the state discovered that a relatively low percentage of its green buildings were achieving superior energy performance. In 2003, the state began coordinating with EPA's ENERGY STAR program and DOE's Rebuild America program to incorporate energy efficiency elements from these programs into its green building program. The state created a staff position to manage the integration of ENERGY STAR and Rebuild America with the green building program. The integration activities have included training sessions for Department of Environmental Protection staff on how to use ENERGY STAR tools to facilitate benchmarking and track the energy performance of the state's green buildings (U.S. EPA, 2005d). The state is exploring the possibility of establishing a system that would mandate minimum point requirements in certain LEED categories in addition to a requirement that new state buildings receive at least 85 points under ENERGY STAR certification (IEc, 2005).

Web site: *http://www.gggc.state.pa.us/gggc/cwp/view.asp?a = 515&q = 156859&gggcNav = |6787|*

Portland, Oregon – Green Building Policy

In 2001, the City of Portland, Oregon adopted a green building policy requiring all new and major retrofits of city-funded or -financed projects to achieve LEED-certified status. In 2005, this policy was modified to require new and major retrofits of city buildings to achieve LEED-Gold certification. Additionally, projects are required to meet the following targets: 75% of construction and demolition waste must be recycled; stormwater, water use, and structural codes must be exceeded by at least 30%; and each project must include an "ecoroof" with at least 70% vegetative coverage or high-reflectance ENERGY STAR-qualified roofing. All buildings are to be commissioned to be eligible for the state Sustainable Building Business Energy Tax Credit and all O&M practices must be consistent with city *Green Building Operations and Maintenance Guidelines* (Portland, 2005).

Web site: *http://www.portlandonline.com/osd/index.cfm?c = 41701&a = 112681.*

THE PENNSYLVANIA CAMBRIA STATE OFFICE BUILDING

The Pennsylvania Department of Environmental Protection's 36,000 square-foot Cambria Office Building was completed in 2000.

- Key design measures included:
  - Passive solar orientation with east/west axis, roof overhangs, north and south facing windows, external light shelves, and clerestories to boost natural daylighting while reducing heating and cooling loads
  - High-performance window glazing, resulting in savings of $30,000 annually at a cost of $15,000
  - High performance insulated concrete form wall systems contribute to HVAC system downsizing
  - Ground source heat pumping system for heating and cooling with 14-kW PV panels mounted on the south-facing roof that provides 28% of the total energy used
  - Building materials selected based on their potential environmental impact and recyclability
- Earned a LEED® Gold rating
- Exceeds ASHRAE standards by 30%
- ENERGY STAR label (rating of 88)
- Building cost was $98 per square foot
- Used 50% less energy than the standard low-rise office building located in the Philadelphia region during first year
- Resulted in energy cost savings of up to 66%

Sources: Ziegler, 2003; NREL, 2004; NREL, 2005.

Wisconsin – Sustainable Facilities Guidelines and Minimum Standards

Executive Order 145, on the *Creation of High Performance Green Building Standards and Energy Conservation for State Facilities and Operations*, called for the reduction of overall energy consumption per square foot in state facilities by 10% by 2008 and 20% by 2010. The order required the Department of Administration to develop energy efficiency goals for state facilities and campuses for 2007, 2008, and 2009. The department was also directed to develop *Sustainable Facilities Guidelines and Minimum Standards* based on LEED criteria, which were published in 2007, and to work with the state Building Commission and Energy Center of Wisconsin to ensure that all new state buildings are constructed to surpass existing commercial building energy codes by 30%. The *Sustainable Facilities Guidelines and Minimum Standards* include requirements that building designs be verified before and during construction, and that building performance be verified once the building becomes operational. The Division of State Facilities ensures that buildings designed achieve their intended performance targets and reports the results of the sustainable building program to the state Building Commission twice annually.

In 2004, the state spent $127 million on energy. It is estimated that the standards will reduce O&M costs for the state's 6,300 buildings by as much as 30% and reduce overall energy consumption per square foot by 10% by 2008 and 20% by 2010. This translates into more than $30 million in annual savings for Wisconsin taxpayers (Wisconsin, 2007b; Wisconsin, 2007).

Web sites: ***http://www.wisgov.state.wi.us/journal_media_detail.asp?locid = 19&prid = 1907*** ***(EO 145)***

http://www.doa.state.wi.us/dsf/masterspec_view_new.asp?catid = 58&locid = 4 ***(Sustainable Facilities Policy and Guidelines)***

THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES BUILDING

Design of the state's first green state office building, the Department of Natural Resources' Northeast Regional Headquarters in Green Bay, included green principles such as daylighting, use of recycled materials and recycled waste, and minimizing the building's footprint. The state invested $70,000 to improve the design of this building and estimates that the improvements will save the state $500,000 over a 20-year period.

Source: Wisconsin, 2006.

Washington, D.C. – Green Building Policy

In 2006, the Washington, D.C. city council passed legislation requiring all publicly-owned and publicly financed buildings be designed to meet LEED-Silver certification standards for environmental performance. To ensure that these buildings achieve optimal energy performance, the legislation includes a requirement that buildings also be designed to earn 75 points on the EPA energy performance rating system, using the ENERGY STAR Target Finder tool. To ensure compliance with these requirements, the legislation mandates reviews by a government agency or a certified third party. The green building program is guided by a Green Building Advisory Committee.

Web site: ***http://green.dc.gov/green/cwp/view,a,1231,q,460953.asp***

2.3 ENERGY-EFFICIENT PRODUCT PROCUREMENT

A number of states are achieving energy, environmental, economic, and other benefits by purchasing energy-efficient products, such as electronics, office equipment, heating and cooling systems, and lighting systems. Purchasing ENERGY STAR-qualified products can save a typical state or local government

CLARIFICATION OF TERMINOLOGY

States can implement energy-efficient product procurement as a stand-alone program or as part of broader programs for purchasing products with other environmental attributes.

Green purchasing is generally used to describe activities that focus on purchasing products and services that have positive energy and environmental attributes, including energy efficiency, recycled content, and reduced toxic content. Energy-efficient product procurement falls within the scope of green purchasing.

While green purchasing focuses on products that have positive energy or environmental attributes, *environmentally preferable product (EPP) procurement* assesses multiple energy and environmental attributes to determine which of these green product(s) are preferable in a given situation. For example, in a facility with poor indoor air quality, paint with low-volatile organic compound (VOC) content is both green and environmentally preferable, while paint with recycled content latex is green, but not the preferable product in this situation. In most situations, energy-efficient products are considered environmentally preferable.

This section focuses on energy-efficient product procurement. However, green purchasing and EPP procurement programs that include energy efficiency are also addressed.

approximately $1.5 million in life-cycle energy and maintenance costs and prevent more than 16,000 tons of CO_2 emissions (U.S. EPA, Undated). Combined, state and local governments across the nation could save more than $750 million annually in energy costs by purchasing energy-efficient products (Harris et al., 2004). In addition, energy-efficient product procurement often involves little or no incremental costs, since conventional products can be replaced with energy-efficient ones on a normal product replacement schedule.

2.3.1 BENEFITS OF ENERGY-EFFICIENT PRODUCT PROCUREMENT

Government leadership in purchasing energy-efficient products for a portfolio of state buildings can produce significant energy, environmental, economic, and other benefits, including:

- *Reduced energy costs*. Because energy-efficient products require less energy to operate than conventional products, they can reduce facility energy loads and achieve energy bill savings on the order of 5% to 10% (LBNL, 2002). ENERGY STAR-qualified products typically use 25% to 50% less energy and can offer consumer energy cost savings of as much as 90% (U.S. EPA, 2007a; U.S. EPA, 2008j). Energy-efficient products can also reduce energy costs indirectly, since they do not generate as much unwanted heat as conventional products, and thus lower cooling loads. Table 2.3.1 summarizes the potential energy cost savings of purchasing energy-efficient products for five product categories. (For more information on the energy savings associated with specific energy-efficient products, see Table 4.3.1, *Rules of Thumb* in Chapter 4.)

- *Reduced GHG emissions and other environmental impacts*. Replacing conventional products with energy-efficient ones can substantially reduce GHG emissions and other environmental impacts by decreasing use of fossil fuel-based energy. Fossil fuel combustion for electricity generation accounts for 40% of the nation's CO_2 emissions, a principle GHG, and 67% of the nation's SO_x emissions and 23% of the nation's NO_x emissions, both of which can lead to smog and acid rain, and results in emissions of trace amounts of airborne particulate matter that can cause respiratory problems for many people (U.S. EPA, 2008s). Replacing 100 conventional light bulbs with compact fluorescent light bulbs (CFLs), for example, can reduce nearly 70,000 pounds of CO_2 emissions over a nine-year product lifetime (U.S. EPA and U.S. DOE, 2008). Table 2.3.1 summarizes the potential CO_2 emission reductions from purchasing energy-efficient products for five product categories.

- *Reduced maintenance costs*. Energy-efficient products often have longer lifetimes than conventional products. Because energy-efficient products require less-frequent replacement, maintenance cost savings over the lifetime of the product can be significant. Reducing the number of times a product needs to be replaced can be especially important when replacement involves handling valuable or antique items, which can be found in many state government facilities.

- *Increased economic benefits through job creation and market development*. State and local governments spend a combined $50 billion to $70 billion to purchase energy-using products each year (Harris et al., 2004). Specifying that these funds be used to purchase energy-efficient products can stimulate the local economy and encourage development of energy-efficient product markets. According to DOE, half of all energy-efficient equipment is purchased from local suppliers (U.S. DOE, 2004).

- *Increased reliability*. When an energy-using product reaches the end of its usable life and "burns out," there is often a period of inactivity before the product can be replaced. Energy-efficient products typically experience less-frequent periods of inactivity because they have longer lifetimes than conventional products. This benefit is particularly important when periods of product inactivity can have serious consequences (e.g., HVAC system failure in extreme heat conditions) (U.S. EPA, 2008x).

- *Improved occupant health*. Some energy-efficient products remove sources of indoor air contaminants. Energy recovery ventilation equipment, for example, can reduce infiltration of air contaminants from outdoors while significantly reducing HVAC energy loads (U.S. EPA, 2003). One study on building performance found that the average reduction in illness as a result of improving air quality in buildings is approximately 40% (Carnegie Mellon, 2005).

TABLE 2.3.1 ESTIMATED ENERGY COST AND CO_2 SAVINGS FROM A SAMPLE OF ENERGY STAR PRODUCTS[a]

Action	Annual Energy Cost Savings	Annual CO_2 Savings (Tons)	Lifetime (years)	Life-Cycle Energy Cost Savings	Life-Cycle CO_2 Savings (Tons)
Replace 5,000 computers and monitors with ENERGY STAR-qualified products and activate power management	$400,000	2,200	4	$1,450,000	13,600
Replace 10 conventional commercial dishwashers with ENERGY STAR-qualified products	$11,500	400	10	$128,000[b]	6,000
Replace 50 conventional vending machines with ENERGY STAR-qualified products	$7,500	64	14	$79,200	890
Replace 100 conventional water coolers with ENERGY STAR-qualified coolers	$3,300	28	10	$26,500	280
Replace 50 color laser printers with ENERGY STAR-qualified printers	$660	6	5	$3,000	28

[a] *Figures obtained from calculators on the ENERGY STAR Purchasing & Procurement Web site http://www.energystar.gov/purchasing using default settings and an electricity rate of 9.039¢ per kWh. Annual costs exclude the initial purchase price and installation cost. All costs are discounted over the product's lifetime using a real discount rate of 4%.*

[b] *Value includes water savings.*

2.3.2 PLANNING AND IMPLEMENTATION STRATEGIES RELATED TO ENERGY-EFFICIENT PRODUCT PROCUREMENT

When planning and implementing energy-efficient product procurement activities, states can follow many of the energy management steps described in Section 2.1, *Energy Efficiency in Buildings*. Other key strategies include:

ENERGY STAR QUALIFICATION

Through the ENERGY STAR program, EPA and DOE develop energy performance specifications for more than 50 product categories. ENERGY STAR-qualified products typically use 25% to 50% less energy and can offer consumer energy cost savings of as much as 90% relative to conventional products.

State governments often include requirements in energy-efficient product procurement policies for purchasers to specify products that are ENERGY STAR-qualified. For example, Washington, D.C. passed an act in 2004 to amend its procurement policy to require agencies to include specifications for ENERGY STAR-qualified products in solicitations for energy-using products.

Sources: U.S. EPA, 2006b; U.S. EPA, 2008; LBNL, 2002; Washington, D.C., 2004.

- *Adhere to energy efficiency standards and specifications.* Many state governments require energy efficiency certification for the energy-using products they purchase. Using established standards streamlines the procurement process and can lead to greater energy benefits, since products will be required to meet minimum performance specifications. A number of states, such as Arizona, California, Pennsylvania, Connecticut, and Michigan, require government purchasers to specify ENERGY STAR-qualified products. EPA's ENERGY STAR program provides energy efficiency specifications for more than 50 product categories. For some categories where ENERGY STAR specifications do not exist, FEMP designates energy-efficient products that perform in the top 25% in terms of energy performance (FEMP, 2007).[8]

- *Aggregate purchases.* Some states have reduced procurement costs by designating a particular government agency as the coordinating facilitator of all state agency purchases, which can enable bulk purchases of energy-efficient products (U.S. DOE, 2006j). Some states, such

[8] *FEMP's specifications are consistent with ENERGY STAR's in categories where ENERGY STAR specifications exist (FEMP, 2007).*

ENERGY STAR PRODUCT SAVINGS CALCULATORS

More than 40 product calculators are available that illustrate the cost-effectiveness of selecting ENERGY STAR-qualified products. Purchasers can use these tools to quantify the financial benefits of energy efficiency when making the case for purchasing energy-efficient products to product specifiers.

Calculators can be found at: *http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing*

Source: U.S. EPA, 2008i.

as Wisconsin and Connecticut, allow local governments to use state government contracts to aggregate purchases (Harris et al., 2004).

- *Borrow from sample procurement language*. State governments can use model contract language to specify energy-efficient products when making purchases. Model contract language can be borrowed from other government and non-governmental organizations. Both EPA's ENERGY STAR program and FEMP, for example, provide general procurement contract language for purchases of energy-efficient products (U.S. EPA, 2008k; FEMP, 2007).

- *Combine energy-efficient product procurement with other LBE activities*. Because many energy-efficient products have little or no cost premium, energy-efficient product procurement can improve the cost-effectiveness of a comprehensive LBE program. Replacing conventional products with energy-efficient ones on a regular replacement schedule can have little additional cost, but can reduce the costs of meeting targets for building energy performance, green power purchases, and clean energy supplies (Harris et al., 2004). Many states have incorporated energy-efficient product procurement into broader commitments to improving energy efficiency in their building portfolios. For more information on improving energy efficiency across a portfolio of buildings, see Section 2.1, *Energy Efficiency in Buildings*.

- *Create strong links between the Purchasing Department and Energy, Environment, and IT Department(s)*. Fostering collaboration between these departments can significantly enhance the benefits of energy-efficient product procurement activities by bringing together individuals with technical expertise in complementary subjects. Purchasers, who have familiarity with vendors and purchasing procedures, can consult with energy and environmental staff to identify priority energy-efficient products and to quantify the benefits of energy-efficient product procurement policies (e.g., by using ENERGY STAR product savings calculators). Purchasers can also work with staff from IT and facilities management departments who are often responsible for specifying office electronics and for implementing energy efficiency policies, such as enabling sleep modes on office electronic equipment.

- *Require life-cycle cost analyses*. Traditional procurement policies sometimes promote methods for assessing project cost-effectiveness that encourage the purchase of products that have the lowest initial design and construction costs. These policies can prevent state agencies from purchasing energy-efficient products that generate energy cost savings but have higher initial costs. Because the life-cycle cost of an energy-efficient product is typically less than that of a conventional product, many states are requiring agencies to compare products using life-cycle cost analyses that account for the present value of all costs associated with the product (including initial costs, future energy costs, and other ancillary costs) over the product's lifetime. In states with mandatory low-bid procurement requirements, legislative authority may be required to modify procurement policies (U.S. EPA, 2006a).

- *Incorporate information on the payback periods of energy-efficient products into investment decisions*. Life-cycle cost analyses can reveal short payback periods (i.e., the length of time required to recoup up-front costs) for most energy efficiency investments. Incorporating investments with short payback periods into a comprehensive energy efficiency upgrade can help reduce the overall payback period for the entire project. For example, purchasing energy-efficient products that reduce supplemental loads, which typically have short payback periods, can generate significant energy cost savings that can shorten the payback period for a building upgrade as a whole. Similarly, behavioral adjustments, such as setting thermostats at lower temperatures in the winter, can often be implemented at no cost yet produce significant savings and reduce the payback period of a comprehensive upgrade. Table 2.3.2, *ENERGY STAR Specification Overviews: Energy Savings and Cost-Effectiveness*, illustrates the payback periods for a variety of energy-efficient products.

- *Train energy-efficient product users*. Even as policies are put in place to encourage the purchase of energy-efficient products, their results are not guaranteed. It is important to educate purchasers to help them identify what products are energy-efficient and track the effectiveness of procurement activities (NACo, Undated).

TABLE 2.3.2 ENERGY STAR SPECIFICATION OVERVIEWS: ENERGY SAVINGS AND PAYBACK PERIODS[a]

Product Category	Effective Date of Current Specification	Percent Energy Savings Compared to Conventional Product	Payback Period
Appliances			
Dehumidifiers	October 2006	15%	0 years (typically no retail cost premium)
Dishwashers	January 2007	40%	0 years (typically no retail cost premium)[b]
Refrigerators and freezers	April 2008	15%	4 years (refrigerators)[c] 6 years (freezers)[d]
Room air conditioners	November 2005	10%	Not available
Room air cleaners	July 2004	45%	0 years (typically no retail cost premium)
Electronics			
Battery charging systems	January 2006	35%	0 years (typically no retail cost premium)
Cordless phones	November 2006	55%	0 years (typically no retail cost premium)
Combination units	July 2005	30%	0 years (typically no retail cost premium)
DVD products	January 2003	60%	0 years (typically no retail cost premium)
External power adapters	January 2005	35%	0 years (typically no retail cost premium)
Home audio systems	January 2003	60%	0 years (typically no retail cost premium)
Televisions	November 2008	25%	0 years (typically no retail cost premium)
Envelope			
Roof products	December 2007	Not available	< 4 years
Windows, doors, and skylights	September 2005	Not available	Not available
Lighting			
Compact fluorescent lamps	January 2004	75%	< 1 year
Residential-style light fixtures	August 2008	75%	< 1 year 2 years for recessed cans
Office Equipment			
Computers	July 2007	25% — 50%	0 years (typically no retail cost premium)
Copiers	April 2007	65%	0 years (typically no retail cost premium)
Monitors	July 2007	25%	0 years (typically no retail cost premium)
Multifunction Devices	April 2007	20%	0 years (typically no retail cost premium)
Printers, fax machines, and mailing machines	April 2007	15%	0 years (typically no retail cost premium)
Scanners	April 2007	50%	0 years (typically no retail cost premium)
Heating and Cooling			
Air source heat pumps	April 2006	5%	< 5 years
Boilers	April 2002	5%	< 1 year

TABLE 2.3.2 ENERGY STAR SPECIFICATION OVERVIEWS: ENERGY SAVINGS AND PAYBACK PERIODS *(cont.)*

Product Category	Effective Date of Current Specification	Percent Energy Savings Compared to Conventional Product	Payback Period
Ceiling fans	September 2006	45%	0 years (typically no retail cost premium)
Furnaces	October 2006	15%	< 3 years
Geothermal heat pumps	April 2001	30%	< 5 years for new construction
Light commercial HVAC	January 2004	5%	< 1 year
Ventilating fans	October 2003	70%	0 years (typically no retail cost premium)
Commercial Food Service			
Commercial dishwashers	October 2007	30%	2 years
Commercial fryers	August 2003	15%	2 years (for typical unit)
Commercial hot food holding cabinets	August 2003	65%	2 years
Commercial ice makers	January 2008	25% — 30%	4 years (for typical unit)
Commercial solid door refrigerators and freezers	September 2001	35%	1 year
Commercial steam cookers	August 2003	50%	0 years (typically no retail cost premium)
Other			
Water coolers	May 2004	45 %	0 years (typically no retail cost premium)
Vending machines	April 2004 August 2006 (rebuilt machines)	40 %	< 1 year

[a] *ENERGY STAR develops performance-based specifications to determine the most energy-efficient products in a particular product category. These specifications, which are used as the basis for ENERGY STAR qualification, are developed using a systematic process that relies on market, engineering, and pollution savings research and input from industry stakeholders. Specifications are revised periodically to be more stringent, which has the effect of increasing overall market energy efficiency (U.S. EPA, 2007d).*

[b] *U.S. EPA and U.S. DOE, 2007c.* [c] *U.S. EPA and U.S. DOE, 2007b.* [d] *U.S. EPA and U.S. DOE, 2007.*

[e] *U.S. EPA and U.S. DOE, 2007d.* [f] *U.S. EPA and U.S. DOE, 2008.*

2.3.3 STATE AND LOCAL EXAMPLES OF ENERGY-EFFICIENT PRODUCT PROCUREMENT

Energy-efficient product procurement activities have been implemented at the state and local government levels using a variety of implementation approaches. The following are examples of state and local government energy-efficient product procurement activities.

Massachusetts – Environmentally Preferable Products Procurement Program

The primary goal of the state's Environmentally Preferable Products Procurement Program is to use the Commonwealth's purchasing power to reduce the environmental and public health impacts of state government and foster markets for environmentally preferable products. The program, which covers a wide range of products and services (including those that reduce energy consumption, contain recycled content,

minimize waste, conserve water, and reduce the disposal or consumption of toxics), uses statewide contracts for environmentally preferable products and provides educational assistance and technical expertise to state agencies and local governments. It also offers workshops to procurement officials and sponsors an annual vendor fair and conference. In recent years, the program staff have collaborated on a national level with procurement officials and other organizations to pull together resources for responsible environmental purchasing.

In FY 2001, the state spent $92.5 million on environmentally preferable products, including approximately 11,000 computers, 7,600 monitors, 1,200 copiers, and 120 fax machines. The cost savings from the program in 2001 surpassed $544,000, with the savings from purchasing energy-efficient office equipment accounting for approximately $270,000 (Massachusetts, 2003). The overall environmental benefits were substantial. It is estimated that the program enabled the state to avoid over 4,000 metric tons of carbon equivalent; more than 11,000 barrels of oil equivalent; over 60,000 trees harvested; and 625,000 feet of fluorescent lamps (Massachusetts, 2007b).

Web site: *http://www.mass.gov/?pageID = osdtopic&L = 3&sid = Aosd&L0 = Home&L1 = Buy+from+a+Contract&L2 = Environmentally+Preferable+Products+(EPP)+Procurement+Program (Program)*

http://www.mass.gov/Aosd/docs/EPP/EPP%20Program%20Assessment%20Final%20Report%20Dec02.doc (2003 Report)

New York City – Energy-Efficient Product Procurement

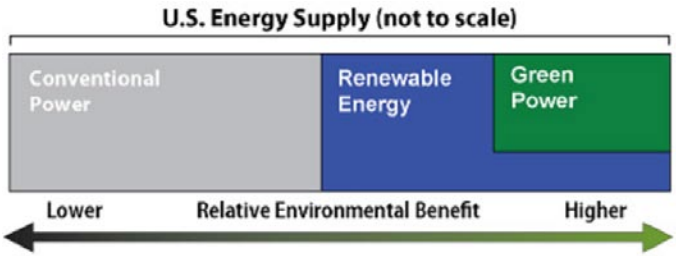
Enacted on April 11, 2003, New York City Local Law 30 requires that energy-using products procured by the city be ENERGY STAR-qualified, provided that there are at least six competing manufacturers of the ENERGY STAR product. During FY 2002, New York City spent $90.8 million for ENERGY STAR-qualified products, consisting mainly of computers, monitors, printers, photocopiers, fax machines, televisions, VCRs, air conditioners, and lamps. Local Law 30 was expanded by Local Law 119 in 2005, which adds a requirement that FEMP water and energy efficiency standards be considered in conjunction with ENERGY STAR when making purchases (New York City Council, 2007; New York City Council, 2005).

Web site: *http://www.nyccouncil.info/search/searchlook2.cfm?SEARCH = NUM.*

2.4 GREEN POWER PURCHASES

Purchasing green power for their portfolio of facilities is another way state and local governments are leading by example. Green power refers to renewable electricity that is produced with no man-made GHG emissions, has a superior environmental profile compared to conventional power generation, and was built after January 1, 1997.[9] This subset of renewable energy resources includes solar, wind, biogas, biomass, low-impact hydro, and geothermal resources. Other renewable energy resources, such as waste-to-energy and hydropower, are not necessarily green power resources, since they can have adverse environmental impacts, such as air pollution or natural landscape disruption (U.S. EPA, 2004b; U.S. EPA, 2007h).

FIGURE 2.4.1 GREEN POWER AND RENEWABLE ENERGY



States can consider several options for purchasing green power. At the point of generation, green power can be sold directly to the customer or separated into its two components: the physical electricity and the technological and environmental attributes. When sold directly to the customer, green power is often supplied as a fixed percentage of monthly use but can also be provided in fixed-quantity blocks (e.g., a 100 kW block of green power). When the two components are separated, the technological and environmental attributes associated with renewable energy are sold as renewable energy certificates (RECs) (also known as *green tags* or *tradable renewable certificates*). The physical electricity, no longer "bundled" with the technological and environmental attributes, is sold through the grid indistinguishable from electricity generated from conventional sources (U.S. EPA, 2007r). RECs can be purchased directly from the renewable electricity generator or

[9] *January 1, 1997 is the accepted date marking the beginning of the voluntary green power market. It is argued that renewable energy generation facilities built after this date are the product of increasing market demand for green power, rather than the product of regulatory action, such as renewable portfolio standards, that required utilities to use renewable energy.*

through several types of REC providers, including retail and wholesale REC marketers (e.g., utilities, non-profits, or other environmental foundations) and REC brokers (U.S. EPA, 2004b; WRI, 2003).

Green power premiums vary, with the national average green power premium being 2.12¢ per kWh in 2006, a decrease of 8% from the 2.36¢ per kWh average in 2005 (Bird et al., 2007). Green power premiums can range as high as 3¢ per kWh, but in many places are much lower (U.S. DOE, 2007e; U.S. DOE, 2007f).

EPA GREEN POWER PARTNERSHIP

The EPA Green Power Partnership is a voluntary program developed by EPA to boost the market for green power sources that do not contribute GHG emissions to the atmosphere. State and local governments participating in the partnership receive EPA technical assistance and public recognition.

Through April 2008, two states and seven agencies in other states were participating in the Green Power Partnership. In addition, more than 80 local governments have committed to meeting the partnership's green power purchase requirements.

Source: U.S. EPA, 2008l.

2.4.1 BENEFITS OF PURCHASING GREEN POWER

By committing to purchasing green power for their portfolio of facilities, states can achieve numerous energy, environmental, economic, and other benefits, including:

- *Hedge against financial risks*. Because green power is not as sensitive to market fluctuations and supply limitations as fossil fuel-based electricity, purchasing green power reduces a state government's susceptibility to fossil fuel price volatility.[10] Since green power is produced from renewable energy sources, it can often be purchased at a more stable (and sometimes fixed) price over the long term (U.S. EPA, 2004b; NYSERDA, 2003).

- *Reduced GHG emissions and other environmental impacts*. Fossil fuel combustion for electricity generation accounts for 40% of the nation's CO_2 emissions, a principle GHG, and 67% of the nation's SO_x emissions and 23% of the nation's NO_x emissions, both of which can lead to smog and acid rain, and results in emissions of trace amounts of airborne particulate matter that can cause respiratory problems for many people (U.S. EPA, 2008s). Using green power, which is produced with no anthropogenic GHG emissions, can substantially reduce a state's GHG emissions and other environmental impacts by decreasing use of fossil fuel-based electricity.

BENEFITS OF PURCHASING RENEWABLE ENERGY CERTIFICATES (RECS)

- RECs create green power opportunities for electricity customers in areas that lack access to utility products and can create additional supply and cost options for customers with access to utility products.
- RECs enable customers to maintain existing procurement relationships with electricity providers.
- RECs provide green power opportunities for customers in leased spaces where control of electricity purchases is retained by a landlord.
- REC purchasers can specify the green power source type and location from which the RECs are derived.
- RECs often have a lower cost premium than green power purchased directly from the utility.

- *Increased regional employment*. Purchasing green power can create and sustain regional jobs, since manufacturing, installing, and maintaining renewable energy generation systems requires a significant amount of effort. To manufacture, construct, install, and maintain one MW of solar photovoltaics, for example, approximately 22 jobs are sustained (Apollo Alliance, 2007).

- *Regional and national benefits*. State governments can help achieve regional- and national-scale energy benefits by increasing the amount of green power in the country's energy portfolio. This reduces dependence on imported fossil fuels and diversifies the nation's fuel resources, which can improve the overall robustness of the country's energy systems by reducing dependence on a vulnerable, centralized energy delivery infrastructure (U.S. EPA, 2004b).

2.4.2 PLANNING AND IMPLEMENTATION STRATEGIES FOR GREEN POWER PURCHASING

Key planning and implementation considerations that can lead to enhanced effectiveness for green power procurement activities include:

[10] *Anticipation of federal and/or state legislation that could impose caps on GHG emissions also has the potential to exacerbate the volatility of fossil fuel prices (U.S. EPA, 2004b).*

- *Aggregate purchases*. A number of states are aggregating electricity demand to purchase green power. By combining the needs of a number of agencies, state they are often able to negotiate lower prices with the utility, making green power purchases more affordable (U.S. EPA, 2006a). For example, the Maryland Department of General Services recently coordinated with the University of Maryland system in aggregating purchases from 4,300 state accounts, procuring over 1.4 billion kWh. This effort is expected to save the state more than $31.3 million over a two-year period (Maryland, 2006).

- *Combine green power purchases with energy efficiency upgrades*. State governments can reduce the cost of meeting green power purchase targets by complementing green power purchases with energy efficiency upgrades. Improving energy efficiency in a facility reduces electricity loads, meaning percentage green power goals can be met at reduced costs.

- *Require certification for green power products*. State governments can require that green power products be certified as meeting consumer protection and environmental standards. Certification provides assurance that green power products reduce a state government's environmental impacts. Certification can also verify that green power product claims are valid (e.g., with respect to the mix of renewable energy resources) and that the products have not been repackaged (U.S. EPA, 2006a; AWEA, 2004).[11] Certification is conferred by a number of organizations, including the Green-e Renewable Energy Certification Program and the Environmental Resources Trust (U.S. DOE, 2007).

- *Seek fixed-price, long-term contracts*. Because green power generation requires no fuel input and is not subject to fuel price volatility, it comes at a consistent cost to the generator, meaning customer prices remain relatively stable over time. While short-term contracts might offer greater future flexibility, long-term contracts can reduce a supplier's risk, which often translates into reduced rates (U.S. EPA, 2004b; WRI, Undated).

PENNSYLVANIA DOUBLES GREEN POWER PURCHASE COMMITMENT

On August 29, 2006, Pennsylvania Governor Ed Rendell announced that the state would be doubling its 2003 green power purchase commitment, increasing the amount of renewable energy as a percentage of overall electricity consumed from 10% to 20%. This increase was achieved at a premium rate of 0.34¢ per kWh and was expected to annually reduce 950 tons of SO_2 emissions, 270 tons of NO_x emissions, and 123,000 tons of CO_2 emissions.

In October 2007, the governor announced that the state government had increased its renewable energy purchases to nearly 280 million kWh per year, or approximately 28% of the state government's electricity demand. Of the 280 million kWh, 57% is from wind power and 43% is from hydroelectric. The 160 million kWh drawn from wind resources qualify as green power under the EPA Green Power Partnership.

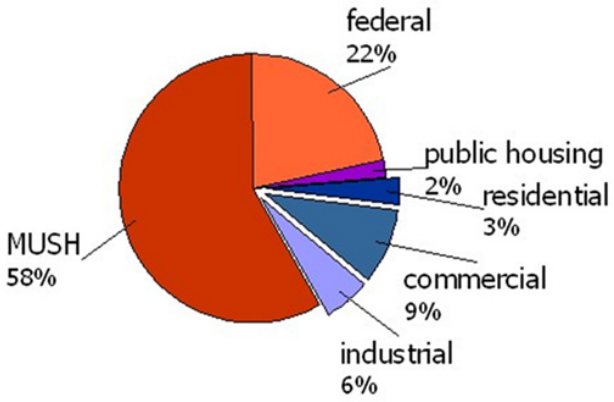
This commitment is expected to support the development of markets for sustainable energy sources, leading to more jobs; enhance national security; and reduce the state's demands on natural resources.

Sources: Pennsylvania, 2006; U.S. EPA, 2006d; Pennsylvania, 2007b.

2.4.3 STATE AND LOCAL EXAMPLES OF GREEN POWER PURCHASES

Compared to other sectors, state and local governments (labelled "MUSH" in the figure below) are responsible for approximately 58 percent of total green power and renewable energy purchases in the U.S.

FIGURE 2.4.1 TOTAL U.S. GREEN POWER AND RENEWABLE ENERGY PURCHASES BY SECTOR



This section highlights examples of these activities.

Connecticut – Green Power Purchases

In September of 2007, through the state's initial purchase of electric supply via a reverse auction process, Connecticut locked in 812 million kWh of supply for a two-year period through June of 2009. A subsequent

[11] *"Repackaging" refers to the concern that green power can be "repackaged" and sold as a mix of renewable energy that is already injected into the grid to satisfy legal mandates (e.g., through renewable portfolio standards) rather than to meet consumer demand. Repackaged renewable energy does not result in environmental improvement, since it merely sustains the status quo (AWEA, 2004). Renewables that are counted toward satisfying mandates may not be used to support purchasers' environmental claims.*

auction for an additional 97 million kWh was held November 29th for supply beginning in January of 2008. The total volume under these contracts for electric supply is for 909 million kWh. Under these supply contracts, 17.5 % of the electric supply (not including RPS) will be green power from Class I renewable sources.

Also in 2008, Connecticut conducted a reverse auction for electric supply. Contracts locked in for this period were for both three and four year periods for a total volume of 2.1 billion kWh. Under these supply contracts, 19% of the electric supply (not including RPS) is for green power from Class I renewable sources. When RPS requirements are factored in, 28% of the electricity used by Connecticut State government will come from Class I renewable sources, exceeding the 20% goal in Governor Rell's 2006 Energy Vision Plan.

Web site: *http://www.ctcleanenergyoptions.com/.*

Maine – Aggregated Purchase Leads to 100% Green Power Coverage

In 2003, the governor's energy agenda established a goal for the state government to purchase at least 50% of its electricity from renewable power sources, using energy efficiency measures in state buildings to offset the cost of the renewable energy. This goal was originally met by a contract agreement committing more than 800 state agency accounts under one service agreement. By March 2007, the state government had increased its renewable energy purchase to cover 100% of power demands. Thirty percent of this total is obtained through the statewide renewable energy portfolio standard, while the remaining 70% is obtained by purchasing RECs (DSIRE, 2007).

Web site: *http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code = ME08R&state = ME&CurrentPageID = 1&RE = 1&EE = 1.*

New Jersey – Aggregated Green Power Purchase

In 1999, the New Jersey Department of the Treasury developed a proposal to lower state government energy costs by aggregating electricity purchases from the accounts of 178 public agencies in the state, thus enabling the group to negotiate lower energy costs through competitive bidding in the state's recently deregulated market. At the same time, the governor issued a mandate that state government agencies obtain at least 10% of their power from renewable resources. Combining the two initiatives resulted in a purchase of nearly 500 million kWh of green power over 52 months. This quantity of energy covers approximately 12% of the overall electricity requirements for the agencies' facilities. The effort has resulted in an estimated avoidance of 168,948 metric tons of CO_2 emissions, which is equivalent to removing 32,490 cars from the road for one year (New Jersey, 2003).

Web site: *http://www.state.nj.us/dep/dsr/bscit/GreenPower.pdf.*

Montgomery County, Maryland – Wind Power Purchase

In 2004, Montgomery County, Maryland represented a group of six county agencies, 11 municipalities, and a neighboring county in completing the largest ever local government purchase of wind energy. The agreement with Washington Gas Services and their wind energy supplier, Community Energy, Inc., is for more than 38.4 million kWh annually over two years, representing 5% of the group's aggregate energy demand. The deal will produce significant environmental benefits. The emissions avoided through this purchase include over 19,000 metric tons of CO_2 (equivalent to 36 million miles not driven) and 43 tons of NO_x (equivalent to 2.9 million trees) (Montgomery County, 2006; U.S. EPA, 2007i).

Web site: *http://www.montgomerycountymd.gov/Apps/News/press/DisplayInfo.cfm?ItemID = 895.*

2.5 CLEAN ENERGY SUPPLY

Clean energy generation technologies, which can have significant state, regional, and national benefits, include on-site energy generation from renewable sources (e.g., wind, photovoltaics, biomass, and hydroelectric power systems) and clean distributed generation (DG) technologies. Clean DG refers to small, decentralized,

VIRGINIA – SOLAR POWER AT NEW STATE FACILITIES

The governor of Virginia issued Executive Order 48 in 2007. The order established a broad commitment to reducing non-renewable energy consumption across state government by 20% by 2010, based on 2006 levels.

The order proposes a strategy for meeting this goal. Included in this strategy is a directive for the state Senior Advisor for Energy Policy periodically assess the cost-effectiveness of incorporating PV system installations in any roofing retrofit for buildings over 5,000 square feet. Where PV system installations with a payback period of 15 years or less are feasible, the Department of General Services will be required to implement the measure.

Source: Virginia, 2007.

grid-connected or off-grid energy generating units, such as combined heat and power (CHP) systems, that are located at or near user facilities to meet on-site energy needs. The benefits of these technologies can be significant. For example, a CHP system with a 75% total system efficiency can consume up to one-third less energy than a separate heat and power (SHP) system with a total system efficiency of 49% (U.S. EPA, 2007c).[12]

Many states are leading by example by meeting government building energy demands with clean energy generated on-site. New Mexico and California, for example, require new construction of state facilities to include on-site energy generation, where possible (California, 2001; New Mexico, 2005). The Arizona Working Group on Renewable Energy and Energy Efficiency has called for the governor to require state facilities to produce 5% of their own energy needs through renewable sources by 2012. Utah has produced the *Policy to Advance Energy Efficiency in the State*, which sets a goal of reducing state government energy consumption by 2% by 2015 using renewable energy generated on-site. In 2007, Oregon passed legislation requiring that 1.5% of the total contract price for capital improvements to public facilities be spent on solar energy technologies (Oregon, 2008).

This section describes some of the benefits of generating clean energy on-site, identifies strategies for planning and implementing clean energy generation activities, provides an overview of clean energy generation technologies, and presents several state and local government examples.

[12] *Based on a 5 MW natural gas-fired combustion turbine CHP system (U.S. EPA, 2007b).*

GENERATION CAPACITY AND PRODUCTION

Electricity production and consumption (measured in kWh) are a function of generation capacity (measured in kW) and time (measured in hours). In wind power generation, a system's generation capacity is dependent on a site-specific capacity factor, which describes the system's actual annual energy output divided by the annual output if the system is operated at full capacity for the entire year. Thus, electricity production can be calculated as follows:

Electricity production (kWh) =
Capacity (kW) x Capacity factor x Time (hours)

Solar photovoltaic panels typically have capacity factors between 0.07 and 0.17. For most wind turbines, the capacity factor is between 0.25 and 0.30 (the *Hull 1* turbine in Hull, Massachusetts, for example, operates at 0.27). For most fossil fuel power plants, the capacity factor is about 0.28.

Sources: EIA, 2007; AWEA, 2007b; CEC, 2007; U.S. DOE, 2007g.

2.5.1 BENEFITS OF USING CLEAN ENERGY

By committing to using clean energy supplies for their portfolio of facilities, states can achieve numerous energy, environmental, economic, and other benefits, including:

- *Hedge against financial risk.* As with purchasing green power, using clean energy can provide a hedge against financial risks because clean energy supplies are not as sensitive to market fluctuations and supply limitations as fossil-fuel based electricity. Reduced susceptibility to market volatility can translate into lower operating costs (U.S. EPA, 2004b). In addition, generating clean energy on-site can sometimes be cheaper than purchasing electricity through the grid. For example, the electricity from two wind turbines in Hull, Massachusetts is generated at a cost of 3.4¢ per kW, which is less than half of the 8.0¢ per kW it would cost the local government to purchase electricity from the grid (Hull, 2008). When inflation and discount rates are taken into account, the cost per kWh rises to 5.3¢, still well below the cost of purchased electricity (Manwell et al., 2003). Hull has a municipal electric company, which means that it distributes the electricity generated by the wind turbines to customers in the town, and does not need to sell the electricity to the grid. In towns without a municipal electric company, the value of the power produced is the selling price of energy. In Hull, the value of the power produced is the avoided cost of purchasing from the grid (RERL, 2006).

- *Reduced GHG emissions and other environmental impacts.* Fossil fuel combustion for electricity generation accounts for 40% of the nation's CO_2 emissions, a principle GHG, and 67% of the nation's SO_x emissions and 23% of the nation's NO_x emissions, both of which can lead to smog and acid rain, and result in emissions of trace amounts of airborne particulate matter that can cause respiratory problems (U.S. EPA, 2008s). Using clean energy can significantly reduce a state government's GHG emissions and other environmental impacts by decreasing use of fossil-fuel based energy. CHP systems, for example, can reduce CO_2 emissions by more than 50% compared to SHP systems (U.S. EPA, 2007j).

- *Electricity grid benefits.* Using clean energy supplies reduces reliance on conventional energy from centralized generation sources. Decreasing the amount of electricity the regional grid is required to transmit and distribute can lower the risk of blackout and reduce electricity losses in transmission lines. Clean energy

supply systems can significantly reduce the amount of energy lost in transmission from source to site. Distributed generation CHP applications, for example, achieve effective electrical efficiencies between 50% and 70%, as opposed to 33% for conventional fossil fuel powered plants (U.S. EPA, 2006e).

2.5.2 PLANNING AND IMPLEMENTATION STRATEGIES RELATED TO USING A CLEAN ENERGY SUPPLY

Key planning and implementation considerations that can lead to enhanced effectiveness for clean energy supply activities include:

- *Bundle clean energy supply with energy efficiency improvements*. Energy efficiency activities can reduce the cost of meeting percentage clean energy generation goals. Increased energy efficiency means less grid-based electricity is required to supplement the production of on-site renewable energy generation systems.

- *Complement clean energy supplies with green power purchases*. States can achieve increased GHG emissions reduction benefits by complementing on-site renewable energy generation with green power purchases. Using clean energy supplies can also reduce the cost of meeting percentage green power purchase targets, since these targets are often based on reducing grid-based electricity purchases.

- *Use the Solar Services Model*.[13] States can use the solar services model to finance solar PV system purchases and installations with no up-front cost. Under this model, the state signs a long-term (often ten years) power purchase agreement with a developer to host a PV system on its facility. The developer then pays for the design, construction, and installation of the system, often arranging for third-party financing through an investor. The developer uses revenue from the host's electricity payments to pay off financing debt to the investor. The host's payments are pre-determined and are assessed much like a monthly utility payment. The state government, as host, benefits from fixed-price payments, reduced peak energy costs, and reduced GHG emissions at no up-front cost. In addition, under the solar services model, the host is not responsible for performing or paying for maintenance on the system, which is arranged by the developer. Ownership of the system can be transferred to the host when the developer's or financier's costs are recovered (Sandia, 2007; WRI, 2007).

[13] *The solar services model is also referred to as an independent energy purchase (IEP).*

2.5.3 CLEAN ENERGY GENERATION TECHNOLOGIES

This section provides an overview of renewable energy generation and clean DG technologies that can be implemented at state government facilities.

Renewable Energy Generation Technologies

- *Wind*. Capturing wind energy using on-site turbines can significantly reduce grid-based electricity purchases. For example, a 3-kW turbine[14] with a 60 to 80 foot tower installed at a facility with monthly electricity costs ranging between $60 and $100 (approximately 700 kWh to 1100 kWh) could reduce the facility's monthly electricity bill by 30% to 60% [AWEA, Undated(c)].[15] The national average installed cost for wind projects in 2006 was approximately $1,480 per kW capacity (U.S. DOE, 2007b).

- *Solar*. Heat and light from the sun provide abundant sources of renewable energy. Solar energy is captured using multiple technologies, including:

  - *Photovoltaics (PV)*. PV systems directly convert sunlight into electricity using solar cells. These systems can produce electricity even in the absence of strong sunlight. A 10-kW system could produce 15,000 kWh annually. In a 20,000 square foot office building that uses 15.5 kWh per square foot,[16] this system could reduce grid-based electricity purchases by approximately 5%. PV systems are often installed on roof tops, making them suitable for urban government buildings. Since 2006, California has installed more than 4 MW of PV capacity on state facilities. In 2008, the state is planning to install as much as 24 MW additional PV capacity on state facilities (California DGS, 2008).

  - *Solar Hot Water*. Passive solar hot water technology uses sunlight to heat water that is distributed throughout a building to provide central or space

[14] *"Small wind" turbines (turbines that have capacities of 100 kW or less) are often better suited for installation at or near state facilities than large utility-scale wind farm turbines, which can reach capacities as high as 3 MW [AWEA, Undated(c); U.S. EPA, 2004b].*

[15] *KWh approximations determined using most recent average retail price for conventional electricity (9¢ per kWh) (EIA, 2007).*

[16] *The average annual energy consumption per square foot for an office building in the United States is approximately 15.5 kWh per square foot (U.S. EPA, 2007k).*

heating, reducing a building's reliance on a conventional hot water heater that uses non-renewable energy sources (NREL, 2007b; NREL, 2007c).

- *Solar Process Heating and Cooling*. Solar process heating technology captures heat from sunlight using contained air or fluid as the medium. The captured heat is then fanned or pumped throughout a building to provide space heating. This technology can also be reversed to cool buildings (NREL, 2007a).

- *Geothermal*. Geothermal systems capture the earth's heat for use in generating electricity and providing heating and hot water. In direct use applications, water is piped underground where geothermal heat produces steam, which can be used to produce electricity using steam turbines. This type of geothermal application is dependent on the availability of adequate geothermal reservoirs (reservoirs of water with temperatures between 68° F and 302° F), most of which are located in the western United States. The Idaho state capitol, for example, is heated using direct use geothermal technology (Idaho, 2008).

A second type of geothermal technology involves capturing the earth's heat to warm liquid that is then pumped into buildings to provide central heating or to heat water. In warmer seasons, geothermal heat pumps can exchange warm surface air for cooler below-ground air (U.S. DOE, 2006k). Geothermal heat pump systems are installed at shallow depths (sometimes as shallow as 4 feet to 6 feet below the surface). Because shallow ground temperatures are fairly constant throughout the United States, geothermal heat pumps can be effective in most locations (U.S. DOE, 2007c).

- *Biomass*. Electricity-producing turbines can be fueled by burning biomass (e.g., plant material, wood, agricultural wastes, and manure). In addition, biomass can be converted into combustible oil or gas biofuel by heating it in an oxygen-free environment, a process that can be twice as efficient as burning biomass (U.S. EPA, 2000; U.S. EPA, 2004b).

- *Landfill and Sewage Methane Gas*. Fitting landfills and wastewater treatment facilities to capture methane, which can be combusted to produce electricity, provides a source of energy from a byproduct that would otherwise be wasted. A single methane recovery project can produce as much as 4 MW of electricity while reducing waste odors and pathogens (U.S. EPA, 2004b; U.S. EPA, 2006a). In addition, a 3 MW landfill methane project can support more than 70 full-time jobs over the course of a year [U.S. EPA, Undated(b)].

- *Municipal Solid Waste*. Municipal solid waste (MSW) that would otherwise be sent to landfills can be burned to produce steam to power electricity-generating turbines. There are currently 89 operational municipal solid waste energy generation facilities in the U.S. that produce a combined 2,500 MW (U.S. EPA, 2006h).[17]

- *Low-Impact Hydropower*. Hydropower projects capture the kinetic energy of moving water to produce electricity. While hydropower is renewable and produces relatively few GHG emissions, hydropower projects can have other impacts on the environment, such as obstructing fish passage and altering land resources by impounding excessive nutrients (U.S. EPA, 2006k). The Low-Impact Hydropower Institute (LIHI) confers certification on hydropower projects that demonstrate minimal impact on the environment (LIHI, 2008).[18]

ARIZONA WESTERN ARMY AVIATION TRAINING SITE SOLAR FARM

The Arizona Department of Emergency and Military Affairs uses a solar farm to supplement its energy usage at the Army Aviation Training Site. The $196,000 photovoltaic system produces 31 kW of electricity, which has resulted in an annual reduction of an estimated 113,000 kWh of electricity that would otherwise be purchased from utilities. These savings equate to approximately $20,000 in energy cost savings annually. The Department estimates that the installation has resulted in a 31% decrease in utility costs.

Sources: Arizona DOC, 2006; Arizona, 2007.

UTAH SOLAR POWER DEMONSTRATION

The governor's *Policy to Advance Energy Efficiency in the State* calls on the state government to establish programs to install on-site renewable energy sources to reduce energy consumption by 2% by 2015 compared to 2005 levels. The governor's office is currently working in coordination with the Utah Geological Survey and the State Energy Program to fund a 1.28 kW solar power and demonstration project at the Department of Natural Resources facility in Salt Lake City. Installation of the solar panels was conducted in conjunction with a six-day course on the benefits of solar technology.

Source: Utah, 2006.

[17] *While burning MSW can produce energy and reduce waste streams, it is important to note that MSW combustion can also produce NO_x, SO_2, and CO_2 emissions if not rigorously monitored. The EPA Green Power Partnership does not recognize electrcity generated from MSW combustion as green power (U.S. EPA, 2007l).*

[18] *The EPA Green Power Partnership recognizes only hydroelectricity generated by LIHI-certified projects.*

- *Fuel Cells*. Fuel cells combine oxygen and hydrogen to produce electricity without combustion, resulting in fewer GHG emissions. However, fuel cells require a continuous stream of hydrogen-rich fuel and can only be considered a renewable energy technology if they operate on a renewably-generated hydrogen fuel, such as digester gas or pure hydrogen generated by solar or wind energy generating systems (U.S. EPA, 2004b).

Clean Distributed Generation Technologies

- *Microturbines*. Microturbines are small combustion turbines with typical energy generation capacities between 25 kW and 500 kW. Microturbines, when used in CHP systems, can achieve efficiency levels greater than 80% (U.S. DOE, 2006m).

THE COMBINED HEAT AND POWER PARTNERSHIP

The EPA CHP Partnership seeks to reduce the environmental impact of power generation by fostering the use of CHP. The partnership works closely with energy users, the CHP industry, state and local governments, and other stakeholders to support the development of new policies, programs, and projects and promotes their energy, environmental, and economic benefits.

The Partnership provides tools and resources to state and local government, industry, and energy users to encourage deployment of CHP including a CHP Emissions Calculator, Catalog of Technology, and CHP and Biomass Funding Database.

Through April 2008, thirteen state government agencies and three local governments were participating in the CHP Partnership.

Sources: U.S. EPA, 2006f; U.S. EPA, 2006g.

- *Gas-Fired Reciprocating Engines*. Reciprocating engines can generate between 0.5 kW and 6.5 MW of electricity. These engines have low capital costs, are easy to operate, have proven reliability, and can be used in CHP applications (U.S. DOE, 2006n).

- *Combined Heat and Power*. Combined heat and power (CHP), also known as cogeneration, refers to the simultaneous production of electricity and thermal energy from a single fuel source. CHP systems consist of three primary components: the unit in which the source fuel is combusted, the electric generator, and the heat recovery unit. CHP systems are differentiated by their type of prime mover, or device they use to convert fuel into electricity (e.g., microturbines, gas turbines, and steam turbine prime movers). Prime movers can operate using several kinds of fuel, including natural gas, biomass, biogas, coal, waste heat, and oil.

There are many opportunities for CHP systems at state government facilities, particularly:

- *Public schools and universities*. Many states, including California, Ohio, Minnesota, and New Mexico have installed CHP systems at state university campuses to supply campus electric and thermal demands.

- *Correctional facilities*. Correctional facilities are also candidates for CHP systems. Numerous correctional facilities across the country currently have CHP systems, including sites in New Jersey and Minnesota.

- *Wastewater treatment facilities*. Wastewater treatment facilities with anaerobic digesters can be strong candidate sites for CHP systems. The biogas flow from the digester is used as "free" fuel to generate electricity and power in a CHP system. Because they provide critical infrastructure for maintaining public health and the environment, power supply disruptions at these facilities would have serious consequences. Wastewater treatment CHP systems are in place in 23 states, representing 176 MW of capacity (U.S. EPA, 2006g).

2.5.4 STATE AND LOCAL EXAMPLES OF USING CLEAN ENERGY

State and local governments have used a variety of approaches to implement clean energy supply activities. The following descriptions provide state and local government examples of using clean energy supplies.

Oregon – Solar State Buildings

The Oregon Renewable Energy Action Plan, adopted in 2005, contains a number of policy goals and

BAYONNE, NEW JERSEY —SOLAR ELECTRICITY GENERATION IN PUBLIC SCHOOL DISTRICT

In cooperation with the New Jersey Board of Public Utilities, the Bayonne Board of Education installed nearly 10,000 solar panels at the local high school and eight elementary schools that have a combined 2 MW of electricity generation capacity, enough to power 200 small homes for 30 years. The $13.2 million project was made possible in part due to assistance from the state's Clean Energy Program, which provided $5.4 million in solar equipment and installation credits. The project is expected to save the school district more than $500,000 yearly in avoided electricity costs. Additional benefits include reduced reliance on fossil fuels, reduced pollution, and decreased strain on the grid.

Source: New Jersey, 2006.

recommended actions for increasing the amount of renewable energy in the state. Included in this plan are several goals for increasing the amount of renewable energy used by state facilities through purchasing green power and by generating renewable energy on-site. Specifically, the plan directed the state Department of Energy to pursue opportunities to install solar water heating, solar electric, and passive solar technologies at all new public facilities. In 2007, the state passed legislation to enforce this activity. House Bill 2620 requires that 1.5% of the total contract price of a new facility or major renovation be spent on solar technologies. This requirement became effective in January 2008, and the state Department of Energy has published proposed rules to implement the legislation. The rules include information on project eligibility, eligible costs, available solar technologies, use of funds, and reporting requirements (Oregon, 2005; Oregon, 2008).

Web sites: ***http://www.oregon.gov/ENERGY/RENEW/docs/FinalREAP.pdf*** ***(Renewable Energy Action Plan)***

http://oregon.gov/ENERGY/CONS/PublicSolar.shtml ***(HB 2620 Web site)***

California – Solar Technology at State Facilities

In 2001, the California state legislature passed a bill requiring the state Department of Administration, in consultation with the State Energy Resources Conservation and Development Commission, to ensure that solar energy equipment be incorporated into designs for new state buildings and parking facilities beginning on January 1, 2003, and that solar energy equipment be installed at existing state buildings and parking facilities by January 1, 2007. Legislation in 2007 extended these respective deadlines to January 1, 2008 and January 1, 2009, respectively. In addition, the governor issued an executive order in 2004 calling on state agencies to reduce non-renewable energy consumption by 20% by 2015 based on 2003 levels through a number of energy efficiency and renewable energy activities. The implementation plan for this order, the *State of California Green Building Action Plan*, directs state agencies to evaluate on-site clean energy generation opportunities.

The Department of General Services is coordinating efforts to meet the goal of the 2004 executive order. Since 2006, the department has directed installations of a combined 4.2 MW of PV system capacity. Electricity generated by these systems is transmitted directly to state facilities under a solar services model agreement with the local utility, which owns and maintains the systems. The state is currently planning installations of an additional combined 23 MW of PV capacity beginning in 2008. Overall, the state estimates that implementing the strategies described in the *Green Building Action Plan*, including developing on-site renewable energy resources, will reduce the state's CO2 emissions by 500,000 metric tons by 2010, increasing to 1.8 million metric tons by 2020 (California, 2001; California, 2004a; California, 2004b; California DGS, 2008; DSIRE, 2008).

Web site: ***http://www.green.ca.gov/factsheets/default.htm***

Massachusetts – Renewable Energy Initiatives

In April 2007, the governor of Massachusetts established a goal for the state to achieve 250 MW of combined solar PV capacity by 2017. As a first step towards achieving this goal, the governor created *Commonwealth Solar*, an initiative to provide rebates to residential and commercial electricity customers who invest in PV technology. The initiative is expected to produce more than 27 MW of PV capacity by 2011. At this time, the governor also issued an executive order on state government *Leading by Example – Clean Energy and Efficient Buildings*, which established a goal for state agencies to obtain 15% of their electricity from renewable resources (including green power purchases and on-site generation) by 2012, increasing to 30% by 2020.

To help state agencies evaluate their PV capacity, the state Executive Office of Energy and Environmental Affairs' *Lead by Example* program has developed a site selection survey that enables agencies to conduct PV feasibility assessments for their facilities. A clean energy committee within the Executive Office of Energy and Environmental Affairs, including members of the Division of Energy Resources, the Division of Capital Asset

HAYWARD, CALIFORNIA —SOLAR ELECTRICITY GENERATION AT A UNIVERSITY

California State University at Hayward received the 2004 Green Power Leadership Award for installing the largest solar electric system at any university in the world. The 1 MW system, which is installed on four of the university's largest buildings and covers more than 110,000 square feet, is capable of supplying approximately 30% of the campus' peak energy demand during the summer months. The project was enabled by a rebate offered by the state Public Utilities Commission for $3.55 million — half of the cost of the project. The remaining $3.55 million will be financed over 15 years using the energy cost savings generated by the project, which is expected to total approximately $200,000 annually. The project is expected to reduce the university's CO2 emissions by nearly 8,900 tons.

Sources: U.S. EPA, 2007p; Energy Services, 2003.

Management, and the Operational Services Division, is providing state agencies with technical assistance in achieving the governor's renewable energy goals.

Web sites: ***http://www.mass.gov/dep/energy.htm*** **(Renewable Energy Programs)**

http://masstech.org/solar/ **(Commonwealth Solar Initiative)**

http://www.mass.gov/envir/Sustainable/documents/pv_site_selection_survey.doc **(Feasibility Assessment)**

Illinois – Environmental Protection Agency CHP Activities

Since 2002, the Illinois Environmental Protection Agency has been providing technical assistance and support for CHP projects throughout the state. The agency, a partner in the EPA CHP Partnership, provides local governments, businesses, and institutions with assistance in identifying existing CHP projects and resources and developing future potential CHP applications. The agency has worked with the Midwest CHP Application Center and the University of Chicago to develop the 2003 *Illinois CHP/BCHP Environmental Permitting Guidebook*, which presents guidance for expedited permitting for CHP applicants in the state. The agency was also represented on a steering committee that led the first statewide CHP conference in 2002. On a regional scale, the agency works through the Midwest CHP Initiative to promote CHP throughout the Midwest.

Web site: ***http://www.chpcentermw.org/07-02_il.html***

Madison, Wisconsin – Combined Heat and Power at a University

In 2003, the governor of Wisconsin announced a public-private partnership to build a CHP plant near the University of Wisconsin-Madison campus to provide 150 MW of power and meet the space heating/cooling needs of the university's facilities. The CHP plant, which became operational in 2005, can achieve 70% efficiency and reduces energy consumption (compared to separate heat and power systems) by 10% to 15%. The CHP plant reduces NO_x emissions by 80% and CO_2 emissions by 15%.

The state Department of Administration worked with a private electric utility to design a facility that meets the university's needs, provides reliable power for residential and commercial businesses in the area,

CHP AT A WASTEWATER TREATMENT FACILITY (WWTF)

The Albert Lea Municipal WWTF takes a normal waste product–methane–from anaerobic digesters that treat the water and uses it to fuel their CHP system to provide thermal and electric power onsite. The WWTF uses four 30 kW microturbines to generate 120 kW of electricity and 28 MMBtu of thermal energy per year, which is used for space heating and to heat the facility's anaerobic digesters. Installed in 2003, the $250,000 project has an estimated payback of four to six years.

Source: Midwest CHP, 2005.

CHP AT KENT STATE UNIVERSITY

Kent State University, a partner in EPA's Combined Heat and Power Partnership, has received the Ohio Department of Development's Award for Excellence in Energy, as well as the 2007 ENERGY STAR CHP Award for its operation of two generators that supply both power and heat to the University.

The generators combine to supply 13 MW of electricity, matching nearly 90% of the university's electricity in winter months and about 60% of the university's electricity in summer months. Steam recovery units installed with the generators capture 60,000 pounds of steam per hour to be distributed to campus facilities, providing for 55% of the school's heating demands.

The system operates at 71% efficiency and achieves a 19% energy consumption reduction compared with separate heat and power systems. EPA estimates that the system reduces CO_2 emissions by approximately 13,000 tons annually.

Sources: Kent State University, 2005; Kent State University, 2007.

CHP AT THE UNIVERSITY OF TEXAS-AUSTIN

Since 1998, campus space at the University of Texas-Austin has increased by over 2 million square feet and energy demand has increased by more than 8%. However, due to the university's continual investment in CHP, fuel consumption since that time has increased by only 4%.

The most recent addition in 2004 included expansion of an existing natural gas-fired combustion turbine and heat recovery steam generator system. With the installation of a 25 MWe (megawatts-electric, often distinguished from megawatts-thermal in CHP applications) steam turbine, the renovated system produces up to 61 MWe of electricity, 280,000 lb/hr of steam, and 150,000 lb/hr of boiler feedwater. The steam and hot water are used for space heating, space cooling, domestic hot water, boiler preheat, and process steam in 160 campus buildings.

To maximize efficiency and overall performance, the system uses operational management software developed by Lightridge Resources. With an estimated operating efficiency of 60%, the University of Texas at Austin's CHP system requires approximately 24% less fuel than typical onsite thermal generation and purchased electricity. Based on this comparison, the system reduces CO2 emissions by an estimated 136,000 tons per year.

Source: U.S. EPA, 2007o.

and produces fewer emissions than conventional heat and power systems. The department negotiated with the utility to include the CHP plant development in a package of clean energy projects that also included installing 37 PV fixtures on campus. In addition, the utility agreed to provide additional fuel discounts to the state that could yield savings approaching $100 million over 30 years (Wisconsin, 2007c; MGE, 2008).

Web site: ***http://www.mge.com/about/powerplants/cogen/***

2.6 OTHER ENERGY SAVING OPPORTUNITIES

Many states are leading by example by implementing other energy and environmental activities that complement the LBE activities described in the preceding sections. While not always directly intended to reduce energy consumption, these activities can have secondary energy saving benefits. This section describes four of these activities.

2.6.1 DEMAND RESPONSE

Demand response refers to changing electricity usage from normal consumption patterns in response to change in the price of electricity over time. This often involves changing electricity use patterns in response to utility incentive payments designed to reduce demand during times of peak energy use or other times when electricity system reliability is uncertain. Participating in utility demand response programs can be an effective way to achieve energy system reliability benefits and reduce energy costs, and several states are saving energy costs by incorporating demand response activities as part of a strategic approach to energy management.

In 2004, the governor of California issued an executive order directing state agencies to reduce energy consumption in advance of private electricity customers during electrical emergencies, to help protect energy system reliability. As part of this mandate, the order directs agencies to work with electric utilities to coordinate agency responses to electrical emergencies and to participate in utility-based demand response programs (California, 2004a; California, 2004b).

CONNECTICUT DEMAND RESPONSE PROGRAM

In Connecticut, the state Office of Policy and Management (OPM) administers a Demand Response Program that coordinates demand response activities of eleven state agencies. OPM works with the agencies to reduce peak electrical loads during period of high demand by transferring loads to distributed generation equipment and reducing non-essential electrical loads. As compensation for reducing peak loads, which enables the regional grid operator to avoid installing additional infrastructure that would be needed to meet demand, OPM receives approximately $300,000 quarterly from ISO New England, the grid operator, through third-party contractors. This payment is allocated to the participating agencies for reinvestment in clean energy projects.

Source: Connecticut OPM, 2008.

MASSACHUSETTS STATE SUSTAINABILITY PROGRAM

Recycling is a cornerstone of the Massachusetts State Sustainability Program. In 2004, the state adopted a goal of achieving a government recycling rate of 50% by 2010. Accomplishments under this program include:

- Between FY 2000 and FY 2002, the Operational Services Division collected 2.8 million feet of fluorescent lamps, 4,000 other mercury-containing lamps, 350 pounds of elemental mercury, and 160,000 pounds of batteries.
- The Bureau of State Office Buildings Office Paper Recycling program recycled 640 tons of paper in FY 2002, saving over 10,000 trees.
- The Department of Environmental Management placed 15 recycling containers next to the dumpsters at the beach entrances and heavy-use areas to mitigate contamination from improper disposal of non-recyclable materials. About 2,400 pounds of material were collected with average contamination rates reduced to 1%.

Sources: Massachusetts, 2004; Massachusetts, 2007c.

2.6.2 REDUCING SOLID WASTE AND RECYCLING

Considerable quantities of energy are consumed to manufacture everyday products, such as office paper, computers, and ink toner cartridges. Using products made from recycled or renewable materials through non-energy-intensive methods can prevent unnecessary depletion of natural resources and reduce the energy required to manufacture new products and

RECYCLING – ENERGY RELATIONSHIP

- Recycling one pound of steel saves 5,450 Btu of energy, enough to light a 60-watt bulb for over 26 hours.
- Recycling one ton of glass saves the equivalent of nine gallons of fuel oil.
- Recycling aluminum cans requires only 5% of the energy needed to produce aluminum from bauxite. Recycling just one can saves enough electricity to light a 100-watt bulb for 3½ hours.

Source: Pennsylvania, 2007.

dispose of used ones. Diligent recycling can conserve 70% to 90% of the energy required to produce products from virgin materials. The amount of energy saved from recycling one ton of office paper or one ton of aluminum cans is equal to 10.2 million Btu and 206.9 million Btu, respectively (Choate et al., 2005).

Most states administer programs to purchase recycled-content products and collect used products to be recycled. In 2005, North Carolina state agencies purchased $12 million in recycled-content office paper. This effort conserved 115,000 trees, saved enough energy to supply nearly 900 homes for a year, and reduced CO_2 emissions equivalent to removing 915 cars from the road for a year (North Carolina DENR, 2005). In Florida, the state office recycling program recycled nearly 235 tons of white paper—34% of all paper used—over two years. In addition to avoiding 700 cubic yards of solid waste, this effort saved the state nearly $7,000 in fees for hauling the garbage and earned the state more than $9,000 in sales of the salvaged materials (Florida, 2004). In 2005, state government recycling efforts coordinated by the Pennsylvania Department of General Services generated $32,000 in salvaged paper sales and $546,000 in salvaged metals sales (GGGC, 2008). In Minnesota, 21 of the state government's largest buildings have joined the State Agency Recycling Challenge in an effort to achieve a 60% recycling rate in each agency. In the month of February 2007 alone, these buildings combined to save approximately 200,000 pounds of recycled material (Minnesota RRP, 2007.).

2.6.3 WATER EFFICIENCY

The conveyance, treatment, distribution, and end-use of water, along with the treatment of wastewater, require a significant amount of energy. The energy required to pump purchased water for end use is approximately 0.6 kW per 1,000 gallons distributed (Universities Council on Water Resources, 1999). According to a 2008 EPA report on the relationship between water and energy use, it is estimated that water supply and wastewater treatment nationwide require 30 billion kWh per year and 7 billion kWh per year, respectively — approximately 1% of total annual U.S. electricity generation at a cost of $3 billion (U.S. EPA, 2008u).[19] In California, where the energy intensity of water conveyance and treatment is high, water-related energy use constitutes 19% of the state's annual energy use and 32% of its annual natural gas use (CEC, 2006).

At the system level, increasing the energy efficiency of system operations (e.g., through process improvements, use of efficient pumps and motors) and shifting discretionary uses of energy to off-peak times (e.g., by increasing water storage capacity) can reduce energy consumption. Energy efficiency measures can reduce energy consumption in most water systems by 25% (Watergy, 2002). In New York, NYSERDA encourages

EPA WATERSENSE LABEL

The EPA WaterSense Program labels products that meet water efficiency and performance criteria. Labeling criteria have been established for plumbing fixtures (e.g., toilets and sink faucets), landscape irrigation equipment, and other commercial products. In general, products that receive the WaterSense label are 20% more water-efficient than conventional products.

Source: U.S. EPA, 2007b.

MASSACHUSETTS WATER CONSUMPTION REDUCTION GOAL

Some states have taken the initiative of setting goals for reducing state government water consumption. Massachusetts, for example, has a goal of reducing water consumption by 15% in state agencies by 2010. The state plans to achieve this objective by taking cost-effective steps such as reducing outdoor water use through green landscaping techniques, replacing old fixtures, inspecting and repairing leaks, and identifying options for using reclaimed water.

Source: Massachusetts, 2004.

COLORADO WATER CONSERVATION ACTION STEPS FOR STATE AGENCIES

The Colorado Greening Government initiative developed a list of action steps for state agencies to reduce water consumption, including:

- Implementing water efficiency awareness programs.
- Reducing non-essential water uses, including vehicle washing, decorative fountains, and routine athletic field watering.
- Focusing on restroom water use, which can account for as much as half of total water demand, by:
  - Replacing old toilets that use 3.5 gallons per flush (gpf) with 1.6 gpf units.
  - Installing water-saving aerators on faucets.
  - Installing pressure-reducing valves to reduce consumption.
- Limiting allowed watering hours to times when evaporation is lowest (i.e., early morning or later in the evening).
- Planting drought-tolerant native plants.
- Eliminating once-through cooling systems.

Source: Colorado, 2005.

[19] *For more information, see EPA's 2008 report, Water and Energy: Leveraging Voluntary Programs to Save Both Water and Energy at http://www.energystar.gov/ia/partners/publications/pubdocs/Final%20Report%20Mar%202008.pdf.*

municipal water, wastewater, and solid waste treatment facilities to adopt energy-efficient practices through cost-sharing research, business development programs, and demonstrations (NYSERDA, 2004b).

At the facility level, states can improve indoor water efficiency by installing water-efficient fixtures (e.g., toilets, faucets). Installing water metering and monitoring systems, for example, can reduce energy consumption by up to 10% (Watergy, 2002). Exterior water consumption reduction strategies include:

- Collecting and using rainwater for landscape irrigation.
- Planting roof areas to reduce loss of storm water.
- Increasing reliance on native plant species that are adapted to the local environment, which can increase water efficiency by as much as 50% (U.S. DOE, 2006l).
- Altering irrigation schedules to reduce peak demand (U.S. EPA, 2002).

Some states have reduced exterior water consumption through a technique called xeriscaping that replaces water-intensive landscaping materials with locally adapted plants, shrubs, mulch, and other materials. Xeriscaping efforts at the Colorado State Laboratory are expected to save more than 780,000 gallons per year, reducing maintenance costs by an estimated $4,000 annually (Colorado, 2006b). Legislation in Florida and Texas requires that the state departments use xeriscaping practices on certain new state construction projects (U.S. EPA, 2002).

2.6.4 TREES AND VEGETATION

Trees and vegetation and responsible landscaping practices can significantly reduce energy consumption by moderating exposure to sun and wind. In general, large trees or bushes planted close to a building's side will produce substantial energy savings, although benefits vary based on orientation, size, leaf cover, and distance of trees and vegetation from a building.

According to EPA, to achieve maximum cooling savings, deciduous trees should be planted to the east, southeast, southwest, and —especially —the west of a building to shade wall exteriors (U.S. EPA, 2003b).[20] A joint study by LBNL and the Sacramento Municipal Utility District placed varying numbers of trees in containers around houses to shade windows and then measured their energy use (Akbari et al., 1993). Cooling energy savings ranged between 7% and 40% and were greatest when trees were planted to the west and southwest of buildings. Another study by LBNL, which modeled the effects of trees on homes in various cities throughout the United States, suggests that a 20% tree canopy would result in annual cooling savings of 8% to 18% and annual heating savings of 2% to 8% (Huang et al., 1990).

Trees and vegetation can also reduce winter heating costs by shielding wind. Trees and large bushes, particularly evergreens, planted to the north or northwest can serve as windbreaks and protect buildings from cold winter winds. One study indicates that properly placed wind-shielding trees can produce heat energy savings of 10% to 15% (LBNL, 2005).

The presence of trees and smaller vegetation in the urban environment can also provide energy benefits during the summer months through evapotranspiration —the process through which trees and vegetation absorb water through their roots and emit water vapor through their leaves. Different species of trees can process varying amounts of water, ranging from a few gallons a day up to several thousand gallons a day. In combination with shading, evapotranspiration can reduce peak summertime air temperatures by as much as 9°F in some regions, which can translate into significant energy cost savings (U.S. EPA, 2007m).

[20] *Planting trees to the direct south, however, should generally be avoided, since these trees will provide relatively little summer shade and will obstruct desired winter sunlight (U.S. EPA, 2007e).*

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TABLE 2.6.1 CHAPTER 2: POTENTIAL LBE ACTIVITIES AND MEASURES: SELECTED RESOURCES

Title	Description	URL
Databases		
DSIRE	The Database of State Incentives for Renewable Energy provides information on state and local government renewable energy and energy efficiency incentives.	*http://www.dsireusa.org/*
DOE State Energy Program	DOE's State Energy Program (SEP) provides grants to states and directs funding to state energy offices from technology programs in DOE's Office of Energy Efficiency and Renewable Energy.	*http://www.eere.energy.gov/state_energy_program/topic_definition_detail.cfm/topic=115*
Best Practices Resources		
EPA ENERGY STAR Building Upgrade Manual	EPA's ENERGY STAR Building Upgrade Manual provides information on implementing a staged upgrade approach to improving energy efficiency in buildings.	*http://www.energystar.gov/index.cfm?c=business.bus_upgrade_manual*
EPA Clean Energy-Environment Guide to Action	EPA's Clean Energy-Environment Guide to Action is designed to share the experiences and lessons learned from successful state clean energy policies and help states evaluate these options, programs, and policies to determine what is most appropriate for them. The Guide to Action describes 16 clean energy policies, details the best practices and attributes of effective state programs, and provides resources for more information.	*http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-best-practices.html*
EPA Clean Energy-Environment State Partnership Program Technical Forum	EPA's State Technical Forum conference calls foster peer-to-peer exchanges among state officials on policy design, implementation, and evaluation issues related to their efforts to advance clean energy	*http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-forum.html*
EPA ENERGY STAR Guidelines for Energy Management	EPA's Guidelines for Energy Management are based on the successful practices of ENERGY STAR partners. The Guidelines for Energy Management for energy management assist organizations in improving its energy and financial performance.	*http://www.energystar.gov/index.cfm?c = guidelines.guidelines_index*
National Governor's Association Center for Best Practices	NGA's Center for Best Practices evaluates public policy innovations and ensures that all governors are aware of these advances by Publishing research reports, policy analyses, issue briefs, and a variety of other materials on timely issues. The center also Hosting policy workshops, seminars, academies, and cross-state learning labs across the country	*http://www.nga.org/portal/site/nga/menuitem.50aeae5ff70b817ae8ebb856a11010a0/*

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CHAPTER THREE

Establish the LBE Program Framework

This chapter builds on the descriptions of activities and measures provided in Chapter 2 and describes a key element of the LBE implementation process: establishing a robust framework to support a comprehensive program.

Establishing the framework is a critical step towards developing a comprehensive LBE program that (a) achieves expanded energy and other benefits, (b) leverages economies of scale across the programs, (c) encourages broader political support, and (d) results in increased visibility and support. The program framework described here serves as the basis for effective screening, program development, and evaluation, which are the subjects of the remaining chapters of this Guide.

Establishing the LBE program framework includes the following actions:

- Select a team – that includes the necessary expertise and represents the appropriate agencies – to be responsible for developing and implementing the program, and tracking and measuring progress;
- Establish the business case for the LBE program and work with key participants and stakeholders to obtain high-level support for the program;
- Identify agencies, organizations, and stakeholders who can help define, initiate, and implement the LBE program;

DOCUMENT MAP

CHAPTER THREE CONTENTS

Related appendices:

Appendix A, State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs: summarizes and provides links to actions states have taken to initiate LBE programs

Appendix C, Resources for Implementing LBE Programs: contains examples and information resources on implementing LBE programs, including several state-developed agency guidance materials.

- Set clean energy goals or targets for state government facilities, operations, and/or fleets, based on the state's baseline energy use and other considerations; and

- Initiating the LBE program – a variety of approaches can be used to get an LBE program started – in some cases the LBE team conducts the ground work to encourage a governor, state legislature or other entity to establish its LBE goals; at other times LBE goals are initiated by the governor, or other entity, and the LBE team then implements the program.

Each of these steps is addressed in greater detail below. In addition, the information on key LBE activities presented in Chapter 2, *Lead by Example Activities and Measures,* can be used to help guide decisions during this first step, and Table 3.5.2, at the end of this chapter, presents selected resources to help establish an LBE program framework, including examples of LBE plans, guidance, and executive orders.

3.1 SELECT AN LBE TEAM

Establishing a team committed to developing a robust LBE program is a key step in the overall implementation process. This team can be informal or officially authorized by the governor. It is often composed of individuals with expertise in the specific LBE activities the state is considering for inclusion in its LBE program, as described in Chapter 2, *Lead by Example Activities and Measures*. Issues to consider when putting together an LBE team are described below.

3.1.1 IDENTIFY LEAD AND SUPPORTING LBE CLEAN ENERGY AGENCIES

States typically assign one agency to lead and coordinate LBE efforts. This lead agency can be selected in the following ways:

- *An existing state office can be the logical lead agency for a clean energy LBE program.* For example, the Georgia Environmental Facilities Authority (Division of Energy Resources), which promotes energy efficiency and renewable energy programs for public and private entities, is the lead agency for state LBE clean energy activities.

- *States can establish new entities to implement state energy policies and programs.* In Massachusetts, the State Sustainability Program was established to make recommendations to the Executive Office of Environmental Affairs and the Executive Office for Administration and Finance to promote innovative sustainable practices – including clean energy activities – in state operations (Massachusetts, 2002). In 2007, the new governor of Massachusetts established an executive order directing these two state agencies to create a Lead by Example program. The program is charged with coordinating efforts at state agencies, including all University of Massachusetts campuses and all state and community colleges, to reduce their environmental impact through a variety of measures including energy conservation and clean energy (Massachusetts, 2007; Massachusetts, 2008).

- *States can designate or work with an existing government-level entity that addresses a related issue, such as climate change.* For example, many states have legislative commissions or executive advisory groups on climate change (Pew Center on Global Climate Change, 2006). If such a body already exists, it can provide clean energy LBE leadership and/or help appoint an LBE team. In Connecticut, the Governor's Steering Committee on Climate Change, which is comprised of the chairmen and commissioners of energy, environmental, transportation, and other state agencies, led a Climate Change Action Plan Summit in 2002. The overall goal of the summit was to establish a process for developing a GHG emissions reduction plan, with one objective to identify opportunities for state agencies to lead by example in the areas of climate change and clean energy (Connecticut, 2002).

To support the lead LBE agency, a variety of state agencies and offices – including the state energy

STATE AGENCIES FOR POSSIBLE INCLUSION ON THE LBE TEAM

- Energy Office
- Environmental Protection Office
- Clean Energy Fund
- Office of Sustainability
- Facilities Management Office
- Department of Transportation
- Procurement Office
- Department of Education
- Public Utility Control
- Department of Administrative Services
- Office of Policy and Management
- Department of General Services
- Department of the Treasury
- Housing Office
- Economic Development Office

office – can participate on the LBE team and take on related responsibilities. For example, in Connecticut, representatives of 13 state agencies gathered with the Governor's Steering Committee (described above) for the Connecticut Climate Change Action Plan Summit to establish an initial framework for developing the LBE component of the state's climate change action plan (Connecticut, 2002, 2006).

3.1.2 IDENTIFY KEY PERSONNEL

It is important to identify key personnel who have responsibility for clean energy and related issues (e.g., staff involved in sustainability, facility management, and/or environmental programs), and are positioned to participate on the LBE team. Selecting team members typically involves the following approaches (CaLEEP, 2006; Massachusetts, 2006b; NYSERDA, 2006):

- Select staff who are actively involved in decisions regarding energy consumption and who can vouch for LBE actions that will save energy (e.g., facilities managers, construction planners, fleet operators, and procurement directors).
- Identify the champions who are already working to implement clean energy activities within their agencies or offices.
- Include managers who will be part of the decision-making process. Their support, perspective, and credibility will be essential in ensuring the success of the LBE program.
- Include key finance personnel, fiscal department staff, and capital planning staff, who need to understand the cost savings and other economic benefits of the LBE program prior to lending their support.
- Include personnel who are concerned about the costs of clean energy. They may provide important perspectives and/or become important allies after getting more information.

3.2 ESTABLISH THE BUSINESS CASE AND IDENTIFY AND OBTAIN HIGH-LEVEL SUPPORT

Creating a sustainable LBE program requires identifying high-level policymakers whose support is critical to the success of the program, and providing them with the appropriate information. These high-level policymakers can include:

- The governor.
- Key legislators (e.g., legislators on finance, treasury, taxation, energy, resources, environment committees).
- Mayors and other elected officials.
- Administrators of key state agencies (e.g., finance, natural resources, and energy agencies).
- Local government officials, including representatives of school authorities (e.g., boards of regents, local school commissioners) and their advisors.

Approaches for building support and gaining sustained backing for an LBE program include:

- *Involve policymakers in the early stages of the LBE process*. Provide these individuals with data regarding LBE opportunities and include them on the LBE team. This can assist in gaining support and provides an early

LBE CHAMPIONS IN MASSACHUSETTS

The LBE program in Massachusetts was initiated when the Massachusetts Executive Office of Environmental Affairs hired a director to develop a new state sustainability program (including clean energy activities) and to coordinate state sustainability LBE efforts. Several state agencies in Massachusetts were already implementing LBE activities but there was no program coordination or integration.

In talking with personnel at other state agencies, the new director discovered that while agency staff often understood the importance of sustainability it was not a priority with their supervisors. Consequently, agency personnel wanted an executive order to give them official authorization to act. The governor ultimately issued Executive Order 438, which created a Sustainability Coordinating Council to develop the State Sustainability Program, and requires all state agencies to reduce energy consumption through energy efficiency and conservation.

Source: Massachusetts, 2006b.

GAINING SUPPORT FOR GEORGIA'S CLEAN ENERGY LBE PROGRAM

The Georgia Environmental Facilities Authority and the Department of Administrative Services worked with Georgia Power to determine state facility energy consumption levels for over 4,000 state accounts. By consolidating state accounts, they were able to obtain strategic rate changes that yielded $2.1 million in electric cost savings. This savings helped convince the governor to issue an LBE Executive Order to help achieve additional savings.

Sources: Georgia, 2006a, 2006b.

opportunity to hear policymakers' perspectives and address their concerns.

- *If possible, identify influential persons to participate on the LBE team.* These are individuals with contacts and influence who can help the LBE champions present their case to key decision-makers who have the authority to initiate and approve the program.

- *Clearly articulate the value of the proposed LBE program and describe why policymakers should support it.* Include information on:
  - Context
  - Purpose of LBE program
  - Key benefits
  - Proposed activities
  - Costs and how they will be met
  - Strategies for addressing barriers
  - Description of how the benefits of clean energy LBE action relate to the broader national energy and environmental context.

It is not always necessary for all of these components to be presented in detail. A broad description, reinforced by evidence of the benefits of similar programs elsewhere, can be an effective way to begin.

3.3 IDENTIFY KEY AGENCIES AND OTHER GROUPS TO HELP SHAPE AND IMPLEMENT LBE PROGRAMS

The LBE team can call on a wide variety of groups to provide input to help initiate, shape, and implement the program, and/or serve as champions in the community. For example, environmental nonprofit organizations may be motivated to support LBE programs because of the environmental benefits of energy efficiency and clean energy. Private sector firms can also play an important role, drawn by the potential for promoting local economic activity and providing a boost to energy services firms and other emerging industries. The decision to involve partners is often based on a state's LBE priorities, as determined by considering the benefits, costs, and implementation issues associated with specific activities and measures, as described in Chapter 2, *Lead by Example Activities and Measures.*

An overview of the agencies and organizations that can assist in initiating and developing an effective clean energy LBE program is presented below. Roles, responsibilities, and examples of how these groups have participated are also provided.

- *Executive Branch*. The executive branch typically plays a key leadership role in LBE initiatives. Many state governors have issued executive orders that set energy savings goals for existing buildings, define energy and environmental performance standards for new buildings, set fuel economy targets for state-owned or leased vehicle fleets, create green power purchasing policies, and create efficiency guidelines for purchasing energy-using equipment. The executive branch also has broad powers to change policies and practices involving state facilities, fleets, purchasing operations.

EXAMPLES: *Wisconsin's Executive Order 145, issued in 2006, establishes a comprehensive set of LBE requirements for state government buildings. The most significant requirement is for the Department of Administration (DOA) to set goals for reducing overall energy usage in state facilities, office buildings or complexes, and campuses by at least 10% by 2008 and 20% by 2010, from a 2005 baseline. To help state agencies achieve these goals, the order directs the DOA to establish programs to conduct energy analyses in state-owned buildings, ensure that new state facilities are constructed to be 30% more energy efficient than the existing code requires, establish sustainable building operation guidelines based on LEED, and ensure that new construction incorporates an integrated design process. The order also requires state agencies to examine the feasibility of entering into performance contracts and directs the DOA to pursue opportunities to demonstrate PV and other renewable technologies at state facilities. Lastly, it directs the DOA to develop centralized reporting procedures and to report annually to the Governor's Office and the state Building Commission (Wisconsin Office of the Governor, 2006).*

EXECUTIVE BRANCH PARTICIPATION IN IOWA

Iowa's Executive Order 41 requires the state to reduce energy consumption in all conditioned facilities (i.e., buildings that are actively heated or cooled by a heating, ventilation, or air-conditioning system) by an average of 15% by 2010 (based on 2000 levels). It directs state agencies to obtain at least 10% of their electricity from renewable energy sources by 2010 and establishes requirements governing state fleets.

Source: Iowa, 2005.

Ohio's Executive Order 2007-02S, issued in 2007, requires state agencies to immediately implement energy saving activities as directed by a 2006 law passed by the state legislature, rather than waiting until the date mandated in the law. Such activities include: developing rules for energy efficiency and conservation standards; designing a life-cycle costing methodology; and implementing a plan for energy-efficient product procurement. The order also directs the Department of Administrative Services to develop a tool that state agencies can use to track and measure energy consumption and to calculate each agency's GHGs.[1] The order directs each state agency to conduct energy audits in its facilities using the tool, to facilitate comparisons between similar state facilities. Following these audits, agencies are directed to reduce energy consumption by 5% within one year and a 15% reduction within four years. The order also creates the position of energy advisor to the governor to be responsible for coordinating the state's energy policy, including the state's LBE activities (Ohio Office of the Governor, 2007).

In 2007, Florida's governor issued Executive Order 07-126, which establishes a goal for state agencies to reduce current levels of GHG emissions by 20% by 2012, 25% by 2017, and 40% by 2025. To help achieve these goals, the order directs state agencies to immediately conduct energy audits of state facilities and prohibits state agencies from entering into new leases for office space that does not meet ENERGY STAR buildings standards. In addition, the order directs the state Department of Management Services to adopt LEED standards for new and existing state facilities and to develop energy efficiency measures and guidelines for state agencies. In 2008, the department issued energy consumption reduction guidelines for facilities managers and employees, and adopted a state facility energy policy (Florida, 2007; Florida, 2008).

- *State Legislature*. Some states have enacted legislation to establish their LBE goals and programs. Legislative authority may also be required when modifying procurement regulations.

EXAMPLES: *In Washington, House Bill 2247 requires energy audits at state facilities. If the audits produce energy-saving opportunities, the improvements must be implemented by using performance contracting (Washington, 2006).*

California's Assembly Bill 532 requires the Department of Administration, in consultation with the State Energy Resources Conservation and Development Commission, to install solar energy equipment on all existing state buildings and state parking facilities, where feasible, by January 1, 2009. It defines solar energy to be "feasible" if there is adequate space on the building and the solar energy equipment is cost-effective (CLI, 2008).

- *State Energy Office*. In many states, the energy office develops and administers a range of clean energy programs, including LBE programs, and provides technical assistance and training to state agency staff and facility managers. State energy offices also share their technical expertise with other state agencies, local governments, school districts, and other public organizations to identify clean energy opportunities statewide.

EXAMPLE: *In North Carolina, the State Energy Office provides energy information and assistance for all state sectors, including state and local government agencies, state universities, community colleges, and schools. Its Utility Savings Initiative is a comprehensive approach for reducing utility expenditures and resource use in public buildings within all these sectors. The goals of this LBE initiative include developing an agency strategic energy plan, providing training and resources for agency personnel, implementing no- and low-cost operation and maintenance conservation measures, and encouraging investments in energy projects and use of performance contracts and guaranteed energy savings contracts to fund these projects (North Carolina, 2006).*

- *State Department of General Services, Facilities Authority, and Department of the Treasury.* One of these agencies typically serves as the custodian of state facilities. They administer state capital construction programs and establish guidelines for construction, operation, and purchasing practices. Consequently, these agencies may become involved in clean energy LBE activities related to state facilities (e.g., developing and implementing energy efficiency measures in new and existing buildings, establishing energy efficiency performance standards, and procuring energy-efficient products).

EXAMPLES: *The Georgia Environmental Facilities Authority (GEFA) administers programs that provide financial assistance and protect the state's environment, including energy programs; water, wastewater, and solid waste infrastructure improvements; land conservation; recycling; and fuel storage systems. The Division of Energy Resources serves as the state energy office for Georgia, and in that role promotes energy efficiency, renewable*

[1] *In June 2007, the Ohio Department of Administrative Services adopted EPA's ENERGY STAR Portfolio Manager in response to the requirements of Executive Order 2007-02S. For more information on the state's use of the ENERGY STAR Portfolio Manager tool, see http://www.das.ohio.gov/gsd/oes/auditguide.htm.*

energy, and energy assistance programs throughout the state. GEFA worked with the Governor's office to issue Executive Order 22806, which directs agencies to "lead by example" by promoting clean energy. The authority also provides information, technical assistance, and other resources to state agencies as they implement the Georgia Governor's Challenge, which commits all state agencies to reduce energy consumption per square foot in state facilities 15 percent below 2007 levels by 2020 (Georgia, 2006; GEFA, 2008).

In Pennsylvania, the Department of General Services administers a performance contracting program for state agencies. The department has established a performance contracting outreach program for local and county governments, K–12 schools, and other government entities (Pennsylvania, 2006).

- *State Housing and Economic Development Offices.* These agencies operate a variety of programs, including low- and moderate-income housing and development programs, state mortgage financing programs, and enterprise zone and brownfield redevelopment initiatives. One way these agencies can become involved in LBE activities is to encourage energy efficiency practices or other clean energy measures in affordable housing developments.

EXAMPLE: *For example, two Massachusetts agencies, MassHousing and the Massachusetts Technology Collaborative (MTC), recently joined with the nonprofit Enterprise Foundation to launch the Massachusetts Green Communities Initiative—a $209-million initiative to build 1,000 energy-efficient, environmentally friendly, affordable homes in the state (Massachusetts, 2006a).*

LOCAL GOVERNMENT PARTICIPATION

San Francisco adopted green building standards for affordable housing developments. The first development features energy-efficient systems, daylighting, natural ventilation, low-flow plumbing fixtures, and solar panels that will meet 12% of the building's energy demand (San Francisco, 2005).

SCHOOL PARTICIPATION IN WASHINGTON

Western Washington University adopted an initiative, introduced by the Students for Renewable Energy, to establish a student fee to purchase green power for the campus. At $1.05 per credit per quarter, the fee is expected to provide enough revenue to supply all 35 million kWh of the school's 2005-2006 electricity demand with clean energy.

Sources: Apollo Alliance, 2005; U.S. EPA, 2006b.

- *Local Governments.* In many cases, local governments have initiated and adopted their own LBE programs. Some states work with local governments to educate local officials about these opportunities and to coordinate, pool, and set common criteria for such initiatives. States can also provide financial assistance, education, training, and technical assistance to local governments.

EXAMPLE: *For example, Arizona's Municipal Energy Management Program (MEMP), administered by the state Commerce Department, provides training, tools, technical assistance, and grants to municipal and tribal governments to help implement energy saving projects (Arizona, 2005).*

- *School Districts, Colleges, and Universities.* There are many opportunities to improve energy efficiency and purchase or generate clean onsite power at K–12 schools, colleges, and universities. One option is to use efficiency savings in operating budgets to finance new energy projects, thereby freeing up capital budget dollars for other uses. In fact, some colleges and universities have found that investing in energy efficiency projects provides better yields than the market (U.S. EPA, 2006c). In addition, states work with their state school systems to implement clean energy activities within school facilities.

EXAMPLES: *An example of a state university investing in clean energy projects is the university-owned and -operated CHP system at the University of North Carolina (UNC) at Chapel Hill. This system provides space heating and cooling, sterilization, domestic hot water, humidification, and cooking for the campus and UNC hospitals (U.S. EPA, 2006a).*

On the state level, the Ohio School Facilities Commission administers the state's comprehensive public school construction program, and helps school districts fund, plan, design, and build or renovate schools. In 2007, the Commission adopted the LEED for Schools Green Building rating system as part of its school design standards. Schools in districts that were approved for funding after September 2007 are required to meet at least LEED Silver Certification, with a goal of meeting the LEED Gold level. In July 2008, the Commission approved school construction and renovation projects of more than $1.9 billion in 40 school districts. The projects will be financed by a combination of state and local funding (OSFC, 2008).

In April 2008, the Wisconsin lieutenant governor issued the Wisconsin ENERGY STAR School Challenge

to encourage 100 Wisconsin public school districts to commit to reducing energy consumption by 10% or more across their building portfolios. In the first two months after issuing the challenge, the number of participating school districts reached 30, including two school districts that had already been recognized as ENERGY STAR Leaders for improving energy efficiency across their building portfolios by 20%. In addition to committing to reducing energy consumption by 10%, participants in the challenge agree to measure and track the energy performance of their buildings using the ENERGY STAR Portfolio Manager, develop and implement energy management plans consistent with the ENERGY STAR Energy Management Guidelines, and educate staff, students, and community members about the benefits of improving energy efficiency (Wisconsin Office of the Lt. Governor, 2008).

- *Utility Energy Programs*. Utilities that administer energy efficiency, demand response, and onsite distributed generation programs can support a state's LBE efforts by providing technical assistance to state facility managers and new facility design teams. In some cases, utilities provide funding and incentives to state agencies for implementing clean energy projects.

EXAMPLE: *In California, the state Department of General Services is collaborating with three investor-owned utilities to implement nearly $17 million worth of energy-saving programs in state facilities and to provide technical resources to ensure that the energy projects deliver cost-effective energy savings according to guidelines established by the California Public Utilities Commission and the California Energy Commission. Administered by the utilities under the auspices of the CPUC, this program includes the state's largest office buildings, prisons, and some smaller state buildings (California, 2006).*

- *Energy Service Companies (ESCOs)*. ESCOs can perform energy project assessments and/or conduct full energy efficiency projects on a performance contracting basis. In such projects, the state does not provide upfront capital; instead, the ESCO develops and finances the project, verifies energy efficiency savings, and uses these savings to cover the cost of capital. A number of states have established programs to coordinate performance contracts for state agencies.

EXAMPLE: *The Texas State Energy Conservation Office (SECO) developed performance contracting guidelines under its State Agencies Program. The agency pays for projects out of savings realized through the program (Texas, 2006).*

- *State Treasurers and Public Pension Fund Managers*. Pension fund trustees and state treasurers provide policy direction for fund managers and are increasingly looking for opportunities to enhance the value of their portfolios. Some state treasurers and public pension fund managers invest in clean energy investments and upgrades on state property. This type of investment not only provides an opportunity for fund managers to "green" their portfolios, but also saves money and increases the value of the assets and the overall portfolio.

EXAMPLE: *In California, for example, the state treasurer started the Green Wave program to encourage pension fund investment in energy efficiency and renewable energy retrofits and upgrades on state property (California State Treasurer's Office, 2006).*

- *Nonprofit Organizations*. Nonprofit organizations can serve a variety of roles. In some states, nonprofit organizations are instrumental in helping to establish the LBE program from "the bottom up" by using their analytical, educational, and/or outreach skills to obtain support for the program. In some cases, nonprofit organizations provide technical assistance, financial incentives, and other support for cost-effective energy-efficient building design, construction, renovation, equipment, lighting, and appliances. Some states establish and work with nonprofit organizations as third party administrators to develop and oversee the LBE programs.

EXAMPLES: *For example, Efficiency Vermont was established by the Vermont legislature and Public Service Board as the nation's first statewide energy efficiency utility. Efficiency Vermont provides technical assistance and financial incentives to help Vermonters and their public agencies pay for energy-efficient building design, construction, and renovation (Efficiency Vermont, 2006).*

Iowa established the State of Iowa Facilities Improvement Corporation (SIFIC), a nonprofit corporation that helps agencies implement energy efficiency measures (Iowa, 2006).

WORKING WITH ESCOS IN NEW HAMPSHIRE

New Hampshire's Building Energy Conservation Initiative (BECI) uses performance contracting to pay for energy retrofits and building upgrades with the energy savings from the project, rather than depending on funding through capital appropriations. Under this program, a pre-qualified group of ESCOs submits proposals to conduct the work based on a predetermined list of energy conservation measures established by the BECI.

Source: New Hampshire, 2006.

- *Private Sector Firms*. Many states have found that they can achieve significant benefits from partnering with private sector organizations. This can be particularly true in the case of green power purchases and clean energy generation, where consistent cooperation with private utilities can lead to discounted costs.

EXAMPLE: *In Wisconsin, for example, the state partnered with a private energy service provider to construct a 150 MW CHP plant near the University of Wisconsin at Madison that provides steam and water for campus facilities as well as 45 MW of its energy demand. The remaining energy output will be available for residential and commercial uses. The agreement includes a provision that enables the state to obtain fuel discounts that could yield savings approaching $100 million over 30 years. The utility has also agreed to work with the state to address air quality concerns associated with plant operations. (Wisconsin DOA, 2003).*

- *State- and Municipally-owned Water and Wastewater Entities*. State and municipal water supply, treatment, and distribution operations, as well as wastewater treatment facilities, typically use large amounts of energy. There can be significant opportunities to reduce net energy demand through improvements in energy efficiency and the generation of clean energy at these facilities. Several states work with water and wastewater treatment facility managers to implement LBE activities.

EXAMPLES: *In New York, for example, NYSERDA offers technical and financial assistance, including cost-sharing research, demonstrations, and business development programs, to encourage municipal water, wastewater, and solid waste facilities to adopt energy-efficient technologies (NYSERDA, 2004).*

In California, the State and Consumer Services Agency has worked with municipal water and wastewater utilities to reduce energy consumption by 15%. Facility improvements included adjusting operation schedules, increasing storage capacity, and installing equipment controls (FYP, 2003).

3.4 SET LBE GOALS

Goals are high-level statements that provide the overall context for what the state is trying to accomplish. Setting a goal or series of goals is an important step that specifies the level of clean energy to be attained within the state's facilities, operations, and fleets during a stated time period. When establishing these goals, states can consider the benefits, costs, and implementation issues associated with specific LBE activities, as described in Chapter 2, *Lead By Example Activities and Measures*. The following sections provide information on how to establish an LBE goal or goals and present a number of state examples.

PRESIDENT'S EXECUTIVE ORDER ESTABLISHES FEDERAL LBE GOALS

On January 24, 2007, the President issued an executive order on "Strengthening Federal Environmental, Energy, and Transportation Management" establishing the following LBE goals for state agencies:

- Reducing GHG emissions by 3% annually or by 30% overall, by FY 2016, based on FY 2003 levels.
- Ensuring that 50% of renewable energy consumption comes from new sources, and that on-site renewable energy projects be considered where possible.
- Reducing water consumption intensity by 2% annually or by 16% overall, by FY 2016, based on FY 2007 levels.
- Requiring procurement of sustainable products.
- Ensuring that new construction and major renovation of federal buildings comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings, and that 15% of existing buildings meet these principles by FY 2016.
- Ensuring that agency fleets annually reduce consumption of petroleum by 2% and increase alternative fuel consumption by 10% by FY 2016.
- Ensuring that ENERGY STAR features are enabled on all appropriate office equipment.

Source: White House, 2007.

3.4.1 ESTABLISH LBE GOALS

Many states have enacted LBE executive orders, legislation, plans, and policies that establish clean energy goals for their facilities and/or fleets. Setting clear LBE goals and targets for state agencies can serve a variety of purposes:

- *Help ensure that all players know the expected outcomes*. This is especially true when the goals are established by the governor or another official; demonstrating high-level commitment to LBE goals can be an effective means of garnering support for an LBE program.

- *Provide for ease of measurement and reporting*. Having quantifiable goals provides a straightforward means of evaluating progress and providing feedback when mid-course corrections are necessary.

- *Demonstrate the feasibility of establishing clean energy initiatives*. Setting LBE goals demonstrates the economic, practical, and political feasibility of establishing an LBE program, and encourages other entities to pursue clean energy strategies.

The process of setting LBE goals involves consideration of past and projected energy consumption, as well as other factors. These factors, and examples of state LBE goals, are described below.

Develop an Energy Consumption Baseline

In order to set LBE goals that are measurable and achievable it is important to use actual data and projections of future consumption. This approach involves collecting data on state energy consumption and establishing reduction goals based on 1) existing, past, and projected consumption and 2) issues that affect energy use, such as climate, the condition of the public facilities, number and square footage of state facilities, fleet size, and current clean energy technologies.

States can collect energy consumption data (e.g., electricity use in kWhs, electricity demand in kW, total fleet mileage, and miles per gallon data) at various levels, including the state (i.e., energy consumption by all state agencies), state agency, facility, or project levels. Data can be obtained in a number of ways, including:

- Sending an energy consumption questionnaire to each state agency or facility.
- Collecting energy provider invoices and utility bills that are paid by each state agency.
- Working with utilities to obtain energy consumption records from the utilities.

Using existing studies, such as state or regional energy potential studies, state energy plans, or facility surveys that have already identified energy consumption data for relevant sectors within the state.

Once annual energy consumption data are collected, some states use commercially available energy accounting software, or contract with a private service and product provider (SPP), to construct a database that enables them to track and analyze energy consumption for all state facilities. Alternatively, state LBE teams can use existing databases to help establish their LBE goals.

EXAMPLE: *For example, the South Carolina Savings Matrix is a spreadsheet tool developed by the South Carolina Energy Office (SCEO) to track energy and cost savings from all SCEO-sponsored projects since 1995. Data were grouped by category, including a category for energy efficiency projects in state and local government agencies. The South Carolina Savings Matrix has enabled SCEO to demonstrate the benefits of its energy efficiency activities. Energy office managers have used the matrix to assess the relative benefit of their energy efficiency projects (U.S. DOE, 2007).*

In cases where states are severely resource constrained, it is possible to begin estimating baseline energy consumption and potential reductions in consumption with a relatively small effort (i.e., a "pilot program" focusing on a single agency or facility). This effort can then be expanded by collecting baseline data on additional state facilities and/or end-uses as resources allow.

MASSACHUSETTS' ENERGY AND CO2 INVENTORY

Massachusetts established an Energy and Carbon Dioxide (CO2) Inventory to analyze trends in statewide CO2 emissions from energy consumption, and use the findings to provide guidance on how to further decrease emissions.

The state the Executive Office of Environmental Affairs (EOEA) created an FY 2002 baseline by state agency, and updates this information annually based upon energy consumption reports completed by the state agencies.

Source: Massachusetts, 2004, 2006b.

CALIFORNIA BENCHMARKING INITIATIVE

California Executive Order S-20-04 established an LBE goal of reducing grid-based energy purchases for state-owned buildings by 20% by 2015, compared to a 2003 baseline. The Order and an accompanying Green Building Action Plan directed the California Energy Commission to develop a methodology for establishing an energy-use benchmarking system that is simple, California-specific, and coordinated with the ENERGY SMART benchmarking system.

The CEC established an interagency Green Team to ensure progress toward these goals and hired a contractor to execute the benchmarking effort. The contractor worked with the state and California utilities to create ENERGY STAR Portfolio Manager accounts for each agency and facility (which include data on energy use, square footage, year built, and identification of meters), develop a data release form for all state agencies to sign, allowing utilities to automatically upload energy data to Portfolio Manager, and establish the data base.

California anticipates that by the first quarter of 2008, the 2003 baseline will be completed and that utilities will continue to regularly upload energy consumption data to enable comparison among buildings and tracking building performance over time.

Sources: California 2004, 2004a, 2007; Miller, 2008.

Additional information on how to collect energy consumption data and establish an energy baseline is presented in Section 6.3, *Conducting Energy and Emissions Tracking and Benchmarking*. Information on how to estimate energy reductions resulting from potential clean energy activities, including simple rules of thumb, is provided in Section 4.3, *Estimate Benefits and Costs of Prospective LBE Activities*.

Assess State Context and Other Issues

Other issues to consider when setting goals include:

- *State context*. It is important for LBE goals to be considered in conjunction with other state clean energy programs, and to reflect the state's unique priorities and goals related to the environment, economy, and energy infrastructure.

- *Sequencing*. Some states have set overall goals for state government (e.g., a reduction in state government energy expenditures) and then developed LBE programs to move the state toward these targets. Other states have chosen to assess where LBE programs are cost-effectively achievable, and then set their goals to suit.

- *Scope*. Some states, such as New York, Colorado, and Massachusetts, have enacted comprehensive LBE programs that include goals for many LBE activities. Other states have established a single goal focusing on a clean energy target for state buildings or fleets.

- *Quantitative versus qualitative goals*. Whenever possible, it is important to establish quantitative goals that can be used to measure the progress of LBE activities.

  Goals can be structured in a variety of ways, depending on a state's preferred LBE approach. Clean energy goals typically fall within the following categories:

- *An Overall Energy Savings Goal for All State LBE Activities*. Some states have established an overall energy savings goal, defined in terms of a reduction in energy use or GHG emissions that can be met through clean energy.

- *Energy Savings Goals for Existing State Buildings*. These goals are typically structured as goals to reduce energy consumption in existing state buildings by some stated percentage within a set timeframe, from a specified baseline.

- *Energy Savings Goals for New and Renovated State Buildings*. These goals can require achieving a certain percentage improvement in energy efficiency performance, a specified energy usage per square foot (e.g., an energy budget), energy efficiency design requirements, and/or other performance standards.

- *Energy-Efficient Procurement Goals*. A number of states have elected to purchase ENERGY STAR-labeled products whenever feasible or cost-effective. State governments can require or encourage the use of energy performance contracts that enable them to invest in energy-saving equipment, using future utility cost savings (or avoided costs) to pay for the improvements. Some states have developed cost-effective programs for achieving energy-efficient product purchasing targets by designating a particular government agency as the coordinating facilitator of all state agency purchases.

- *Renewable Energy Goals*. These goals typically take the form of requirements to obtain a certain percentage of electricity usage from renewable energy sources. States can also establish a minimum renewable energy purchase volume (e.g., in megawatt-hours, MWh) by a given date or set targets for on-site generation of clean energy.

NEW YORK'S "GREEN AND CLEAN" STATE BUILDINGS AND VEHICLES

New York's Executive Order 111, adopted in 2001, establishes a comprehensive LBE energy efficiency and renewable program. Applicable to all state agencies and departments, the order sets the following goals:

- Energy consumption in all state-owned, leased, or operated buildings must be reduced by 35% by 2010, relative to 1990 levels
- State agencies must set peak electric demand reduction targets for each facility by 2010
- New state buildings must achieve at least a 20% improvement in energy efficiency performance relative to the state building energy code
- Renovated state buildings must achieve a 10% improvement in energy efficiency performance
- All state entities must ensure that 20% of their annual electricity needs are met by renewable energy sources by 2010
- At least 50% of new light-duty vehicles must be alternative-fueled vehicles by 2005, and 100% of all new light-duty vehicles (with the exception of specialty, police, or emergency vehicles) must be alternative-fuel by 2010

Sources: NYSERDA, 2001, 2002.

- *Energy Savings Goals for State Fleets and Fuel Use.* These targets include requiring the purchase of a specified percentage of fuel-efficient or alternative-fuel vehicles for state fleets, setting mileage standards, establishing minimum requirements for the use of biofuels, and developing programs to encourage clean energy actions related to commuting.

3.4.2 EXAMPLES OF STATE LBE GOALS

Table 3.4.1, *Examples of LBE Goals and Targets* presents examples of how states have set their LBE goals. Appendix A, *State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs*, provides a more detailed summary of, and links to, these state actions.

TABLE 3.4.1 EXAMPLES OF LBE GOALS AND TARGETS

State/Title	Goal or Target
Overall LBE Energy Savings and GHG Emission Reductions	
Washington *Executive Order 05-01*	State agencies must reduce energy purchases by 10% by September 1, 2009 from a fiscal year (FY) 2003 baseline, using all practicable and cost-effective means available, including energy efficiency programs and use of on-site renewable resources.
Massachusetts *Executive Order 484*	Establishes a goal for GHG emissions from state operations to be reduced by 25% by 2012, 40% by 2020, and 80% by 2050, based on a FY 2002 baseline.
Existing Buildings	
Arizona *Arizona Revised Statutes 34-451*	State agencies must reduce energy use in buildings by 10% per square foot of floor area by 2008 and 15% per square foot of floor area by 2011, based on FY 2002 levels.
Iowa *Executive Order 41*	State-owned conditioned facilities must reduce energy consumption per square foot per degree day by an average of 15% from 2000 levels by 2010.
Nevada *NRS Title 58, Chapter 701—Energy Policy*	The Director of the Office of Energy is directed to prepare a state energy reduction plan to reduce grid-based energy purchases for state-owned buildings by 20% by 2015.
New Hampshire *Executive Order 2005-4*	The state shall reduce energy consumption in state facilities by 10% in accordance with the ENERGY STAR Challenge.
New and Renovated Buildings	
Maine *Title 5 MRSA 1764-A*	Statute establishes a target for state-funded new buildings and renovations over 5,000 square feet to exceed state energy efficiency standards in effect for commercial and institutional buildings by at least 20%.
Michigan *Executive Directive 2005-04*	Requires that all new construction and major renovation of state-owned facilities be consistent with LEED standards and score a minimum of 26 points on the LEED scorecard. Also requires the ENERGY STAR assessment and rating program to be extended to all state buildings.
New Mexico *Executive Order 2006-01*	New public buildings in excess of 15,000 square feet and/or using over 50 kW peak electrical demand must be designed to meet LEED-Silver standards and must achieve a minimum delivered energy performance standard of 50% of the average consumption for that building type.
	New construction and renovation of existing buildings between 5,000 and 15,000 square feet will achieve a minimum delivered energy performance standard of 50% of the average consumption for that building type.
Oregon *OAR 330-130*	All renovation and construction projects for state facilities must exceed Oregon's energy conservation building codes by at least 20%.

TABLE 3.4.1 EXAMPLES OF LBE GOALS AND TARGETS *(cont.)*

State/Title	Goal or Target
Virginia *Executive Order 48*	Establishes a goal for state agencies to reduce annual energy costs by 20% by 2010, relative to 2006 levels. State-owned facilities over 5,000 square feet and renovations of greater than 50% are required to be designed consistent with LEED and ENERGY STAR rating systems.
Washington, D.C. *Green Building Act of 2006*	New non-residential public buildings greater than 10,000 square feet must meet LEED-Silver standards, be designed to achieve 75 points on the ENERGY STAR Target Finder rating scale, and be benchmarked annually using ENERGY STAR Portfolio Manager.
Energy-Efficient Procurement	
Maryland *Executive Order 01.01.2001.02*	State agencies shall purchase ENERGY STAR products when purchasing energy-using products or shall purchase products in the top 25% in energy efficiency for products where ENERGY STAR labeling is not available.
Colorado *Executive Order 0012 07*	Requires Department of Personnel and Administration to develop policies that require state agencies to purchase equipment that is ENERGY STAR qualified and to ensure that energy-saving features are enabled where ENERGY STAR-qualified equipment is available and cost-effective.
Connecticut *Executive Order 17*	Requires that all future equipment and appliances purchased by and for executive branch state agencies shall be ENERGY STAR® certified, provided such ENERGY STAR® certified equipment and appliances are commercially available.
Renewable Energy	
Arizona *Executive Order 2005-05*	State agencies are directed to ensure that all new state-funded buildings derive at least 10% of their energy from renewable sources.
Connecticut *Executive Order 32*	State governments and universities are directed to replace an increasing share of electricity with renewable energy, toward the goal of increasing Class I renewable purchases to 20% by 2010, 50% by 2020, and 100% by 2050.
Oregon *Renewable Energy Plan*	Establishes a goal for 100% of the state government's total electricity needs to be met by renewable energy sources by 2010.
Wisconsin *Wisconsin Act 141*	Requires the Department of Administration to set renewable energy purchase goals for six agencies with an overall goal that renewable energy account for 10% of state energy purchases by 2008 and 20% by 2012.
State Fleets and Fuel Use[a]	
Georgia *Executive Order 2.28.06.02*	State agencies and departments are ordered to permanently increase employee commute miles saved by 20% through compressed work schedules, alternate work schedules, and teleworking, where appropriate as determined at the agency or department level.
Connecticut *Executive Order 22*	Requires 20% reduction in the overall state fleet by July 1, 2009 and specifies that vehicle purchases of cars and light trucks must be vehicles that are classified by the U.S. EPA as "best in class" for estimated highway gasoline mileage.
Iowa *Executive Order 41*	Directs agencies to ensure that 100% of non-law enforcement, light-duty vehicles procured by 2010 are alternative-fuel (AFVs) or hybrid-electric.
	All agencies shall ensure that bulk diesel fuel procured by the state contains at least 5% renewable content by 2007, 10% renewable content by 2008, and 20% renewable content by 2010.
Nevada *Nevada Administrative Code 486A.160*	State fleets containing 10 or more vehicles must acquire AFVs or EPA-certified ultra-low emission vehicles. Beginning in FY 2000, 90% of new vehicles purchased must be either AFVs or low-emission vehicles (LEVs).

TABLE 3.4.1 EXAMPLES OF LBE GOALS AND TARGETS *(cont.)*

State/Title	Goal or Target
Rhode Island *Executive Order 05-13*	Order establishes that all new light duty trucks must achieve a minimum of 19 miles per gallon (mpg) and be certified LEVs, and that all new passenger vehicles achieve a minimum of 23 mpg.
Wisconsin *Executive Order 141*	State agencies are required to reduce petroleum-based gasoline use in state-owned vehicles by 20% by 2010 and 50% by 2015, and to reduce petroleum-based diesel fuel use by 10% by 2010 and by 35% by 2015.

a Examples of state goals for fleets and fuel are presented in this table because many states have adopted these goals. However, this is not one of the clean energy activities described in the LBE Guide.

Source: Appendix A, State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs.

3.5 INITIATE AN LBE PROGRAM

States have designed their LBE programs based on a variety of models and launched them in different ways. In some cases the LBE team conducts the ground work to encourage a governor, state legislature or other entity to establish LBE goals. In other cases, these goals are initiated by the governor or state legislature, and the LBE team then implements the program. Examples of both approaches are presented below. Mechanisms that states have used to successfully initiate their LBE programs incorporate one or more of the following approaches:

- The state governor issues an *executive order* that establishes clean energy LBE goals and requirements for an LBE program.
- The state legislature enacts *LBE legislation* that establishes clean energy LBE goals and requirements for an LBE program.
- The state government initiates an *LBE program as part of a broader energy plan, climate plan, sustainability plan, or other comprehensive plan or policy*.
- The state energy office or other agency initiates a *clean energy LBE program*.
- *Local governments, universities, or other state or local groups adopt LBE programs* that support state goals and/or influence the state to adopt an LBE program.

States can determine appropriate mechanisms for implementation based on their review of potential LBE activities, described in Chapter 2, *Lead by Example Activities and Measures*, since some activities might require specific types of enabling authority (e.g., large expenditures on clean energy generation systems may require legislative authority).

Table 3.5.1 provides a summary of the mechanisms that states have used to initiate LBE programs. The table differentiates between mechanisms that 1) have been used to establish quantitative goals or to require a state government to take a specific LBE action and 2) encourage or recommend (but do not require) LBE action. Many states have used a combination of complementary mechanisms to produce an effective, comprehensive LBE program. Appendix A: *State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs* provides more detailed descriptions of the approaches taken by each state and provides links to sources.

TABLE 3.4.1 SUMMARY OF STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008)

Table 3.5.1 Summary of State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs (Through April 2008)

	Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Executive Order	Legislation	Plan, Policy, or Other	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
AL	●			●	●			●	●						
AK	No Activity														
AZ	●	●		●	●		●	●	●	●	●	●	●		○
AR		●		○	○		○								
CA	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
CO	●	●		●	●		●	●	●	●		●	●	●	●
CT	●	●	●	●	●		●	●	●	●	○	●	●	●	●
DC		●	●	●	●	●	●	●	●				●		
DE	●	●			○			●	●	○					
FL	●	●	●	●	●	●	●	●	○	●	●	●	●		●
GA	●		●		○			○	○	○		●	●	●	
HI	●	●		●	●	●	●	●	●	●	●	●	●	●	●
ID	●				●										
IL	●	●	●	●	●			●	●	●		●	●	●	●
IN	●		●	○	○					●			●		○
IA	●		●	●	●			●		●	●	●	●	○	○
KS	●	●			●			●	●			●	●		
KY	●	●	●	●	●	●		○	○	○	○	●	●		○
LA	●	●		●	○	○		○	○	○	○	○	○	○	○
ME	●	●	●	●	●		●	●		●		●	●	●	●
MD	●	●		●	●	●	●	●	●	●	●		●		●
MA	●		●	●	●		●	●	●	●			●		●
MI	●			●	●	●	●	●	●			●	●		○
MN	●	●		●	●			●		●		●	●	●	●
MS	No Activity														
MO		●		●	●								●		
MT	●	●		○	●		○	○	○	○			●		○
NE	●												●		
NV		●		●	●		●						●		
NH	●		●	●	●	●		●	●			●	○	●	●
NJ	●	●		●	○		●	●	●	●		○	●		●
NM	●	●		●	●		●			●	●	●	●	●	●
NY	●	●	●	●	●	●	●	●	●	●		●	●		
NC	●	●	●	●	●		○	●	●	○		●	●	●	●
ND	No Activity														
OH	●	●		●	●			●				●	●		●
OK	No Activity														
OR	●	●	●	●	●			○		○	●	○	●		○
PA	●		●	○	●		○	●	●	●		○	○		○
RI	●		●	●	●		●			●		●	●	●	
SC		●		●	●			●	○						○
SD	No Activity														
TN		●										●	○		
TX	●	●		●	●			●	●	○	○	●	●		●
UT	●	●	●	○	●			●	○	○	○	●	○	●	
VT	●	●	●	●	●	○		●	●	○		●	○	○	●
VA	●		●	●	●	●	●	●	●	○	●	●	●	●	●
WA	●	●		●	●		●			●	○	●	●	●	●
WV		●											●		
WI	●	●		●	●		●	○		●	○	●	○	●	○
WY	No Activity														

Key	
●	Directs or requires implementation of LBE action, directs or requires action to be taken toward implementation of LBE action, requires attainment of a specific LBE goal, or otherwise establishes numerical targets for specific LBE activities.
○	Promotes --but does not require -- LBE action, recommends LBE action, requires the development of recommendations for LBE action, establishes general or non-numerical goals, or requires pursuit of opportunities to implement LBE activities generally.
*	Has not been enacted or is currently under consideration
No Activity	While states labeled "No Activity" may have individual LBE programs, these programs were not initiated by an LBE goal (i.e., via an executive order, legislation, plan, policy).

Source: Appendix A, State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs

3.5.1 GOVERNOR ISSUES AN LBE EXECUTIVE ORDER

Many state governors have issued executive orders establishing LBE goals, programs, and specific requirements for state agencies to follow. Executive orders typically have the following advantages:

- Since it is signed by the governor, an executive order gives the state's clean energy LBE activities an official status.
- Top-level commitment to a coordinated set of clean energy policies is key to ensuring effective follow-through on implementing LBE activities.
- Executive orders are a time-efficient means of establishing clean energy objectives for state governments.
- A series of executive orders can be issued over time to change and/or expand LBE program requirements as technology and information improves (see Massachusetts text box).
- Executive orders can be used to create cabinet-level task forces or similar formal offices to pursue clean energy policy goals (e.g., Delaware Energy Task Force, Iowa Energy Coordinating Council, Florida Energy 2020 Study Commission, New Mexico Solar Power Task Force, Oregon Renewable Energy Action Plan, West Virginia Energy Task Force, and Wisconsin Energy Efficiency and Renewables Task Force).
- Executive orders can be effective as a mechanism for reinforcing a governor's energy plan. In Utah, for example, Executive Order 2006-04 (Utah, 2006a) was used to codify LBE goals set forth in the governor's policy for advancing energy efficiency (Utah, 2006b).

On the other hand, a potential disadvantage associated with executive orders is that they require a governor who is convinced of the value of LBE activities and takes the lead on ensuring the order is implemented. As such, executive orders can be rescinded or go unenforced after a new governor takes office. To be effective and enduring after the issuing governor leaves office, executive orders can be reinforced with complementary legislation or administrative rules that build on the framework provided by an executive order.

MASSACHUSETTS EXECUTIVE ORDER BUILDS ON EARLIER EXECUTIVE ORDER AND ADMINISTRATIVE BULLETINS

In 2002, the Massachusetts governor issued Executive Order 438, which created a Sustainability Coordinating Council with the responsibility of developing and maintaining a State Sustainability Program. The order required state agencies to work with the Council to develop policies to:

- Reduce energy consumption in state facilities.
- Reduce GHG emissions by 25% by 2012 based on 2002 levels.
- Promote environmentally-appropriate facility siting.
- Increase purchase of environmentally preferable products.

Building on the goals of this initiative, the state Executive Office for Administration and Finance issued three administrative bulletins in 2006:

- Bulletin 11 directed the Sustainability Coordinating Council to develop guidance for state agencies to help reduce energy consumption by 15% by 2010.
- Bulletin 12 established the "LEED-Plus" design standard for new construction and major renovations of facilities.
- Bulletin 13 established minimum requirements for use of bio-fuels in state vehicles and buildings by state agencies.

In 2007, the new governor issued Executive Order 484, which incorporated the goals set forth in Executive Order 438 and Bulletins 11 and 12. In addition, Executive Order 484 included the following goals:

- Reduce GHG emissions from state government operations by 40% by 2020 and 80% by 2050, based on 2002 levels.
- Reduce energy consumption per square foot in state buildings by 20% by 2012 and 35% by 2020.
- Obtain 15% of energy demand from renewable sources by 2012, and 30% by 2020.
- Reduce potable water use by 10% by 2012 and 15% by 2020 based on 2006 levels.

Sources: Massachusetts, 2002; 2006c; 2006d; 2006e; 2007.

3.5.2 STATE ENACTS LBE LEGISLATION

A second mechanism for establishing LBE initiatives is to enact state legislation. This can be accomplished via a comprehensive package or through sequential bills targeting individual LBE initiatives. Legislation that mandates a comprehensive package of policies, such as the South Carolina Energy Efficiency Act, can provide a robust framework for an LBE program. In addition, certain aspects of an LBE program may *require* legislation. For example, legislation may be required:

- *If changes to tax codes are necessary*, such as appropriating funds to finance the LBE program.
- *To provide funding sources to establish LBE programs* (e.g., an initial endowment for a revolving loan fund).
- *To modify procurement regulations* such as implementing life-cycle costing for purchasing decisions, releasing state agencies from mandatory low-bid requirements when buying Green Power, or allowing agencies to enter into long-term energy service agreements for performance contracting.

Other uses of legislation are to:

- *Establish key components of state LBE programs*. For example, Montana, Texas, and Iowa have enacted legislation to create revolving loan funds that can be used to finance energy efficiency improvements in state facilities. Colorado and Washington have passed bills to facilitate performance contracting in state facilities.
- *Authorize a government department or agency to oversee the implementation and operation of a state's LBE program*. Legislation in Maine, for example, created the Clean Government Initiative (Maine, 2006), which assists state agencies and state-supported institutions of higher learning to incorporate environmentally sustainable practices into all state government functions.

While legislative authority provides a solid foundation for an LBE program, the legislative process can be slow and uncertain, resulting in delays and/or lack of support for the anticipated LBE legislation. States have found that pairing legislation with a high-profile executive order can provide an LBE program with both momentum and longevity.

SOUTH CAROLINA ENERGY EFFICIENCY ACT

South Carolina passed legislation that establishes comprehensive requirements for a state LBE program. The Energy Efficiency Act established requirements for a state energy plan and policy and established the state energy office. The Act includes the following requirements:

- Implementation of energy efficiency standards in state-owned and -leased buildings, including public school buildings, which must provide for life-cycle cost-effectiveness.
- State agency energy conservation planning, metering, and reporting.
- Energy conservation savings requirements, which specified that an agency's budget must not be reduced by the full amount of money saved through energy conservation measures.
- Performance contracting requirements.
- Establishment of a revolving loan fund for energy efficiency.
- Energy-efficient product procurement.
- Lease purchase agreements with energy efficiency product vendors and utility companies.
- Guaranteed energy, water, or wastewater savings contracts for the evaluation, recommendation, and implementation of energy, water, or wastewater conservation measures.

Source: South Carolina Legislature Online, 2005.

3.5.3 LBE PROGRAM INITIATED THROUGH THE STATE PLANNING PROCESSES

A third mechanism is to initiate an LBE program as part of a broader state energy plan, climate plan, sustainability initiative, or other comprehensive initiative. States can incorporate LBE policies into these plans and/or use the LBE activities as a key driver for implementing these plans. For example, Connecticut's Climate Change Action Plan is a blueprint for achieving cost-effective GHG reductions within the state. The inclusion of LBE activities played a major role in developing the plan, since the state recognized the importance of adopting clean energy activities within its own operations prior to encouraging other sectors to implement similar programs. (See Section 1.5, *Overview of the LBE Process*, for more detailed information about how Connecticut developed its Climate Change Action Plan.)

Incorporating LBE policies into a related clean energy plan can be an important first step in building support for a comprehensive LBE program. However, such policy and planning decisions often lack the directness of an executive order or legislation. Also, as with executive orders, policy and planning decisions can be revised, dropped, or unenforced when the executive administration changes. Combining these policy initiatives with statutory legislation or with an executive order can provide the reinforcement necessary to ensure effective implementation.

3.5.4 STATE ENERGY (OR OTHER) OFFICE INITIATES PROGRAM

In some states, the energy agency (or other office involved with clean energy, environmental, and/or facilities management issues) initiates the state's LBE program. This state agency may conduct background research and assemble preparatory data (e.g., on the costs and benefits of an LBE program) that can be instrumental in providing information that the governor needs to enact an executive order or that can help spur legislative action.

In New York, for example, NYSERDA prepared a draft executive order on energy efficiency in state buildings and fleets, based on an analysis of federal Executive Order 13123, *Greening the Government through Efficiency Energy Management*, and information on LBE activities obtained from other states. NYSERDA shared the draft order with the governor's office and key state agencies, and worked with these offices to develop support for Executive Order 111, "Green and Clean" State Buildings and Vehicles. (See Section 3.2, *Identify and Obtain High-Level Support*, for additional information on ways to gain policymaker support for clean energy LBE programs.)

3.5.5 LOCAL GOVERNMENTS OR OTHER STATE/PUBLIC ORGANIZATIONS ADOPT PROGRAMS THAT INFLUENCE STATE LBE ACTIONS

Clean energy LBE actions taken at the local level and by nonprofit organizations, regional groups, universities, and other organizations in the state can influence LBE action at the state level by serving as models and by reaching out to actively engage state governments. In both ways, these organizations can assist states by illustrating the potential energy savings and cost savings from clean energy actions.

Local Governments

Many local governments have developed their own LBE and other clean energy initiatives that can serve as models for state activities. In some instances, local governments have also reached out to include state governments in their clean energy LBE activities. States can look toward these local actions to help build a case for their own state LBE program. For example:

- *Salt Lake City's* Green initiative provides an example that can serve as a model for states. This initiative includes numerous LBE activities, such as high-performance buildings, green power purchases, building energy conservation, water conservation, and recycling. The city also requires new and renovated public buildings to be LEED-Silver certified.

  Salt Lake City has significantly reduced its energy costs through this program. The city replaced its city and county buildings' incandescent bulbs with more energy-efficient compact fluorescent bulbs, saving over $33,000 a year and reducing carbon dioxide (CO_2) emissions by 344 tons per year. The city also saves over $32,000 a year on its energy costs from the installation of 861 LED traffic signals, an initiative it plans to expand to include all of its 1,630 traffic signals. This expanded measure is expected to save over 500 tons of CO_2 each year with an annual cost savings of $53,000. The city invested a portion of the savings from these energy conservation measures in renewable energy; it is now the largest purchaser of Blue Sky wind energy in the state (Salt Lake City, 2005).

- *Burlington, Vermont* is a local government that has reached out to include state government in its clean energy LBE activities. Burlington produced a climate action plan in 2000 that established goals for reducing GHG emissions in the city, including emissions from municipal government operations. It formed the Alliance for Climate Action to implement the action plan's recommendations. Part of the Alliance's mission is to expand its activities beyond the city level by involving regional and state entities. The state Department of General Services and the University of Vermont, along with numerous local government agencies, have joined

KING COUNTY, WASHINGTON – MODEL CLEAN ENERGY LBE PROGRAM

In 1989, King County, Washington established an environmental purchasing program that enables county government purchasers to select environmentally preferable office equipment, automotive parts, vehicles, maintenance products, and construction and landscaping materials. Overall, the program saved the county $675,000 in 2005.

The county also provides guidance to other governments, including a model policy for procuring environmentally preferable products and a description of the program and its benefits.

In 2006, King County was appointed to the Responsible Purchasing Network, an organization of federal, state, and local governments; non-profits; and private firms that assist jurisdictions in designing and implementing environmental purchasing programs.

Source: King County, Washington, 2006.

Burlington as members of the Alliance and are working to implement the *10% Challenge* initiative to reduce GHG emissions by 10% by 2010.

U.S. MAYORS CLIMATE PROTECTION AGREEMENT

Inspired by a challenge from the mayor of Seattle in 2005, an agreement was passed by the U.S. Conference of Mayors pledging to take local action to reduce global warming. The agreement goals are based on the targets outlined in the Kyoto Protocol, and include such actions as purchasing green power, improving energy efficiency in existing buildings, purchasing only ENERGY STAR equipment and appliances for public use, promoting sustainable building practices using LEED standards, increasing fuel efficiency of municipal fleets, improving water conservation and efficiency practices, and educating the public about the need to take action.

Source: U.S. Conference of Mayors, 2005.

Regional Organizations

Regional organizations can also influence and/or provide support for state-level LBE actions. For example:

- *The Puget Sound Clean Air Agency* works in partnership with U.S. Environmental Protection Agency and the Washington State Department of Ecology to protect public health in four counties. By implementing its own clean energy policies at the sub-state level, the agency serves as a bridge between state and local LBE activities (Puget Sound Clean Air Energy, 2006).

- *The Conference of New England Governors and Eastern Canadian Premiers* developed a Climate Change Action Plan in 2001 with the goal of reducing GHG emissions to 1990 levels by 2010, and to 10% below 1990 levels by 2020. One action item was for governments to "lead by example" by reducing emissions within the public sector by 25% by 2012. The plan called on governments to encourage the purchase of fuel-efficient vehicles and sustainable building design, to educate government employees about clean energy opportunities, to create a market for environmentally preferable products, and to develop a regional clearinghouse of operations and maintenance best practices. The plan has had a significant influence on several state LBE programs, including Connecticut's Climate Change Action Plan, which includes LBE as a major component (NEG-ECP, 2006).

THE NORTHWEST ENERGY EFFICIENCY ALLIANCE

The Northwest Energy Efficiency Alliance is a non-profit regional organization that brings together state and local governments, electric utilities, public interest groups, and energy efficiency industrial representatives to encourage marketplace adoption of energy-efficient products and services. The alliance supports and creates partnerships with local government associations in Idaho, Montana, Oregon, and Washington, providing a forum for information sharing.

Source: NWEA, 2006.

Nonprofit and Other Organizations

Nonprofit organizations have developed clean energy initiatives and conduct other activities that can provide support for state LBE programs. For example:

- *The Rocky Mountain Climate Organization (RMCO)* started the Colorado Climate Project, which is modeled after several state climate change initiatives. RMCO is a coalition of more than 30 local governments, utilities, businesses, and nonprofit organizations whose goal is to communicate the effects of climate change and provide information on how to address these impacts. The project's mission is to reduce the state's contributions and vulnerability to climate change by developing and promoting a Colorado Climate Agenda of actions to reduce the state's GHG emissions. The recommended agenda will be presented to the state's governor, legislature, and other policymakers (RMCO, 2006).

THE AMERICAN COUNCIL ON RENEWABLE ENERGY (ACORE) HIGHER EDUCATION COMMITTEE

The ACORE Higher Education Committee (HEC) is an extra-governmental entity that supports and influences state government LBE activities. The HEC aims to demonstrate the potential for a transition to a cleaner, more secure, more reliable, and less expensive energy future, and to develop educational materials and curricula about energy in schools. To achieve these objectives, the committee established goals to encourage 100 U.S. colleges and universities to:

- Purchase 100% renewable energy by 2010.
- Invest at least 10% of their endowments into funds that support renewable energy companies by 2010.
- Create renewable energy courses of study by 2010.

Source: ACORE, 2006.

- *The Northeast Energy Efficiency Partnerships (NEEP)* is a nonprofit organization working to advance energy efficiency in the Northeast. NEEP composed a letter to the governor of Connecticut commenting on recommendations by a working group of representatives from the Department of Public Utility Control, the Office of Consumer Counsel, and the Energy Conservation Management Board in the report *On Energy Efficiency Opportunities at State Facilities*. NEEP voiced support

for the recommendations, suggested six additional opportunities for improving energy efficiency in state facilities, and offered its assistance in implementing these recommendations. (NEEP, 2005; Department of Public Utility Control, 2006).

- *The Association of Washington Cities (AWC)* is a private, nonprofit corporation that represents Washington's cities and towns before the state legislature and other state organizations. Through its Local Government Energy Project, the AWC provides assistance to member governments on energy efficiency and energy policy matters. The association also monitors regional and state energy policy issues and represents its constituent cities in state and federal energy policy development (Association of Washington Cities, 2006).

- *The National Governors Association (NGA)* launched its Securing a Clean Energy Future (SCEF) Initiative in July 2007 with the objective of enlisting all U.S. governors in enacting clean energy policies at the state level. NGA is developing a variety of tools, including guides, reports, regional workshops, and national summits, to help governors understand the specific energy challenges in their states and implement policies to address these challenges. In addition, the SCEF initiative emphasizes the role of public-private partnerships to assist states in achieving their clean energy goals. In one such partnership, Greening State Capitols, the SCEF Initiative has joined with Wal-Mart Stores, Inc. to conduct energy audits of state capitol complexes. A team of Wal-Mart engineering experts will perform energy audits for up to 20 state capitol complexes during 2008 and 2009. The audits, which will be free to the states, will recommend energy efficiency improvements and provide estimates of resulting CO_2 emissions. A second partnership is with the Climate Savers Computing Initiative (CSCA), a nonprofit initiative founded by Google and Intel to encourage the use of more energy-efficient computers and servers in state offices and agencies. Participating states agree to reduce energy consumption from a majority of their computing equipment by: 1) pledging to purchase computer equipment that meets or exceeds ENERGY STAR ratings, 2) optimizing existing computer systems by educating employees about energy efficient computer power management strategies, 3) and over time, purchasing computing equipment with increasing levels of energy efficiency. (NGA, 2008, 2008a, 2007).

Another recent NGA initiative is the *Advanced Energy Strategies for Buildings* Policy Academy, designed to help states develop an action plan and implementation strategy around improving energy use in buildings. NGA's Center for Best Practices selected seven states to participate in this program.The state teams will work with leading experts to develop action plans that identify cost-effective strategies for reducing energy use in buildings; design new policies, programs, and measures that promote energy efficiency and renewable energy; and develop innovative financing and funding options (NGA, 2008b).

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TABLE 3.5.2 CHAPTER 3: ESTABLISH THE LE PROGRAM FRAMEWORK: SELECTED RESOURCES

State	Title and Description	URL
Examples of State Plans and Guidance for Implementing LBE Programs		
Connecticut	The Leading by Example report details steps taken by the Connecticut state government to establish framework for developing a Climate Change Action Plan for the state. This report and other links on the Connecticut Climate Change Web site provide information on the process used to develop the plan and current LBE initiatives for implementing the plan.	Report: *http://ctclimatechange.com/StateActionPlan.html* Web site: *http://www.ctclimatechange.com/rbf_rept.html*
Maine	Maine's Clean Energy Government Website details the energy-related accomplishments of Maine's Clean Government Initiative – including energy efficiency in state buildings, energy efficiency in fleets, and use of renewable energy.	*http://www.maineenergyinfo.org/examples.html*
Massachusetts	The Agency Sustainability Planning and Implementation Guide is intended to help state agencies understand the environmental impacts of their day-to-day operations and implement specific actions as part of the broader State Sustainability Program.	*http://www.ncprojectgreen.com/Documents/AgencySusGuide.pdf* *http://www.mass.gov/envir/Sustainable/pdf/ss_guide_web.pdf*
New York	NYSERDA has developed "Green and Clean" State Buildings and Vehicles Guidelines to aid state agencies in implementing Executive Order No. 111.	*http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf*
State Executive Orders for Initiating LBE Programs		
Massachusetts	Executive Order 484 establishes goals for state agencies for energy consumption reduction, GHG emission reductions, and use of renewable sources.	*http://www.mass.gov/Agov3/docs/Executive%20Orders/Leading%20by%20Example%20EO.pdf*
Virginia	Executive Order 48 establishes goals for state agencies to reduce annual energy costs.	*http://www.governor.virginia.gov/initiatives/ExecutiveOrders/pdf/EO_48.pdf*
Resources for Implementing LBE Programs		
California Public Utilities Commission	California's Local Energy Efficiency Program (CALeep) designs and implements energy efficiency strategies for communities—maximizing the use of existing energy efficiency initiatives and resources.	*http://www.caleep.org/*
National Governors' Association	Securing A Clean Energy Future is an NGA initiative that provides state governments with resources on clean energy opportunities. The Web site provides best practices and state initiatives.	*http://www.nga.org/portal/site/nga/menuitem.751b186f65e10b568a278110501010a0/?vgnextoid=f080dd9ebe318110VgnVCM1000001a01010aRCRD&vgnextchannel=92ebc7df618a2010VgnVCM1000001a01010aRCRD*

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CHAPTER FOUR

Screening LBE Activities and Measures

This chapter addresses the second important step in developing a LBE program: screening an initial set of potential LBE activities and measures (as described in Chapter 2) to identify a subset for inclusion in the state's LBE portfolio.

To assist in this process, several "rules of thumb" are presented that can be used to establish a high-level estimate of the benefits and costs of LBE activities and measures. For states seeking a tailored analysis, a series of well-regarded and interactive "preliminary assessment tools" are also provided. This chapter also describes options for those interested in working with a consultant, efficiency program administrator, or energy services company (ESCO) for detailed technical assistance on activity and measure selection. Information is also presented on methods for refining these initial screening results over time as state priorities are clarified and additional resources become available.

This chapter is organized around the following four key steps in screening LBE activities and measures:

- Selecting an initial set of LBE activities and measures for assessment.
- Developing criteria to use in assessing the prospective LBE activities and measures.

DOCUMENT MAP

CHAPTER FOUR CONTENTS

Related appendices:

Appendix B, State and Local Clean Energy LBE Programs: Examples, Tools, and Information Resources. This appendix presents examples of state and local LBE activities, as well as resources for each of the activities described in this chapter.

Appendix H, State LBE Tracking Tools and Resources. This appendix presents both simple and complex tools that states can use to estimate energy consumption reductions from LBE activities and the environmental and economic benefits associated with these reductions.

- Estimating the costs and benefits of each LBE activity and measure using simple assessment tools and rules of thumb.

- Selecting the LBE activities and measures to include the state LBE program, using the selection criteria to assess the relative costs and benefits of each potential activity or measure.

4.1 SELECT LBE ACTIVITIES AND MEASURES FOR SCREENING

The first step in LBE screening is to identify the broad set of prospective activities and measures for consideration. This set of options can include all or some of those identified in Chapter 2, *Lead by Example Activities and Measures*. The decision on which activities and measures to include is based on how likely each is to assist states in meeting their overall LBE goals, as identified when establishing the LBE program framework (see Chapter 3, *Establish the LBE Program Framework*).

4.2 DEVELOP ASSESSMENT CRITERIA

After identifying a broad set of activities and measures for consideration, states can develop criteria for determining which to include in their LBE program. Developing criteria involves balancing priorities and requirements specific to state needs and circumstances. Criteria may include:

- *Energy Savings.* States can compare anticipated energy savings across LBE activities or establish a minimum threshold, such as a specific percentage contribution toward an LBE goal.

  EXAMPLE: *One criterion used by the Connecticut Working Group on energy efficiency opportunities at state facilities is potential energy savings (Department of Public Utility Control, 2005).*

- *Financial Criteria.* Common criteria are payback periods and life-cycle costs. Funding availability for candidate LBE activities can also be an important financial criterion, since states might want to save money and reduce administrative effort by prioritizing activities for which funding is readily available or easily obtained. Some funding mechanisms are available only for specific activities (e.g., loans for energy efficiency investments typically cannot be used to fund green power purchases). (See Section 5.2, *Funding the LBE Program*, for more information on funding mechanisms.)

  EXAMPLE: *The Colorado Greening Government Planning and Implementation Guide directs state agencies to prioritize actions that take into account life cycle costs and to select the ones with the shortest payback periods (Colorado, 2006).*

- *Environmental Benefits.* Criteria can address key environmental concerns, such as requiring LBE activities to contribute a certain percentage to state government GHG emission reduction goals.

  EXAMPLES: *In Pennsylvania, the Governor's Green Government Council was directed to facilitate government practices that would reduce state government's emissions to zero (Pennsylvania, 1998).*

  A Colorado executive order requires the state Greening Government Coordinating Council to implement activities that prevent pollution and conserve natural resources, in addition to saving energy (Colorado, 2005).

- *Economic Development.* States can look for activities that encourage local economic development and job growth in the state.

  EXAMPLE: *For example, an executive order directs the Oregon Sustainability Board to encourage state LBE activities that support in-state bio-energy markets (Oregon, 2006).*

- *Visibility.* Criteria can focus on LBE activities that are highly visible or are likely to have spillover effects into the private sector. This can include giving priority to LBE activities in state facilities (e.g., schools) where the public has the most contact, or to energy-efficiency product procurement activities that can stimulate the local economy and encourage the development of energy efficiency service markets.

- *Feasibility.* Criteria can be based on likelihood of success or ease of implementation. Feasibility criteria can be informed by LBE activities in other states and may include political feasibility, such as timing (e.g., activities that can be implemented within the current election term) and addressing the clean energy needs of key stakeholders.

  EXAMPLES: *In addition to considering energy savings, the Connecticut Working Group on energy efficiency*

opportunities at state facilities identified activities based on their ability to be implemented immediately (Department of Public Utility Control, 2005).

The governor of Pennsylvania directed the Interagency Task Force on Energy to facilitate activities that foster strong working relationships with stakeholders (Pennsylvania, 2002).

When developing feasibility criteria, it is helpful to identify barriers to the state's ability to implement LBE activities and measures. States can select options for which barriers are minimal or for which there are clear strategies for overcoming them. A variety of barriers are applicable across *all* LBE activities and measures, including lack of management commitment, limited information and knowledge, limited time and staff availability, lack of comprehensive measurement tools and methodologies, financial barriers, policy and political disincentives and issues, and length of time required for decision-making (NAPEE, 2008).

In addition, states encounter barriers that affect *specific types* of LBE activities. Assessing these barriers can provide states with valuable information when determining the most appropriate activities to include in their LBE program. Table 4.2.1 presents a summary of barriers by type of LBE activity and options for overcoming them. Additional information on developing strategies for lowering both activity-specific and general LBE barriers is provided in Chapter 5, *Develop LBE Program.*

4.3 ESTIMATE BENEFITS AND COSTS OF LBE ACTIVITIES

The next step in screening LBE activities and measures is conducting an initial estimate of the potential benefits and costs based on the criteria identified above. The simple screening tools described in this section can help quantify the energy savings, costs, emission reductions, and other effects of prospective LBE options at a level of rigor that is sufficient for initial purposes.

Prior to using these tools, it is important to gather baseline information on the energy consumption and size (e.g., building square footage, number of vehicles) of state facilities, operations, and fleets, and associated expenditures. As noted in Section 3.4.1, *Establish LBE Goals,* this information may have already been collected for the purpose of setting LBE goals. For more information on developing a baseline, see Section 6.3, *Conduct Energy and Emissions Tracking and Benchmarking.*

Section 4.3.1 presents rules of thumb for obtaining an initial impression of the quantitative costs and benefits of prospective LBE activities and measures, and Section 4.3.2 summarizes tools to help make further assessments of the effects of LBE activities.

MICHIGAN - FINANCIAL CRITERIA FOR DEVELOPING AN ENERGY REDUCTION STRATEGY

The Michigan Department of Management and Budget (DMB) is developing an energy reduction strategy to reduce utility expenditures by 10% for DMB-managed and owned buildings by the end of 2008 based on utility expenditures in 2002. Criteria for determining the overall strategy include:

- Ensure "low-hanging fruit" has been picked.
- Focus on improvements that offer 20%-40% rate of return.
- Strive for a payback of five years of less.

LBE activities selected on the basis of these criteria include:

- Energy conservation and use reduction measures.
- Green power renewable energy (purchasing methane landfill gas).
- Improved maintenance and upkeep.
- Procurement and billing management.
- Renegotiation of energy contracts.

Sources: Michigan, 2005 and 2007.

MASSACHUSETTS STATE SUSTAINABILITY PROGRAM: SELECTION CRITERIA

The Massachusetts *Agency Sustainability Planning and Implementation Guide* outlines a wide range of LBE activities and measures related to:

- GHG emission reduction strategies.
- Sustainable design and construction (new and existing facilities).
- Environmentally preferable purchasing.

It directs state agencies to prioritize and select LBE measures based on:

- Overall cost.
- Potential environmental impact.
- Payback period.
- Ease of implementation.

Source: Massachusetts, 2004.

TABLE 4.2.1. BARRIERS TO INDIVIDUAL LBE ACTIVITIES

LBE Activity	Barrier	Possible Response
Energy Efficiency Measures in Existing Buildings	▪ Leasing, rather than owning, state facilities can be a barrier to retrofit programs because the building owner, rather than the state, is responsible for the building infrastructure. Thus, states have limited influence on whether energy efficiency measures are implemented.	▪ Make the case to the building owner and manager that energy cost savings result from energy efficiency measures. ▪ Incorporate ENERGY STAR criteria into lease agreements when they are renegotiated for renewal ▪ Establish executive orders or legislation to direct state agencies to give preference to ENERGY STAR and LEED-certified spaces when pursuing building spaces for lease.
Energy Efficiency Measures in New Buildings / Green Buildings	▪ High capital costs present a financial hurdle. ▪ Actual energy and cost savings are sometimes less than anticipated. ▪ Architects and designers may be unwilling to commit the additional effort needed to make the integrated design process fully effective.	▪ In some cases it may make sense to incorporate green principles in a retrofitted building rather than design a new structure, since it is easier to access the O&M budget and to make the case using life-cycle cost analysis. ▪ When making the case for green buildings, use realistic estimates of benefits. ▪ States can choose to offer designers and architects energy performance bonuses to be distributed only if the building meets an agreed-upon efficiency target. ▪ Consider innovative funding mechanisms, such as performance contracting.
Energy-Efficient Product Procurement	▪ Some states require government purchasing agents to make purchase decisions based on products with the lowest upfront costs. However, energy savings from energy-efficient products are not realized until the products are employed. ▪ Purchasing authority is sometimes dispersed across agencies.	▪ When mandatory low-bid requirements are in place, legislative authority may be required to modify procurement regulations to require life-cycle costing. ▪ Investigate the possibility of aggregating purchasing contracts among state agencies.
Green Power Purchasing	▪ The market can fail to value the benefits of renewable energy. ▪ Green power is more expensive than conventional generation. ▪ Externalities are not included in the price of conventional electricity.	▪ Set targets to ensure green power usage. ▪ Provide recognition for green power users. ▪ Offer exemptions from utility fuel clause adjustment and future environmental control costs.
Clean Energy Generation	▪ New technologies must compete with mature power generation technologies. ▪ Regulatory disincentives, such as non-uniform interconnection standards and environmental permitting, can present barriers to implementing new clean energy technologies.	▪ Build on knowledge from private sector through communications outreach. ▪ Establish interagency partnerships to create leverage on industry. ▪ Establish tax credits and subsidies. ▪ Standardize interconnection standards (i.e., at the federal level).

ADVANTAGES OF USING SIMPLE SCREENING TOOLS

Benefit and cost calculations based on rules of thumb and/or simple screening tools require relatively little analytical work, are usually transparent, and are easily adapted to an initial screening of LBE activities, which may be repeatedly revised and redefined over the course of the program development and implementation.

4.3.1 RULES OF THUMB

Rules of thumb can be used to provide rough estimates of the benefits and costs of prospective LBE programs and help determine the specific activities and measures to pursue. These rules of thumb are typically simple calculations that produce first-order approximations suitable for an initial screening. While these calculations require relatively little analytical work and are less data-intensive than other approaches, they necessarily provide only approximate, "ballpark" estimates. Cost and benefit estimates derived from rules of thumb can vary greatly based, for example, on region, weather conditions, and other factors. As a result, they are not typically the sole basis for making final decisions about which LBE activities to include in a state program and are rarely, if ever, used to make energy savings claims in a regulatory setting.

Table 4.3.1 provides rules of thumb for the following LBE activities:

- Energy Efficiency in Buildings
- Green Buildings
- Energy-Efficient Product Procurement
- Green Power Purchases
- Clean Energy Generation

4.3.2 PRELIMINARY CLEAN ENERGY ANALYSIS TOOLS

The rules of thumb described above provide rough estimates for the purpose of screening LBE activities. Numerous tools and resources exist for going beyond these rough numbers to develop more rigorous calculations of the benefits and costs of LBE activities and measures. Eleven easy-to-use clean energy analysis tools, categorized by type of tool, are summarized in Table 4.3.2. States can use these tools to: 1) help assess the energy performance of energy efficiency approaches being considered in new and existing buildings, 2) estimate GHG and air pollutant emission reductions, 3) estimate energy savings at the community level, and 4) investigate the financial impacts of efficiency investments. If states require a higher degree of accuracy or precision in their results than what is offered by rules of thumb or preliminary assessment tools, they can follow the suggestions in the text box below (See "Further Quantitative Analysis").

Estimating the benefits of LBE activities and measures can be conducted *prospectively* or *retrospectively* with respect to program implementation. The tools and resources describe in this chapter are prospective in nature. However, once states have implemented a suite of activities it is important to look backward and conduct a retrospective assessment of program effectiveness. This topic and the related post-implementation step of tracking the progress of LBE activities and measures are addressed in detail in Chapter 6. A In addition, Appendix H, *State LBE Tracking Tools and Resources*, contains an annotated inventory of a wide range of tools for tracking energy savings, environmental emissions, economic benefits and other clean energy impacts and evaluating LBE programs and activities

FURTHER QUANTITATIVE ANALYSIS

Ultimately, more extensive analysis may be needed beyond the rules of thumb and preliminary assessment tools that provide an initial sense of the costs and benefits of LBE activities. Because the development of LBE activities is typically an ongoing, iterative process, further analysis is useful over time to make revisions to LBE program activities, design, and implementation, based on program experience and retrospective evaluations. A detailed analysis requires assembling extensive data on baseline energy consumption by state facilities and clean energy generation, including:

- Making plausible and transparent assumptions about future trends for energy consumption.
- Considering hiring outside expertise to help conduct the energy analysis, and using more sophisticated quantitative assessment tools.
- Assessing the amount of time and effort to invest in analysis – often, there are diminishing returns. The initial investment provides a large amount of helpful information about the measures, but reaching the next level of precision may require considerably more expense and analytical expertise.
- Ensuring that the state has its own expertise even if outside experts conduct the analysis. It is important to understand the underlying assumptions of the model, assess whether those assumptions are appropriate to the state, and communicate results to key stakeholders.

TABLE 4.3.1 RULES OF THUMB

ENERGY EFFICIENCY IN BUILDINGS					
	Benefits				
Cost Premiums	Energy Savings	Cost Savings	Increased Productivity	Economic Development	Other Benefits
Standard lighting retrofits: $0.90-$1.20 per square foot.[a]	*Existing buildings:* overall consumption reductions of 20% to 30%, with reductions as high as 35%-40%, depending on aggressiveness.[f]	*Existing buildings:* reducing consumption by 20% to 30% can produce savings from 6%-9% of *total annual costs*.[l]	*Existing buildings:* improved comfort and better air quality can increase productivity.	*Existing buildings*: For every $1 spent in local economy, energy efficiency generates 57¢- 84¢ more economic activity than does payment of energy bills.[p]	*Existing Buildings:* energy efficiency investments can increase asset value by $2.00-$3.00 for each $1.00 spent.[q]
High-efficiency packaged and split system A/C equipment: $100-$180 per ton more than standard efficiency models.[b]	*Retro-commissioned commercial building:* average savings of 1.7 kWh/ft2 and average overall energy savings of 15%.[j]	*Converting constant volume HVAC systems to variable air volume systems:* can save between $0.10/ft2 to $0.20/ft2 or 10%-21% of HVAC energy costs.[m]	*Retrofitted buildings:* Increased savings from enhanced productivity can equal up to 10 times the energy cost savings.[n]		*Existing buildings:* a lighting power reduction of 40% increases an ENERGY STAR rating by 10 points.[g]
Premium Efficiency Motors (incremental costs vs. standard replacements): about $16 per horse power (HP) for 1 HP-10 HP motors; $8/HP for 11 HP to 100 HP.[c]	*Lighting retrofits:* save 10%-20% of *total* electric consumption in gas-heated buildings.[h]	*Installing premium efficiency motors and VFDs: Potential energy cost savings are 50-85%.*[d]	*Existing buildings:* 1% productivity improvements can offset entire annual utility costs.[o]		*Retro-commissioned buildings:* annual non-energy savings, such as extended equipment life and improved air quality, are approximately $0.26/ft2.[j]
Variable frequency drives (VFDs): $150-$200, installed.[d]	*High efficiency packaged and split-system cooling equipment:* 25% less *cooling* energy than standard equipment and 10%-15% less than ASHRAE standard.[i]	*Peak energy-reducing measures:* produce proportionally greater cost savings than those that have mostly off-peak savings.			
Commissioning new buildings: $0.50-$3.00 per square foot.[e]	*Building Operator training*: 0.35-1.2 kWh/ft2 per year.[k]	*Commissioning new buildings:* average savings of $0.05/ft2.[j]			
Retro-commissioning buildings: $0.05 and $0.40 per square foot.[e]		*Retro-commissioning existing buildings:* save around $0.27/ft2, resulting in 15% energy savings and a payback period of 0.7 years.[j]			

see next page for footnote information

ENERGY EFFICIENCY IN BUILDINGS FOOTNOTES

[a] The estimate assumes basic 1-for-1 lamp replacement and 1 electronic ballast per fixture to achieve the same illumination. Lamp and ballast costs total $20 for T8 – 800 series equipment, ½ hour of labor at $45/hour and 6-foot by 8-foot fixture spacing. Architectural design assistance and use of Super-T8 lighting can increase costs, but may result in fewer lamps and fixtures, better quality lighting design and greater energy savings (CEE, 2004).

[b] California DEER, 2005.

[c] Arizona Public Service. Premium motor replacement program. Based on analysis of proprietary data conducted by Summit Blue.

[d] U.S. EPA. Undated(a);

[e] According to the Federal Energy Management Program (FEMP) Operations and Maintenance Best Practices Guide, retro-commissioning for an existing building generally costs between $0.05 and $0.40 per square foot (FEMP, 2004). Median retro-commissioning costs are $0.27 per square foot (Mills et al., 2004) with a typical range of $0.13 - $0.45 per square foot.

[f] U.S. EPA., Undated(a); U.S. EPA. 2004; U.S. EPA, 2006h.

[g] For a typical building, a lighting power reduction of 40% increases the building's ENERGY STAR rating by about 10 points (U.S. EPA. 2006j).

[h] Lighting energy comprises 34% of non-space heat energy in commercial buildings. Retrofitting T12 lighting with standard T8 systems saves about 32% of lighting power while delivering the same or improved illumination (Advance Transformer 2005 catalog Energy-Savings T12 magnetic ballast and T8 low-output electronic ballast–different lamp configurations). Total electric savings is 34% x 32% = 11%. Older T12 ballasts are less efficient than new magnetic ballasts; therefore, retrofitting older systems will save more than 11% of building electricity. Lighting retrofits reduce cooling loads and increase electricity savings, but can increase heating loads slightly. New lighting designs can employ delamping, Super-T8 or T5 systems to increase savings (U.S. DOE, 2006d).

[i] Estimate assumes baseline efficiency of 9.2 energy efficiency ratio (EER) (ASHRAE Standard 90.1-2004 minimum requirements for air-cooled equipment efficiency) and 12.5 EER for High-efficiency equipment (ASHRAE 90.1, section that permits omission of economizers due to high efficiency cooling equipment).

[j] A comprehensive study of 106 buildings conducted by the Lawrence Berkeley National Laboratory (LBNL) estimates that retro-commissioning existing buildings can produce annual energy savings of 15% and annual energy cost savings of roughly $0.26 per square foot, depending on the aggressiveness of the retrofit. The study also estimates a median retro-commissioning cost of $0.27 per square foot, 15% energy savings, and a payback period of approximately 0.7 years, depending on the aggressiveness of the retrofit (Mills et al., 2004).

[k] Summit Blue Consulting, 2006.

[l] A report by BOMA International and Kingsley Associates estimates that energy expenses account for approximately 30% of a building's total costs. If a building reduced energy consumption by 20% to 30%, a reasonable target in many existing buildings, a building's total annual costs could be reduced by 6% to 9% (BOMA International and Kingsley Associates, 2006).

[m] U.S. EPA. 2006i.

[n] EPA estimates that increases in employee comfort related to improvements in energy performance can increase productivity in upgraded buildings. Revenue generated from this increase in productivity can equal as much as 10 times the energy cost savings received from performing upgrades (U.S. EPA. 2004).

[o] In a typical office building, the 30-year life-cycle costs are overwhelmingly comprised of personnel costs, with a comparatively small portion due to initial building capital or O&M costs. In dollar terms, annual costs per square foot come to ~$200 for personnel, ~$20 for lease/mortgage costs, ~$2 for utilities, and ~$2 for maintenance. Thus, very small improvements in staff productivity can more than compensate for major changes in the initial capital cost or building O&M. A 1% improvement in staff productivity equals the entire utility cost of a typical building (Smith, 2002).

[p] When money goes toward paying energy bills, much of it often leaves the state, whereas when money is spent on other goods and services (whether it is a clean energy investment in energy efficiency and local green energy, or non-energy consumption), much more remains locally, creating economic growth and jobs within the state. The U.S. Department of Energy (DOE) estimates that for every dollar spent in local economies, energy efficiency generates 57¢ to 84¢ more economic activity than does the payment of energy bills (Hatcher and Dietsche, 2001). The measure of how much economic activity can be generated in a community by different combinations of purchasing and investment is called the economic multiplier. Depending on regional characteristics, energy-efficient LBE activities can have a high economic multiplier. The California Sustainable Building Task Force report estimates an economic multiplier of 2.23:1 for energy efficiency, meaning that for every dollar spent on energy efficiency in California, $2.23 is generated (U.S. DOE, 1996; Kats et al., 2003).

[q] Simple steps to improve energy efficiency can have substantial returns. Over a long time period, reductions from even small energy efficiency improvements can more than offset the implementation costs. EPA estimates that investments in energy-efficient equipment and buildings can increase the asset value by $2.00 to $3.00 for each $1.00 spent (U.S. EPA. 2004).

TABLE 4.3.1 RULES OF THUMB *(cont.)*

GREEN BUILDINGS					
	Benefits				
Cost Premiums	Energy Savings	Cost Savings	Increased Productivity	Average Period Payback (years)	Other Benefits
Green buildings: cost premiums average $3/ft²-$5/ft², or less than 2% of initial costs.	*New green buildings:* mean savings is 27%; mean value for actual consumption is 1% lower than modeled.[d]	*New green buildings:* energy cost savings compared to conventional design as high as $0.47/ft².[f]	*Installing high-performance lighting:* productivity improvements of 0.7%-26% with a median of 3.2%.[h]	*High-performance buildings:* simple payback period can be as short as 2.0 years for offices, 2.1 years for libraries, and 2.6 years for schools.[i]	*GHG emissions reductions:* as high as 36%.[k]
New high-performance green buildings: cost premium range from 2%-7%, depending on the specific design features integrated. *LEED green buildings:* additional cost of certified projects: 0%-2.5%, Silver 0%-3.5%, Gold 0.5%-5%, Platinum 4.5%+ .[b]	*New green buildings:* 50% reduced consumption compared to conventional new buildings.[e]	*Commissioning new buildings:* average savings of $0.05/ft².[j]	*Incorporating daylighting:* productivity improvements of 0.45% -40%, mean of 5.5%.[h]		*Reduced indoor and outdoor water consumption:* 30% and 50%, respectively.[k]
			Increasing natural ventilation: productivity improvements of 3%- 18%, mean of 8.5%.[h]		*Reduced waste consumption:* 50%-75%.[k]
					Value of non-energy benefits: 25%-50% of the value of annual electricity cost savings.[j]

[a] *Based on 2002 Green Building Roundtable and Prepared for the U.S. Senate. The report outlines trends, benefits, and barriers to green building practices (USGBC, 2003; Kats, 2003).*

[b] *The premiums for LEED certified green buildings are average ranges (Syphers, 2003).*

[c] *Kats et al., 2003.*

[d] *A joint study by LBNL, USGBC, U.S. EPA, and U.S. DOE reviewed the modeled and actual energy performance of 21 LEED certified buildings across the country. Although the mean value for actual consumption was 1% lower than the modeled value, there was a wide variation around the mean. (Diamond, 2006).*

[e] *Consumption can be reduced by as much as 50% in energy-efficient green compared to conventional buildings (U.S. DOE, 2006b). New York City defines High Performance as 40% more efficient (New York City, 1999). Pennsylvania Cambria Building consumes 50% as much energy as a conventional new office building (Deru and Hancock, 2003; Ziegler, 2003).*

[f] *A study of 33 LEED certified buildings assessed the financial value of the benefits of green building design. The combined financial benefits were found to be more than 10 times the average initial investment required to design and construct a green building. Energy cost savings alone were estimated at $0.47/ft² per year ($5.79/ft² net present value over 20 years), exceeding the average incremental cost associated with green buildings. (Kats et al., 2003).*

[g] *Mills et al., 2004.*

[h] *Loftness, 2005. A 1.5% increase in productivity (or a little over 7 minutes each workday) is equal to $998 per year, or $4.44/ft² per year, assuming an average employee salary of $66,469 and an average space per employee of 225 ft² (Kats et al, 2003).*

[i] *A Minnesota study quantified the benefits of 41 high performance commercial buildings in the state. The study compared their high performance design to the same (hypothetical) buildings designed to meet minimum requirements of the MN Energy Code (MOEA, 2005).*

[j] *From research completed for NYSERDA (Barkett, 2006).*

ENERGY-EFFICIENT PRODUCT PROCUREMENT – ALL PRODUCTS				
	Benefits			
Cost Premiums	Energy Savings	Energy Cost Savings	Average Payback Period (years)	Emission Reductions
Energy-efficient as opposed to conventional products: cost premium varies with each product, but most often the difference is slight.	*Energy-efficient product procurement*: savings of 3%-12% of total building energy consumption.[a]	*Energy-efficient product procurement:* energy cost savings of 4%-17% relative to total commercial energy costs.[a]		*1 MWh of electricity saved: through energy-efficient product procurement equals emissions reductions of:* [e] ▪ 1,364 pounds of CO_2 ▪ 5.6 pounds of SO_2 ▪ 2.2 pounds NO_x

[a] *A comprehensive study of energy-efficient product procurement programs for federal, state, and local governments assessed major energy-use categories including HVAC, office equipment, washers, lighting, motors, and transformers. Basing its assessment on ENERGY STAR ratings and FEMP guidelines, the study found that diligent energy-efficient product procurement would yield roughly 3% to 12% energy savings by 2010, relative to total energy consumption. The study also found that energy-efficient product procurement would yield roughly 4% to 17% energy cost savings by 2010, relative to total energy costs. (Harris and Johnson, 2000).*

[b] *Columbia University, Undated.* [c] *U.S. EPA. Undated(b).* [d] *U.S. EPA. 2004.*

[e] *Energy Information Administration, 2005.*

ENERGY-EFFICIENT PRODUCT PROCUREMENT – BY TYPE OF PRODUCT			
Product Category	Effective Date of Current Specification[a]	Percent Savings Compared to Conventional Product	Cost-effectiveness (payback period)
Appliances			
Dehumidifiers	October 2006	15%	0 years (typically no retail cost premium)
Dishwashers	January 2007	40%	0 years (typically no retail cost premium)[b]
Refrigerators and freezers	April 2008	15%	4 years (refrigerators)[c] 6 years (freezers)[d]
Room air conditioners	November 2005	10%	Not available[e]
Room air cleaners	July 2004	45%	0 years (typically no retail cost premium)
Electronics			
Battery charging systems	January 2006	35%	0 years (typically no retail cost premium)
DVD products	January 2003	60%	0 years (typically no retail cost premium)
External power adapters	January 2005	35%	0 years (typically no retail cost premium)
Televisions	November 2008	25%	0 years (typically no retail cost premium)
Envelope			
Roof products	December 2007	Not available	< 4 years
Lighting			
Compact fluorescent lamps	January 2004	75%	< 1 year[f]
Office Equipment			
Computers	July 2007	25% - 50%	0 years (typically no retail cost premium)

TABLE 4.3.1 RULES OF THUMB *(cont.)*

ENERGY-EFFICIENT PRODUCT PROCUREMENT – BY TYPE OF PRODUCT			
Product Category	**Effective Date of Current Specification[a]**	**Percent Savings Compared to Conventional Product**	**Cost-effectiveness (payback period)**
Copiers	April 2007	65%	0 years (typically no retail cost premium)
Monitors	July 2007	25%	0 years (typically no retail cost premium)
Multifunction Devices	April 2007	20%	0 years (typically no retail cost premium)
Printers, fax machines, and mailing machines	April 2007	15%	0 years (typically no retail cost premium)
Scanners	April 2007	50%	0 years (typically no retail cost premium)
Heating and Cooling			
Air source heat pumps	April 2006	5%	< 5 years
Boilers	April 2002	5%	< 1 year
Ceiling fans	September 2006	45%	0 years (typically no retail cost premium)
Furnaces	October 2006	15%	< 3 years
Geothermal heat pumps	April 2001	30%	< 5 years for new construction
Light commercial HVAC	January 2004	5%	< 1 year
Ventilating fans	October 2003	70%	0 years (typically no retail cost premium)
Commercial Food Service			
Commercial dishwashers	October 2007	30%	2 years
Commercial fryers	August 2003	15%	2 years (for typical unit)
Commercial ice makers	January 2008	25% - 30%	4 years (for typical unit)
Commercial solid door refrigerators and freezers	September 2001	35%	1 year
Other			
Water coolers	May 2004	45 %	0 years (typically no retail cost premium)
Vending machines	April 2004 August 2006 (rebuilt machines)	40 %	< 1 year

[a] *EPA and DOE develop performance-based specifications to identify efficient products in the market place that will be cost-effective to the consumer and will offer the expected functionality. These specifications, which are used as the basis for ENERGY STAR qualification, are developed using a systematic process that relies on market, engineering, and pollution savings research and input from industry stakeholders. Specifications are revised periodically to be more stringent, which has the effect of increasing overall market energy efficiency (U.S. EPA, 2007).*

[b] *U.S. EPA and U.S. DOE, 2007c.*

[c] *U.S. EPA and U.S. DOE, 2007b.*

[d] *U.S. EPA and U.S. DOE, 2007a.*

[e] *U.S. EPA and U.S. DOE, 2007d.*

[f] *U.S. EPA and U.S. DOE, 2008.*

GREEN POWER PURCHASES

Cost Premiums	Benefits		
	Energy Savings	Energy Cost Savings	Emission Reductions
Green power: about 2¢/kWh. Premiums vary by utility but range from 0.2¢/kWh-17.6¢/kWh[a]	N/A	*Utility green power programs:* For some utility green power programs, the premium can be negative, thus reducing energy bills. These premiums have been as low as -0.13¢/kWh[a]	*Purchasing 1 MWh of green power is equivalent to:*[d] ▪ 0.14 passenger cars not driven for one year; ▪ 0.52 acres of pine or fir forests storing carbon for one year; ▪ 16 tree seedlings grown for 10 years; ▪ 0.21 tons of waste recycled instead of landfilled; and ▪ 71 gallons of gasoline.
Renewable energy certificates (RECs): 1¢/kWh (in ME) -about 5¢/kWh (in MA). Solar REC prices in NJ are the highest at 25¢/kWh[b]			
RECs offered by a certificate marketer: 0.5¢/kWh -7.5¢/kWh, with an average of 2.3¢/kWh. RECs are also available at $5.50/ton CO_2 to $12/ton CO_2, with an average of $9.80/ton CO_2[c]			

[a] *Premiums vary by utility provider. Premiums for the Xcel Energy's WindSource program, the OG&E Electric Services' OG&E Wind Power program, and Austin Energy's GreenChoice program have all been negative at times (U.S. DOE, 2006c).*

[b] *LBNL compiled data from Evolution Markets for average monthly REC prices from August 2002 to December 2006 (Wiser, 2007).*

[c] *U.S. DOE, 2006c.*

[d] *The environmental impacts of green power purchasing can be better understood by translating emission reductions into tangible real-world concepts – for example, converting pounds of CO_2 avoided into an equivalent number of cars removed from the road or trees planted. The fossil fuel electricity generation emission factor used for CO_2 is 1,380 pounds per MWh. (U.S. Climate Technology Cooperation Gateway, 2006).*

CLEAN ENERGY SUPPLY

Total Costs	Benefits		
	Energy Savings or Energy Generated	Cost Savings	Emission Reductions
Small-scale CHP plant: installed cost of $1.60/W for systems less than 500 kW, and about $1/W for systems between 0.5 MW and 5 MW.[a] Installed costs for on-site CHP systems average around $2.90/W in California.[b]	*CHP systems:* energy savings as high as 40%.[f]	*CHP systems:* as high as 40% of the cost of operating separate heat and power systems.[f]	*CHP systems:* equivalent to about 2.6 lbs NO_x/MWh, 5.8 lbs SO_x/MWh, and 1,200 lbs CO_2/MWh.[i]
Solar photovoltaics: average shipment price in 2004 was $3.00/W; the average price in 2005 was $3.20/W.[c] Total costs, including the inverter, installation, and balance of system range from $6-$9 per peak Watt.[d] Installed costs for PV modules average around $8.70/W in California and $7.90/W in New Jersey.[b]	*10 kW solar PV system:* generates 9,700 kWh/year to 16,800 kWh/year, depending on the location of the system.[g]	*10 kW solar PV system:* from about $600-$1,400 per year, depending on the geographic location of the system.[g]	*10 kW solar PV system*: from 12,000 lbs-20,000 lbs of CO_2, 10 lbs-90 lbs of SO_x, and 4 lbs- 90 lbs of NO_x per year.[j]
Small wind turbine: including installation, ranges from $14,700-$20,800 for a low-range model; $28,100-$59,600 for a mid-range model; and $105,000 and $115,000, respectively, for two elite models.[e] Installed costs for on-site wind generation average around $3.60/W in California.[b]	*Wind turbine with 84-foot tower and 7-foot diameter (rated at 900 W)*: generates 96 kWh/month at an average wind speed of 10 mph and 155 kWh/month at 12 mph.[e] *Wind turbine with 140-foot tower and 50-foot diameter (rated at 65 kW):* generates 3,674 kWh/month at 10 mph and 5,992 kWh/month at 12 mph.[e]	*900W wind turbine*: cost savings range from $9/mo.-$14/mo per installed turbine.[h] *65 kW wind turbine:* range from $330/mo -$540/mo. Per installed turbine.[h]	*Single 10-meter wind turbine with 750 kW capacity with wind speeds ranging between 12.5 and 13.4 mph*: 2.36 million lbs of CO_2, 13,800 lbs of SO_x, and 8,600 lbs of NO_x in one year.[k]

see next page for footnote information

CLEAN ENERGY SUPPLY FOOTNOTES

[a] ACEEE, 1995. Costs escalated to 2007 assuming 2% annual inflation.

[b] Installed costs from a review of on-site generation programs in NJ and CA – the two states with the most installed solar in the U.S. From the public Statewide Self Generation Incentive Program Data (SGIP, 2007). Also used in the analysis completed for the Self Generation Incentive Program: Program Administrator Comparative Assessment (Cooney and Thompson, 2007). Information about the New Jersey Customer On-Site Renewable Energy Program is available at *http://www.njcep.com/*.

[c] EIA, 2006. In dollars per peak Watt.

[d] ASES, 2007.

[e] On-site wind electricity production reduces the amount of conventional fossil fuel used as an energy source. On-site generation capacity depends on the particular turbine model and the wind speed available at a particular site. The Wisconsin *Focus on Energy* initiative has compiled a table of 14 small wind turbine models ranked by electricity generation potential. The smallest of these models, which has an 84-foot tower and an area sweep of 36.9 ft^2, can produce 96 kWh/month at an average wind speed of 10 mph and 155 kWh/month at 12 mph. The largest model, which has a 140-foot tower and a sweep of 1,963 ft^2, can produce 3,674 kWh/month at 10 mph and 5,992 kWh/month at 12 mph. The cost of the 12 smaller systems, including installation, ranges from $14,700 to $20,800 for a low-range model; $28,100 to $59,600 for a mid-range model; and $105,000 and $115,000, respectively, for two elite models (Wisconsin Focus on Energy, 2005).

[f] CHP systems are typically 40% more efficient than separate heat and power generation systems, meaning CHP systems require 40% less source energy to achieve the same output that conventional separate systems achieve (U.S. EPA, 2006b).

[g] This estimate assumes a PV system with a DC rating of 10 kW, a DC to AC derate factor of 0.77, an array tilt equal to the latitude of Seattle and Albuquerque in degrees, an array azimuth of 180°, and cost of electricity ranging from 6¢/kWh to 9.0¢/kWh. Calculations were obtained using the National Renewable Energy Laboratory (NREL) PV Watts calculator (RReDC, 2006)]. Analysis was run for Seattle, WA and Albuquerque, NM for low and high exposure, respectively.

[h] Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, Year-to-Date through January 2007 and 2006. Average for 2006 for the commercial sector was about 9 cents/kWh (EIA, 2007).

[i] Combined heat and power systems provide substantial percentage reductions in total emissions amounts. Emissions factors from the EGrid annual average (U.S. EPA, 2006f).

[j] Emissions for solar PV systems estimated using the California Energy Commission Clean Power Estimator. Assumptions included a 10 kW ac system, 30 degree tilt, Southern orientation, and 20% PV output adjustment factor. Analysis was run in Seattle, WA and Albuquerque, NM for low and high exposure, respectively. (CEC, 2007b).

[k] The American Wind Energy Association estimates that operating a single 10-meter wind turbine with a 750 kW capacity for one year, with wind speeds ranging between 12.5 and 13.4 mph, can displace a total of 2.36 million pounds of CO_2, 13,800 pounds of SO_x, and 8,600 pounds of NO_x that would otherwise be emitted through the generation of conventional energy (Wisconsin Focus on Energy, 2005). Note that the emissions factors in the first bullet of the 'Emissions Reductions' column (EPA, 2006f) can be applied to other sizes of wind turbine, if energy output is available.

TABLE 4.3.2 CLEAN ENERGY ANALYSIS TOOLS

Tools/Organization	Type	Description	Inputs	Outputs	URL/Source
Tools for Assessing Building Performance					
Portfolio Manager (ENERGY STAR)	Web-based tool	▪ Enables states to rate their facilities' energy performance and identify priority opportunities. ▪ Assists states in applying for the ENERGY STAR label for facilities scoring 75 or higher.	▪ Facility space type. ▪ Meter information. ▪ Energy type. ▪ Energy use.	▪ ENERGY STAR energy performance rating (1–100). ▪ Portfolio profile, including information on status, progress, financials, performance, environment, and energy intensity.	*http://www.energystar.gov/index.cfm?c = evaluate_performance.bus_portfoliomanager*

TABLE 4.3.2 CLEAN ENERGY ANALYSIS TOOLS *(cont.)*

Tools/Organization	Type	Description	Inputs	Outputs	URL/Source
Target Finder (ENERGY STAR)	Web-based tool	▪ Allows states to assess the design of new buildings and compare simulations with existing buildings, based on data provided. ▪ Helps set energy performance goals and receive an energy rating for design projects.	▪ Facility location, type, size, occupancy, number of computers, and operating hours per week. ▪ Energy target rating or energy reduction target, energy source, estimated energy usage, and energy rate.	▪ Projected ENERGY STAR energy performance rating (1–100). ▪ Projected energy reduction (%) (from an average building). ▪ Projected energy use intensity. ▪ Projected annual source energy use. ▪ Projected site energy use. ▪ Projected energy costs.	*http://www.energystar.gov/index.cfm?c = new_bldg_design.bus_target_finder*
Small Business Calculator (ENERGY STAR)	Web-based calculator	▪ Estimates a facility's energy intensity and potential energy cost savings from upgrades.	▪ Facility size. ▪ Facility type. ▪ Previous 12 months energy bill figures.	▪ Energy intensity (energy used per square foot). ▪ Potential cost savings from energy efficiency upgrades.	*http://www.energystar.gov/index.cfm?c = small_business.sb_calculate*
Life-Cycle Cost Program (National Institute of Standards/ Technology)	Computer software	▪ Enables states to evaluate alternative designs that may have higher initial costs, using a life-cycle costing method.	▪ Initial and contract costs ▪ Base-year energy costs. ▪ Maintenance and repair costs. ▪ Time period. ▪ Emissions inputs.	▪ Costs and benefits of energy and water conservation and renewable energy projects. ▪ Economic analyses (net savings, savings-to-investment ratio, rate of return, payback period).	*http://www1.eere.energy.gov/femp/information/download_blcc.html*
Emission Inventory Tools					
Clean Air and Climate Protection Software (National Association of Clean Air Agencies)	Computer software	▪ Tracks emission reductions and forecasts emissions from proposed reduction measures. ▪ Develops government baseline inventory.	▪ Fuel and energy use by type of source (e.g., coal, solar, wind). ▪ Sector information. ▪ Emissions factors (default provided)	▪ Equivalent GHG emissions from fuel and electricity use, presented in reports outlined by sector, by location, by source, or by indicator.	*http://www.cacpsoftware.org/*
Greenhouse Gas Equivalencies Calculator (U.S. EPA)	Web-based calculator	▪ Translates GHG reductions into terms that are easier to conceptualize. States can also use the calculator "in reverse."	▪ Quantity of emission reductions (e.g., metric tons of CO_2 equivalent).	▪ Gallons of gasoline not consumed. ▪ kWh of electricity not consumed. ▪ Number of cars and light trucks not driven in one year.	*http://www.epa.gov/cleanenergy/energy-resources/calculator.html*

TABLE 4.3.1 RULES OF THUMB *(cont.)*

Tools/Organization	Type	Description	Inputs	Outputs	URL/Source
e-GRID (U.S. EPA)	Online database	▪ Allows states to obtain information on power plants. ▪ Develop emissions inventories for buildings.	▪ Year of data. ▪ Plant(s) or state(s) of interest.	▪ NO_x, SO_2, CO_2, and mercury, with emissions reported in tons, input and output rates. ▪ Generation resources mix, in MWh and percentage.	*http://www.epa.gov/cleanenergy/egrid/index.htm*
State Inventory Tool (U.S. EPA)	Interactive spread-sheet	▪ Enables states to develop GHG emissions inventories	▪ State-specific data (pre-loaded default data used otherwise)	▪ Comprehensive GHG emissions inventory covering multiple industry sources	*http://www.epa.gov/climatechange/wycd/stateandlocalgov/analyticaltools.html*
Emissions Forecasting Tool (U.S. EPA)	Interactive spread-sheet	▪ Enables states to forecast business-as-usual emissions through 2020	▪ State assumptions relating to future growth and consumption patterns	▪ Estimation of future emissions through linear extrapolation of State Inventory Tool output and federal forecasts	*http://www.epa.gov/climatechange/wycd/stateandlocalgov/analyticaltools.html*
Community-Level Energy Saving Tool					
Community Energy Opportunity Finder (Rocky Mountain Institute)	Web-based calculator	▪ Helps identify potential community benefits resulting from energy efficiency upgrades and renewable energy opportunities.	▪ Community and building characteristics. ▪ Building energy consumption. ▪ Energy costs. ▪ Emissions data.	▪ Energy savings. ▪ Dollar savings. ▪ Reductions in CO_2, NO_x, and SO_2 emissions. ▪ Job creation.	*http://www.energyfinder.org*
Financial and Economic Analysis Tool					
Cash Flow Opportunity Calculator (ENERGY STAR)	Web-based calculator	▪ Calculates the amount of equipment that can be purchased using anticipated savings. ▪ Compares costs of financing and waiting for cash.	▪ Facility size. ▪ Energy costs and savings target ▪ Financing rate and term. ▪ % savings to be committed to upgrades.	▪ Suggested spending on energy efficiency ($/ft^2). ▪ Potential lost savings due to waiting one year to avoid financing. ▪ Potential cost of waiting for better interest rate.	*http://www.energystar.gov/ia/business/cfo_calculator.xls*

4.4 SELECT LBE ACTIVITIES AND MEASURES

Once states have assembled information on the objectives, assessment criteria, barriers, and estimated program impacts of each activity/measure, they can analyze these data to determine which LBE activities and measures to include in their initial LBE portfolio. Table 4.4.1 presents a sample spreadsheet that states can use to help make this recommendation. This approach is intended to illustrate just one approach for comparing and assessing alternative LBE activities. Individual jurisdictions may prefer to develop their own analytic tools to help with this purpose.

4.5 STATE EXAMPLES OF SCREENING LBE ACTIVITIES AND MEASURES

The activities and measures included in LBE programs across the country vary according to the state's specific goals, assessment criteria, and the screening methods used. The following examples illustrate a variety of approaches that states have used to identify the activities and measures in their LBE portfolios.

Utah—Energy Efficiency Policy Options: a Method for Screening Options

The Utah Governor announced a goal of increasing energy efficiency in the state by 20% in 2015. This goal covers all sectors and applies to all forms of energy use. The state commissioned an analysis of 23 potential policies, programs, and initiatives for consideration in meeting its goal, including the following three LBE initiatives:

- Adopt energy efficiency requirements for state agencies, including universities and colleges. Support energy efficiency for local government and K-12 Schools, including the expansion of Utah's Revolving Loan Fund.
- Implement energy efficiency education in K-12 schools.

Each option was screened according to the following criteria:

- Energy savings per year (measured against a business-as-usual baseline)
- Cost and cost effectiveness (measured by net economic benefit)
- Environmental and social benefits
- Political and other considerations

Based on this analysis, each option was assigned a priority level of high, medium, or low. The first option, adopting energy efficiency requirements for state agencies, received a "high priority" rating and was recommended for consideration by the governor and other key decision makers. The remaining options were rated as medium priority, and were not recommended for further consideration. (Geller et al., 2007.)

Web site: *http://energy.utah.gov/energy/utah_energy_efficiency_strategy.html*

Vermont—State Agency Energy Plan for State Government

The Vermont Department of Buildings and General Services created the Comprehensive Environmental and Resource Management Program in 2003 to ensure sustainable state government operations. This program was the impetus for legislative changes leading to a revised State Agency Energy Plan for State Government issued in 2005. The plan stresses the importance of selecting and implementing LBE actions that:

- Reduce state operating costs through energy savings
- Reduce environmental impacts
- Sustain existing and create new Vermont businesses that develop, produce, or market environmentally preferable products
- Demonstrate the economic benefits of clean energy activities to other states and to the private sector.

The plan focuses on the three programs listed below. State agencies are required to develop agency implementation plans that describe the actions they will take to comply with each of these programs, as appropriate to their operations.

- New and existing building infrastructure development, including O&M practices in existing infrastructure. The mid-term goal is to reduce energy consumption in existing and new state buildings and correctional facilities by 20%. State agencies are required to implement the following ten steps for each existing building: 1) benchmarking, 2) low cost/no cost use-habits, O&M improvements, 3) energy audits, 4) additional low cost/no cost use-habits and O&M measures, 5) technical energy analysis, 6) funding analysis and grants potential investigations and applications, 7) ranking and selection of energy savings measures (ESMs) that have associated costs, 8) schedule/streaming, 9) construction or implementation and commissioning, 10) monitoring and evaluation. In step 7, the plan recommends prioritizing ESMs according to the following criteria:
  - ESMs in buildings with sub-standard energy performance should receive the highest priority.
  - Best cost-benefit, life cycle cost
  - Lowest simple payback
  - Highest gross energy savings ranking
  - Renewable energy projects receive priority, when feasible

Table 4.4.1. SAMPLE ASSESSMENT APPROACH: Criteria Worksheet for Screening the Benefits, Costs, and Feasibility of LBE Activities

Goal: Reduce annual energy consumption by state-used buildings by 20% by 2015, using 2006 as a baseline.

Objective	Activity Description	Assessment Criteria: Contribution Toward Goal: How will the described measure contribute to the overall goal of reducing energy consumption by state buildings by 20% 2015, using 2006 as a baseline?	Assessment Criteria: Visibility: How will the described measure spill over into the private sector?	Assessment Criteria: Payback period: How will the described measure meet the payback period of five years or less?	Assessment Criteria: Feasibility: What are the potential barriers and strategies to overcome them?	Quantitative Screening: Annual Energy Savings ($)	Quantitative Screening: Annual Energy Savings (BTU)	Quantitative Screening: Annual GHG Reductions	Quantitative Screening: Total Cost Premium
Reduce energy consumption in state government office buildings.	Implement energy-efficiency measures in all state government office buildings.	This measure will reduce total energy consumption by state-used buildings by 4% by 2015, based on projected energy savings.	This measure may have limited public visibility. Activities will be implemented primarily through changes in behavioral and maintenance practice by state employees.	Yes. The measure is anticipated to have a payback period of less than two years, based on the anticipated energy savings and the projected cost.	The state leases, rather than owns, some of the buildings its agencies occupy. It will be necessary to negotiate with the property owners to implement certain energy efficiency measures.	$3.5 million	200 billion Btu	66 million pounds of CO_2 avoided	$6.25 million
		Baseline: Annual energy consumption in state government office buildings totals approximately 2 trillion Btu, costing nearly $35 million.							
	Activity 1.2								
	Activity 1.3								
Objective 2	Activity 2.1								
	Activity 2.2								
	Activity 2.3								
Objective 3	Activity 3.1								
	Activity 3.2								
	Activity 3.3								

Note: The figures used in this model are hypothetical, and should not be interpreted as realistic expectations of the costs and/or benefits of this, or any, hypothetical LBE policy option. Information on performing rough quantitative assessments of the benefits and costs of implementing LBE measures are presented in Section 4.3.1., *Rules of Thumb and Section 4.3.2, Preliminary Clean Energy Analysis Tools.*

- Availability of grant money
- Highest public visibility and educational benefits.

New construction and major renovations must be conducted according to the following five-step process: 1) planning and design, 2) construction and commissioning, 3) facility operation and maintenance, 4) training occupants about how the building functions and required usage protocols that optimize comfort and energy efficiency, and 5) monitoring energy usage and adjusting usage protocols.

- State purchasing and contract administration policies and practices. The plan establishes a general commodities purchasing policy to encourage the purchase of environmentally preferable products. This policy also encourages economically sound purchases by considering the total life cycle cost of these purchases.

- Transportation activities relating to fleet vehicles, personal vehicles, and employee commuter driving practices. Transportation policies cover the state fleet (passenger cars, light duty trucks, and heavy duty trucks) and employee commutes to and from work. The plan sets an initial target of 10% reduction in energy and anticipates that more aggressive targets may be set individually by agencies or departments. Energy reduction strategies include: minimizing personal vehicle reimbursed mileage opportunities, right-sizing vehicles, instituting vehicle maintenance procedures, ensuring that purchasing decisions require fleet vehicles to be among the most fuel-efficient and lowest emission vehicle models in each class, adopting strategies to reduce on-the-job miles, instituting no-idling campaigns and policies, and encouraging alternative reduced-emission fuels or fuels that reduce emissions of greenhouse gases. (Vermont, 2005.)

Web site: ***http://www.bgs.vermont.gov/sites/bgs/files/pdfs/BGS-CERMP.pdf***

Wisconsin Energy Initiative—A Phased Approach to Implementing Energy Efficiency in State Buildings

Wisconsin instituted the Wisconsin Energy Initiative (WEI) in 1992 to comprehensively address energy savings opportunities, with a goal of reducing energy use in state buildings by 15%. The state Department of Administration (DOA) hired an ESCO to conduct audits of energy use in state facilities and to implement improvements in the following order:

- Installation of Energy-Efficient Lighting in State-owned Building Space. Lighting was replaced first, in part because it was easiest to implement and could be funded from the maintenance budget. Another reason for targeting lighting first is that it is important to upgrade the lighting system early in the building upgrade process to have a significant impact on how other building systems (especially heating and cooling systems) use energy.[1] To help gain buy-in and demonstrate that lighting quality is comparable to that of less efficient options, the first lighting replacement was completed without prior notice on the floor where state office engineers were located. Subsequently, aging electrical ballasts and lighting fixtures were replaced one building or campus at a time. More than 700,000 fluorescent T-8 lamps, 350,000 ballasts, and tens of thousands of exit signs and CFLs were installed, resulting in annual energy savings of over $5 million.

- Installation of Energy Efficient Lighting in Local Schools and Municipal Facilities. In this phase, the DOA worked with the Cooperative Educational School Agencies (CESAs) to leverage private funds to improve energy conservation in schools across the state.

- Upgrading Mechanical Equipment. The state entered into performance contracts to upgrade HVAC, other mechanical equipment, and water-saving devices in state buildings, campuses and other institutions. Improvements included lighting occupancy sensors, stream traps, air handling and distribution systems, and ultra-low flow toilets. More difficult and time-consuming than improving lighting, DOA estimated that this phase would save enough energy to heat 10,000 Wisconsin homes and reduce state expenditures by $6.8 million annually.

- Upgrading Specifications for New Buildings. DOA also upgraded its specifications for new buildings to include the most up-to-date energy-savings and green technologies, including daylighting, building automation systems, heat recovery systems, and co-generation. (Wisconsin 2002; Mapp et al., 2006; Mapp, 2007.)

Web site: ***http://www.doa.state.wi.us/press_releases_detail.asp?prid=123&divid=4***

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[1] *For more information on the staged approach to upgrading buildings for energy efficiency, see EPA's ENERGY STAR Building Upgrade Manual at* ***http://www.energystar.gov/index.cfm?c=business.bus_upgrade_manual****.*

Nevada—Energy Conservation Plan for State Government

In its State of Nevada Energy Conservation Plan for State Government, the state's Office of Energy outlined its plan for implementing measures to reduce both total energy usage and peak energy loads in state buildings. Measures were identified based on whether they could be implemented immediately, in the short term, or in the long term, as follows:

- Immediate Measures: measures that can be performed at the present time requiring no additional funding or legislative support. These include behavior modification measures such as:
  - Turn off lights when leaving a room
  - Turn down heaters for the night
  - Eliminate unnecessary appliances
  - Keep lighting fixtures, filters, and heating and cooling coils clean.
- Short-term Measures: measures that can be performed within the fiscal year requiring no funding in addition to current budgets and/or legislative support, including:
  - Replace incandescent bulbs with CFLs
  - Acquire photocells to automatically turn lights on and off
  - Clean and maintain filters, coils, and vents
- Long-term Measures: measures that cannot be accomplished within the fiscal year and/or require additional funding or legislative support, including:
  - Perform energy audits on all buildings
  - Incorporate energy efficiency guidelines for all new construction and building retrofits
  - Purchase only ENERGY STAR equipment (Nevada, 2001.)

Web site: *http://energy.state.nv.us/conservation%20plan%20for%20state%20government.pdf*

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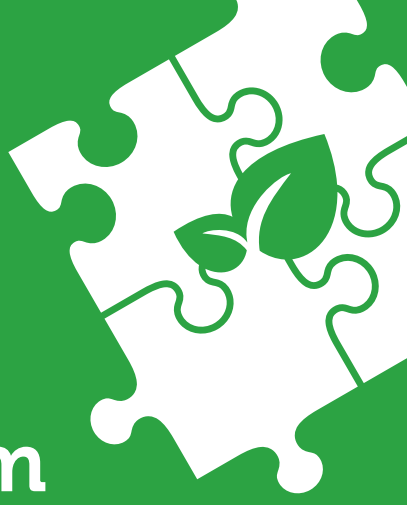
CHAPTER FIVE

Developing a Comprehensive LBE Program



This chapter describes key design options, implementation issues, and best practices that states can consider as they develop a comprehensive LBE program.

The following five recommendations are critical to program success, and are discussed in this chapter:

- Energy savings can be increased by *integrating clean energy activities within the LBE program*. This can be accomplished at the program outset or over time, as resources permit. (See Section 5.1.)
- *Consider all available funding options* and identify those best suited for implementing a comprehensive and cost-effective program. States can explore legislative, policy, and/or other changes to address financial obstacles. (See Section 5.2.)
- *Communications and outreach* are key to demonstrating the benefits of clean energy and building and maintaining support for the LBE program. (See Section 5.3.)
- *Work with, and provide assistance to, local governments* as they develop their own LBE programs. Encouraging local governments to implement clean energy programs is an effective way for states to achieve their own LBE goals. (See Section 5.4.)
- Enhance LBE program effectiveness through *networking and information-sharing with federal, state, local, and other organizations.* (See Section 5.5.)

DOCUMENT MAP

CHAPTER FIVE CONTENTS

Related appendices:

Appendix B, State and Local Clean Energy LBE Programs: State and Local Examples, Tools, and Information Resources: presents examples of state and local LBE activities and provides resources for each activity.

Appendix C, Resources for Implementing LBE Programs: contains examples and resources on implementing LBE programs, including several state-developed agency guidance materials.

CHAPTER FIVE CONTENTS *(cont.)*

5.1 INTEGRATE INDIVIDUAL CLEAN ENERGY ACTIVITIES INTO A PROGRAM

Developing an integrated and comprehensive LBE program that consists of multiple clean energy activities can achieve the following benefits:

- *Increase the overall benefits.* An integrated LBE program includes multiple clean energy activities – energy efficiency, green power purchases, clean energy generation – rather than focusing on just one approach. Having a diversified energy strategy increases program benefits, such as reducing the risk of supply disruption, and achieves broader positive spill-over effects, such as increased employment in clean energy technology and service sectors.

- *Enhance the cost-effectiveness of LBE activities by leveraging interactions.* Integrating multiple LBE activities can result in interactions that produce greater economic benefits than an approach centered around a single strategy. For example, commitments to purchase specified quantities of electricity from green power sources (or to purchase onsite renewable energy systems) can be increased using savings generated by building energy efficiency activities. Once the upfront costs of the energy efficiency activities are repaid, the recurring energy cost savings can be used to offset the cost premium associated with green power purchases or renewable energy systems (for example, see the text box at right on California's Solar Schools Program). Similarly, the benefits of energy-efficient product procurement can be increased when products are purchased using a systematic approach to improving energy efficiency in buildings. Because efficiency reduces the energy load, states can then upgrade their heating and cooling systems using smaller, "right-sized" equipment. Sequencing product purchases and energy efficiency measures using this staged approach can lead to greater overall energy cost savings.

- *Achieve political support.* A comprehensive program can win broad support by appealing to a variety of constituencies with different interests, including legislators and agency personnel. An integrated program can help lessen any reservations about clean energy and can provide the impetus for stakeholders to mobilize resources for LBE activities.

- *Increase the visibility of LBE activities.* States that develop a comprehensive clean energy LBE program can establish a single contact (or office) that provides consistent and comprehensive information. This increases visibility and provides a single point of reference for agency customers and the public. Examples include New York's "Green and Clean" State Buildings and Vehicles program (New York, 2004) and Massachusetts' State Sustainability Program (Massachusetts, 2004).

In practice, it is not always possible to start with an integrated program. Many states begin with a more targeted, activity-specific approach that builds towards a comprehensive program over time. This can ensure that LBE needs match available resources and increase opportunities for achieving a few quick LBE successes

CALIFORNIA SOLAR SCHOOLS PROGRAM

This program illustrates one way to integrate energy efficiency with renewable energy measures. Between 2004 and 2006, 31 California schools were awarded $4.5 million from the Solar Schools Program to purchase and install 675 kW of solar PV power. Grant eligibility was tied to meeting energy efficiency and energy education goals. The schools were required to have already installed high efficiency fluorescent lighting or other energy efficiency measures with equal or greater energy savings in at least 80% of classrooms, and to have established a curriculum plan to educate students about the benefits of energy conservation and solar energy.

Funding was provided by the CEC's Emerging Renewables Program with a matching amount from the California Attorney General's Alternative Energy Retrofit Account (AGAERA).

Source: CEC, 2006c.

to demonstrate success and provide a basis for further funding and sustained momentum (CALeep, 2006).

5.2 FINANCING THE LBE PROGRAM

This section describes options for financing the LBE program (which includes selecting vehicles for financing the program and choosing sources of funding) and presents a summary of the key strategies for overcoming financial barriers to implementation. The text box below provides a brief overview of the topics covered. Additional funding information is available in Appendix D, *Resources for Funding LBE Programs*.

5.2.1 FINANCIAL VEHICLES

Financing refers to the use of loans, bonds, energy performance contracts, lease-purchase agreements, grants, and other mechanisms to pay for clean energy activities. Table 5.2.1 summarizes seven financial vehicles in terms of nine key metrics. A more detailed description of each vehicle is provided below.

FINANCING LBE PROGRAMS

Financial Vehicles (Section 5.2.1)

- Capital budgets and procurement budgets ("cash")
- Loans
- Public bonds
- Energy performance contracts
- Tax-exempt lease-purchase agreements
- Grants and rebates
- Other short-term financing alternatives

Funding Sources (Section 5.2.2)

- Public benefits funds
- Revolving loan funds
- Aggregated purchasing contracts for green power, equipment procurement, and service contracting
- Pension funds
- Private foundations (e.g., grants)
- Other procurement and accounting methods

Summary of Strategies for Overcoming Financial Obstacles (Section 5.2.3)

- Consider multiple financing options.
- Modify state purchasing rules and develop standard agreements for sharing or retaining energy savings.
- Address "split incentives" issues

TABLE 5.2.1 SUMMARY OF FINANCIAL VEHICLES FOR ENERGY EFFICIENCY ACTIVITIES

Key Aspect	Cash[a]	Loans	Bonds	Energy Performance Contracts	Lease-Purchase Agreements	Grants and Rebates	Other (RANs, BANs, TANs[b])
Interest Rates	N/A	Often done at taxable rates.	Lowest tax-exempt rate.	Can be taxable or tax-exempt.	Low tax-exempt rate.	N/A	Low, short-term tax-exempt rates.
Financing Term	N/A	Repayment terms over 12 months may need voter approval.	May be 20 years or more.	Typically up to 10 years but may extend to 20 years.	Up to 12 years is common, and up to 20 years is possible for large projects. Term limited to useful life of equipment.	N/A	Less than one year.
Other Costs	N/A	Minor closing costs, if any.	Underwriting, legal opinion, insurance.	May have to pay engineering costs if contract is not executed.	None.	Some may have matching grant requirements.	Issuing costs from lender.

TABLE 5.2.1 SUMMARY OF FINANCIAL VEHICLES FOR ENERGY EFFICIENCY ACTIVITIES *(cont.)*

Key Aspect	Cash[a]	Loans	Bonds	Energy Performance Contracts	Lease-Purchase Agreements	Grants and Rebates	Other (RANs, BANs, TANs[b])
Approval Process	Internal.	Depends on financing term. Subject to potential legislative and charter limitations.	Usually requires voter approval/ public referendum; bond counsel opinion letter required.	RFP usually required; internal approvals needed.	Internal approvals needed; simple attorney letter required.	Application made to manager of PBF, utility, or foundation.	Internal approvals needed; attorney's letter required.
Approval Time	Current budget period.	Fast, if short term.	Can be lengthy—process may take years.	Legislative authority may facilitate approval,	Fast; generally within a week of receiving all requested documentation.	Depends on availability of funds and funding cycle.	Fast; similar to tax-exempt lease.
Funding Flexibility	N/A	Relatively flexible.	Very difficult to go above the dollar ceiling.	Relatively flexible; an underlying municipal lease is often used.	Flexible. Can set up master lease, which allows drawing down of funds, as needed. Can finance entire project cost.	Prescriptive for public funds, competitive for foundation funding.	Based on expected source of repayment (bond, revenue, or tax).
Budget Used	Operating or capital.	Operating or capital, depending on terms.	Capital.	Operating or capital, depending on terms and conditions.	Operating.	N/A	Operating or capital.
Greatest Benefit	Direct access if included in budget.	Fast, if voter approval is not necessary.	Low interest rate because it is backed by the full faith and credit (taxing powers) of the public entity.	Provides performance guarantees, which help in approval process.	Allows capital equipment purchase using operating dollars.	Reduces activity cost as funding usually does not have to be repaid.	Low-cost access to short-term funds that allow the immediate installation of energy efficiency equipment to save money sooner.
Greatest Hurdle	Insufficient funding available for activities.	Often higher taxable interest rates; statutory limitations regarding term and amounts.	Very time consuming.	Identifying the activity to be financed; selecting the energy service provider.	Identifying the activity to be financed.	Availability of funds; may be very competitive.	Repayment must be made within the current operating period.

a While cash is typically considered to be a source of funds rather than a financing vehicle, it is included in this table for comparison purposes.

b RANs = Revenue Anticipation Notes, BANs = Bond Anticipation Notes, TANs = Tax Anticipation Notes.

Sources: Zobler and Hatcher, 2003; U.S. EPA, 2004a; Thumann and Woodroof, 2008.

Capital Budgets and Procurement Budgets

States can finance clean energy by "paying cash" from existing capital and procurement budgets. The benefits of tapping these budgets include their ready availability and lack of associated interest payments. At the same time, the capital budgeting process can be complex (compared to using procurement budgets) and may introduce numerous financial, practical, and political constraints, including:

- Capital budget dollars are often scarce, already committed, and subject to a funding ceiling. Jurisdictions under serious fiscal pressure sometimes impose freezes on capital spending.
- The process for requesting new capital dollars can be time- and resource-consuming.
- Political considerations can be important, since authorization for requesting new capital dollars can require legislative and/or taxpayer approval (e.g., a voter referendum).

In addition, both existing capital budgeting and procurement policies can impede cost-effective energy efficiency investments. For example:

- Government capital budgeting and procurement practices often prescribe first cost accounting, with lowest bid requirements, that fail to consider life-cycle costs.[1]
- Capital budgeting often does not allow borrowing from operating budget savings even when they offset a capital cost premium.

To address these barriers, states have introduced a number of innovative strategies and techniques, including:

- *Institute life-cycle cost accounting and procurement procedures*, which take into consideration both the lower net capital and future operating costs of clean energy investments. For example, states can require clean energy investment and procurement decisions to be based on the lowest life-cycle cost (rather than the lowest first costs) and can modify life-cycle procurement procedures to require vendors to provide both equipment investment costs and estimated lifetime energy costs. Life-cycle cost accounting can go beyond calculating direct lifetime cost savings to include the energy, environmental, and other social costs or benefits that accrue to society at large. However, these social costs and benefits can be more difficult to measure.[2] For additional information on life-cycle costing, see Section 5.2.3, *Strategies for Overcoming Financial Obstacles.*
- *Directly specify minimum energy efficiency requirements for products.* For example, some states require products to be ENERGY STAR-qualified, obviating the need to justify higher upfront costs.
- *Require capital activities to meet energy performance targets.* States have required new state construction and renovations to be compliant with ENERGY STAR building requirements.
- *Reform budgeting procedures to allow agencies to borrow from operating budgets* to supplement capital budgets, thus expanding the pool of available funds.

Loans

A loan is a debt instrument between a lender (e.g., a bank, commercial lender, or a state revolving loan fund) and a borrower (e.g., a state agency) in which the lender agrees to provide a stated amount of money to be repaid over a period of time, along with interest. Loans can be structured to be repaid monthly, quarterly, semi-annually or annually. The payments can be "level" (i.e., the same every period) or may require a balloon payment at the end. Interest rates can be fixed or variable, taxable, or tax-exempt. Short-term loans (i.e., usually less than 12 months) can be repaid from the operating budget – which provides an advantage

[1] *First costs are the upfront costs that are incurred before an investment generates any savings.*

[2] *EPA is preparing A Guidebook for Assessing the Multiple Benefits of Clean Energy to provide information on understanding and quantifying the multiple benefits of clean energy activities [U.S. EPA, Forthcoming(a)]).*

VERMONT'S STATE ENERGY PLAN: LIFE-CYCLE ACCOUNTING REQUIREMENTS

Vermont's State Agency Energy Plan requires that, where applicable, life-cycle cost analyses must be used when purchasing equipment or products. The state plan also requires building investments to be undertaken on a lowest life-cycle cost basis. The plan defines life cycle cost as the "amortized annual cost of a product, including capital costs, installation costs, operating costs, maintenance costs and disposal costs discounted over the lifetime of the product plus the energy and environmental externalities costs or benefits." The objective of using life cycle analysis in Vermont is to show positive cash flow within a specified period of time after implementing the measure.

Source: Vermont, 2005.

over using the capital budget since there are fewer restrictions (e.g., voter approval is typically not required when using the operating budget). Long-term loans (e.g., longer than 12 months) are subject to any long-term debt restrictions the state may have.[3]

Banks will make loans for energy-efficient equipment purchases; however, they typically require a down payment that can be 20% or more, or is secured by compensating balances. The borrower's ability to negotiate favorable terms on the down payment, interest rate, and payment structure depends primarily on the lender's perception of the risk involved (U.S. EPA, 2008). However, some state agencies offer loan programs for public and non-profit agencies that offer below-market terms and can be used for clean energy activities. For example, revolving loan funds provide a key source of debt for state and local government LBE clean energy projects. These funds are designed to be self-supporting, in that states establish a pool of capital (funded, for example, by the state's PBF policy) and provide low-interest loans to borrowers that then "revolves" over a multi-year period as payments are returned to the fund and lent anew to other borrowers (U.S. EPA, 2006b). (See Section 5.2.2., *Funding Sources*, for additional information on revolving loan funds and how state agencies have used these as finance sources for energy efficiency improvements in their facilities.)

Public Bonds

Bonds are debt instruments sold by public- and private-sector organizations that enable borrowing from the capital market (U.S. EPA, 2008). They allow amortization of capital costs over a multi-year repayment term and are therefore well suited to LBE investments that accrue annual energy cost savings. Public bonds can also be offered as investment vehicles – with no federal and, in many states, state income tax liabilities to the investors – that can result in lower interest rates than commercial lending or equipment leasing arrangements. On the other hand, bonds can involve a lengthy approval time, since they may require public referenda and/or legislative approval.

These vehicles take many forms, including[4]:

- *Revenue bonds*, which are supported directly from the revenues of the activity being financed.
- *General obligation bonds,* which are backed by the federal, state, or local issuing entity, and typically require voter approval. They generally provide the most favorable interest rates since they are subject to the least risk.
- *Clean Renewable Energy Bonds* (CREBs), which were established in May 2005 by federal legislation that provides for $1 billion of tax-credit bonds to be issued between 2006 and 2008 to finance renewable energy projects for public utility companies. These bonds, which can be issued by states, provide the equivalent of an interest-free loan for qualified energy projects. (Bond Buyer Online, 2005; ELPC, 2006).

Some states have worked with educational, health, and environmental bond issuance authorities to fund LBE activities or have added LBE features to planned facility bonds. For example, New Jersey's Economic Development Authority, in partnership with New Jersey's Board of Public Utilities, offers a variety of renewable energy and energy efficiency incentives (New Jersey, 2007).

It is important to consider the ancillary costs associated with issuing a bond. Bond issues can:

- Involve a time-consuming, costly, and complex process that requires an extensive legal opinion, setting up a trustee, and retaining accounting services to ensure compliance.
- Require taxpayer approval or be subject to other restrictions on new debt. Meeting these requirements can be time consuming and result in political vulnerability.
- Incur costs to rate the bond, obtain insurance, set aside a cash reserve for the first year, and pay for printing or marketing fees – additional costs that can exceed $50,000. (EPA, 2004c.)

Adding these bond issuance costs to the cost of energy efficiency activities can change the economics of the activity, depending on its size. Therefore, although a public bond may provide the lowest stated interest rate, it may or may not have the lowest net total cost. In addition, as with capital budget requests, bond requests are often assessed using accounting protocols that do not recognize their reduced operating costs even though they may more than offset the debt service obligations (EPA, 2004c).

[3] *Because most energy efficiency activities have a simple payback of more than one year, short-term financing typically works best as bridge financing, as long as long-term financing is also available.*

[4] *Industrial development and revenue bonds are also common and used to acquire assets that are, in turn, leased to private sector organizations. Therefore, they are usually inappropriate for LBE clean energy investments.*

Energy Performance Contracts and Tax-Exempt Lease-Purchase Agreements

States often look for financing options that allow them to pay for capital investments by drawing on operating budgets. Energy performance contracts and tax-exempt lease-purchase agreements are both well-matched to LBE activities that generate a stream of energy cost savings. As long as future energy costs are budgeted at current levels with rate escalators, an ongoing revenue stream will be generated that can pay for the investment. Both of these financial vehicles are described below.

Energy Performance Contracts

An energy performance contract is an arrangement with an energy service company (ESCO) or energy service provider (ESP) to implement and manage energy savings projects over their lifetime. The ESCO or ESP acts as the general contractor responsible for all aspects of the project and assumes the associated technical and performance risks. Energy performance contracts bundle energy-saving investments (e.g., energy audits, design and specification of new equipment, ongoing maintenance, measurement and verification of product performance, indoor air quality management, and personnel training) and financing into a package that can be attractive to public agencies. The contract allows a state to finance energy-saving capital improvements – usually over a 7–20 year term – with no initial capital investment by using money saved through reduced utility expenditures. As shown in Figure 5.2.1, about 82% of all performance contracts involve public entities [i.e., municipal facilities, universities, schools and hospitals (referred to as "MUSH") plus federal and public housing].

An ESCO typically provides a guarantee that energy cost savings will meet or exceed annual payments covering all activity costs. Such guaranteed savings agreements are the most common type of performance contract for public sector clients.[5] If the savings do not occur, the ESCO pays the difference. Some performance contracts include a reserve fund to cover potential shortfalls, while others provide security enhancements in the form of performance bonds or letters of credit. In some instances, performance insurance or "shared savings" may be available. When surplus energy savings result from the project, these savings are shared between the state and the ESCO or ESP, as negotiated in the energy performance contract (U.S. EPA, 2008).

Financing may be offered as part of the performance contract. However, because ESCOs are private sector firms that borrow at taxable, commercial rates, it is often possible for a state to secure better financing arrangements by taking advantage of lower, tax-exempt interest rates available to government entities.

Several states have created enabling legislation and developed model ESCO programs. For example, the Kansas Facility Conservation Improvement Program enables public agencies to enter agreements with pre-

PERFORMANCE CONTRACTING RESOURCES

Rebuild Colorado's Energy Performance Contracting Web site

Colorado launched Rebuild Colorado in 1997 to help building owners identify and implement energy saving opportunities. The Web site provides guidance materials, case studies, and information on the benefits of performance contracting and steps for success (Rebuild Colorado, 2006b). Web site: *http://www.state.co.us/oemc/rebuildco/epc.htm*

California Energy Commission Resources

CEC has compiled a variety of handbooks on financing energy efficiency projects, including:

How to Hire an Energy Service Company provides guidance on selecting and working with ESCOs (CEC, 2000). Web site: *http://www.energy.ca.gov/reports/efficiency_handbooks/400-00-001E.PDF*

Summary of Energy Service Companies: Summary of Responses, a directory of California ESCOs, many of which provide services in other states (CEC, 2005). Web site: *http://energy.ca.gov/2005publications/CEC-400-2005-001/CEC-400-2005-001.PDF*

- For other resources on ESCOs, see Appendix E, Resources for Funding LBE Programs.

CITY OF AMHERST, NEW YORK: USING ESCOS

Amherst, New York, which has an electricity budget of $2.7 million and a total operating budget of $100 million, used an energy performance contract to implement energy efficiency upgrades in a number of its facilities.

The town entered into a guaranteed savings agreement with an ESCO that maximized the amount of new equipment that could be purchased from the energy savings. The result was a $5.2 million project that included the city's ice skating rinks, police station, three community and recreational centers, four libraries, a museum, and the local wastewater treatment facility. The ESCO guaranteed $5 million in savings on these projects. The actual savings exceeded projected savings by 16%.

Source: U.S. EPA, 2004c.

[5] *Another type of agreement is an "own-operate" agreement, in which the ESCO maintains ownership of the facility, and sells back its "output" to the state entity.*

approved ESCOs. Through this program, agencies can continuously rely on the expertise of ESCO staff and use the program's low-cost financing to fund activities (Kansas Corporation Commission, 2003b).

Tax-Exempt Lease-Purchase Agreements

A tax-exempt lease-purchase agreement, also known as a municipal lease, is a low-interest financing vehicle exclusively available to the public sector.[6] These mechanisms are frequently used as the financing instrument underlying energy performance contracts because they allow governments to avoid using capital budgets to pay for energy efficiency upgrades. Because tax-exempt lease-purchase agreements often include non-appropriation language (that effectively limits an agreement's payment obligation to the current operating budget period), these agreements do not constitute debt in most states and therefore typically do not require voter approval.

Lease-purchase agreements, unlike commercial rental agreements, enable the lessee to own the equipment at the end of the lease term. This is a standard arrangement for many agencies, which already lease a portion of their equipment. It is often possible to add a clean energy activity to an existing leasing agreement, especially if a master lease is in place with a lending institution (Hatcher and Dietsche, 2001; Zobler and Hatcher, 2008; NAESC, Undated, U.S. EPA, 2008).[7]

Grants and Rebates

Governments and private foundations offer grants for specific activities with definable social benefits. Grants do not have to be repaid, which reduces the financing needed to complete a project and effectively reduces the associated payback period.

Most energy-related rebates are funded by Public Benefits Funds (PBFs), which are administered by state energy offices, local utilities, or other program administrators (see Section 5.2.2, *Funding Sources - Public Benefits Funds and System Benefits Charges* for more information).

Other Short-Term Financing Alternatives

Because most clean energy programs and activities cannot be paid off within a single fiscal year, states often must decide whether to enter long-term financing agreements or to delay the activity. For a budgeted activity (i.e., for which funds will become available in a known time frame), an alternative is for a state to start the activity immediately by issuing notes (i.e., a promise to pay). Common notes that government entities can issue include Tax Anticipation Notes (TANs), Bond Anticipation Notes (BANs), and Revenue Anticipation Notes (RANs). These short-term (e.g., less than 12 months) debt securities can be issued in anticipation of collecting future tax, bond, or revenues needed to pay for the activity, but they must be paid off in full at the end of their term. While this payment schedule may make short-term notes inappropriate for financing most energy efficiency projects, in some cases it can be a good business decision to mix financial vehicles (e.g.

[6] *Lenders do not have to pay federal income tax on the interest earned on qualifying transactions and pass the benefit through to the borrower (lessee).*

[7] *A master lease is similar to a "lease line of credit" in that it allows a variety of equipment with different useful lives and delivered at different times to be financed under one agreement, thereby reducing the paperwork required for approval.*

FINANCING NEW HEATING SYSTEMS IN THE SHENENDEHOWA CENTRAL SCHOOL DISTRICT, CLINTON PARK, NEW YORK

In the face of escalating energy and maintenance costs, the Shenendehowa Central school district installed new energy-efficient equipment that could be paid for from future energy cost savings. With assistance from NYSERDA, they hired an ESP that guaranteed energy savings.

Instead of bundling the financing under the performance contract, the district chose to obtain the funds directly from a commercial lender using a tax-exempt lease-purchase agreement for a 10-year term. The lease-purchase agreement contained non-appropriation language, which limited payments to the operating budget savings. This financing option allowed school officials to successfully install energy-efficient equipment without raising taxes.

Source: U.S. EPA, 2004c.

WASHINGTON ENERGY PERFORMANCE CONTRACTING PROGRAM

In 2001, Washington passed legislation requiring state agencies to perform energy audits in their facilities. The legislation requires agencies to use energy performance contracts to conduct upgrades in facilities where audits reveal energy saving opportunities. The Washington Department of General Administration has designed a program to assist state agencies, local governments, and other public institutions in entering into energy performance contracts. The Department has formed an Energy Team to administer the program and provide program participants with a pre-qualified list of approved ESCOs, an experienced energy engineer to provide technical assistance, and assistance obtaining low-interest state treasurer financing.

Source: Washington, 2007.

via a short-term note and a long-term agreement) to minimize the costs of delaying activities.

5.2.2 FUNDING SOURCES

This section describes how and when to use different funding sources, which are distinguished from financial vehicles. Sources of funding for LBE activities – including PBFs, revolving loans, pension funds, and private foundations – are accessed through the financial vehicles described above to provide the capital for clean energy activities. For example, a funding source such as a revolving loan fund or a state-run PBF can provide funding to a state agency via a financial vehicle such as a loan or a grant.

Energy Efficiency Program Administrators

States can work with their energy efficiency program administrators, such as utilities (e.g., PG&E) or third-party entities (e.g., the Mass Technology Trust or Efficiency Vermont) to obtain funding for their LBE programs. These organizations deliver efficiency measures and services with monies collected via public benefits funds, utility cost recovery mechanisms, or other funding sources. .

In the case of a PBF (also called a system benefits charge), state fund dedicated to supporting energy efficiency and/or renewable energy, paid for by a "per kWh" surcharge on electricity sales (typically 2 to 5 mills per kWh).[8] As of 2006, 19 states had implemented PBF programs for energy efficiency, collecting and reinvesting more than $1 billion per year, and 16 states were collecting more than $300 million per year for clean energy supply (U.S. EPA, 2006b). While PBFs are typically used to support clean energy programs aimed at homeowners and the private sector, several states use them to pay for LBE activities.

EXAMPLE: *the Mass Technology Collaborative (MTC) – an entity that oversees the allocation of funding from the Massachusetts Renewable Trust, a fund generated from system benefits charges – provided funding in the form of a grant to the Massachusetts Division of Fisheries and Wildlife to evaluate the potential for integrating renewable energy and energy efficiency technologies into the design of a new state facility (EOEEA, 2007).*

[8] *1 mill = one-tenth of a cent.*

Revolving Loan Funds

Revolving loan funds are capital funds that make loans, collect payments, and then re-lend the loan payments to finance new activities. The original capitalization can come from sources such as PBFs, oil overcharge refunds, legal settlements, bond issues, or billing corrections. Revolving loan funds typically offer below-market rate long-term loans for energy efficiency or renewable energy activities.

Revolving loan funds can vary from state to state, according to type of qualifying project, financing terms, maximum loan amounts, interest rates, fees, and application and approval processes. Some revolving loan funds cover all capital expenditures while others are on a cost-shared basis. To contribute to state energy goals and be self-sustaining, revolving funds must be well-capitalized (e.g., large enough to meet a significant portion of the market need) and/or long-term (e.g., to allow funds to fully recycle and be re-loaned to a sizable number of borrowers). To maintain a large pool of capital, it is important for states to consider tradeoffs such as the balance between private and public sector loans and between short-term and long-term loans. Additionally, if a fund holds only a few loans made to similar types of borrowers, it can be exposed to default; a fund with many diverse loans spreads the risks.

NEW HAMPSHIRE BUILDING ENERGY CONSERVATION (BECI) INITIATIVE

The New Hampshire BECI prompted an evaluation of options for improving energy efficiency in state-owned buildings. The state's Treasury Department was concerned about increasing the state's debt, which could adversely affect its credit rating. State officials determined that by setting up a tax-exempt master lease program (MLP) to underwrite its performance contracts, the state could obtain lower cost financing. Because the non-appropriation language of the MLP would allow the lease to be repaid from operating funds, there would be minimal impact on the state's credit rating. The state arranged two rounds of MLP funding for its facilities, totaling approximately $25 million.

This low-cost financing enabled state officials to install a broader range of energy-efficient equipment than if they had used the financing bundled into an ESP's performance contract. As a result, more projects met the legislated payback requirements. Ten buildings have been renovated through the BECI program. Avoided energy costs for these facilities exceed $200,000 annually. When fully implemented, it is anticipated that the BECI will be responsible for upgrades in more than 500 state-owned buildings, with energy savings of up to $4 million a year. These energy efficiency improvements will reduce CO2 emissions by approximately 35,000 tons per year.

Sources: U.S. EPA, 2004c; New Hampshire, 2006; U.S. EPA, 2006b.

IOWA ENERGY BANK

The Iowa Energy Bank combines private and public funds to finance energy efficiency improvements in state facilities by using saved energy costs to pay for the projects. The Energy Bank conducts an energy audit and engineering analysis, and negotiates financing terms with private lenders. The bank has facilitated more than $130 million in energy efficiency measures since its inception in 1989. Common energy efficiency improvements include fluorescent lamp and ballast replacement, motor replacement, exit sign replacement, pipe insulation, lighting controls, low volume toilets, biomass fuels, envelope insulation, and wind energy purchases.

Source: Iowa, 2006.

OREGON: STATE BUSINESS TAX CREDIT FOR EFFICIENCY AND RENEWABLES

Oregon's Business Energy Tax Credit (BETC), which any business and public entity can qualify for, has stimulated business investment in energy conservation, renewable energy resources, recycling, and less-polluting transportation fuels since 1980.

The tax credit is 35% of the eligible project costs (i.e., the incremental cost of the system or equipment that is beyond standard practice). The credit is taken over five years: 10% in the first and second years and 5% each year thereafter. The unused credit can be carried forward up to eight years. Recipients with eligible project costs of $20,000 or less can take the tax credit in one year. Through 2003, more than 7,400 Oregon energy tax credits had been awarded. Altogether, these investments saved or generated energy worth about $215 million a year.

A key feature of the program is its innovative "pass-through option," in which a project owner can transfer a tax credit to a pass-through partner in return for a lump-sum cash payment (the net present value of the tax credit) upon project completion. The pass-through option allows public entities and businesses with and without tax liability to use the energy tax credit by transferring their tax credit for an eligible project to a partner with a tax liability.

Source: Oregon, 2006a.

LOANSTAR REVOLVING LOAN PROGRAM

The Texas LoanSTAR (Saving Taxes and Resources) Program is a self-sustaining program of the State Energy Conservation Office (SECO), which provides low-interest loans to finance energy conservation in public facilities. Loans are repaid using cost savings from verified energy reductions. Legislatively mandated to be funded at a minimum of $95 million at all times, the LoanSTAR Program had funded projects in 191 facilities as of April 2006, with energy savings averaging 15%, an average payback period of 5.6 years, and 3% annual interest rates. The program has achieved cumulative energy savings of more than $210 million and has prevented 7,073 tons of NOx, 2.1 million tons of CO2, and 4,788 tons of SO2.

Sources: SECO, 2006b and ACEEE, 2007

A number of states have revolving loan funds that are successfully providing capital for clean energy activities, including LBE activities. These funds can be coordinated with tax incentives [e.g., the Oregon Business Energy Tax Credit (BETC)], have varying degrees of private commercial lender involvement (e.g., the New York Energy $mart Loan Program), or can be run as a direct lender (e.g., Texas LoanSTAR Program).

EXAMPLE: *The Maryland Energy Administration provides loans to state agencies for cost-effective energy efficiency improvements in state facilities through its State Agency Loan Program (SALP), which awards about $1 million in new loans each fiscal year. State agencies pay zero interest with a 1% administration fee. Their repayments are made from the agency's fuel and utility budget, based on the avoided energy costs of the activity. This self-sustaining fund is capitalized with national oil overcharge funds (MEA, 2005).*

Pension Funds

Some states use pension funds to invest in clean energy activities. Pension fund managers seek a mix of investments that ensure stable returns for their contributors after they retire, and energy cost savings can generate a solid return to the pension fund.

EXAMPLES: *Washington Real Estate Holdings, a real estate manager for the Washington State Investment Board, which manages the state's pensions, completed a $3.5 million SMART ENERGY and energy efficiency upgrade of Union Square that lowered building energy costs by 40% and created 30 jobs for a year (Feldman, 2005).*

CalPERS (California Pubic Employees Retirement System) and CalSTRS (California State Teachers Retirement System), which are among the country's largest pension funds for state and local government employees, hosted a conference in 2005 on environmental investing in San Jose, California, stating that "there is a growing demand in our global economy for cleaner, more efficient energy and technological solutions." (CalPERS, 2005.)

Private Foundations

A number of private foundations (e.g., nonprofit organizations or charitable trusts) help fund scientific, educational, or other charitable activities. The most common types of financing provided by these foundations include grants and program-related investments (which are usually set up with a repayment schedule). While foundations are sometimes reluctant to finance government

activities, clean energy activities that meet a foundation's specific objectives (e.g., improved indoor air quality in public buildings) may qualify for assistance.

5.2.3 STRATEGIES FOR OVERCOMING FINANCIAL OBSTACLES

The previous two sections describe financial vehicles and funding sources that states can use to finance their clean energy LBE programs. This section summarizes strategies and best practices states can use to mitigate financial barriers to their LBE programs.

- *Consider Multiple Financing Options.* LBE activities compete with many other programs for limited financial resources. In addition, capital is often difficult to access and financial requirements may be difficult to meet. Strategies for addressing financial issues include:
  - Use alternative financing options, including municipal lease-purchase agreements, performance contracting, and revolving loan funds.
  - Reform budgeting procedures to allow agencies to borrow from operating budgets to supplement capital budgets.
  - Communicate the fact that in the long run, cost-effective clean energy LBE activities help extend limited financial resources.

STATES ARE DEVELOPING WAYS TO SHARE OR RETAIN THEIR ENERGY SAVINGS

Iowa Executive Order 41 requires agencies to retain energy savings and reinvest them in facility infrastructure.

South Carolina legislation states that an agency's budget must not be reduced by the full amount of money saved through energy conservation measures. Instead, energy savings must be divided among the agency, the general fund, and debt retirement of capital expenditures on energy efficiency. In addition, the legislation requires the use of financial incentives to encourage agencies to reinvest their energy cost savings into energy conservation areas, where practical.

Recent Connecticut legislation requires development of a strategic plan to improve the management of energy use in state facilities. The resulting financial benefits to states and the overall electric system will be measured and distributed as follows:

- 75% retained by electric ratepayers
- 12.5% reinvested in EE programs in state buildings
- 12.5% invested in EE programs and technologies for energy assistance programs administered by the Department of Social Services.

Sources: Iowa, 2005; South Carolina, no date given; Connecticut, 2007.

- *Modify State Procurement and Accounting Rules.* State policies sometimes present barriers to implementation. Some states have modified their public procurement and accounting methods to encourage energy efficiency investments and renewable energy procurements. Barriers and potential solutions include:
  - Modify purchasing requirements that require using least first-cost and lowest bid approaches. This is critical because performance contracts and other energy-saving investments can increase upfront capital costs while resulting in lower life-cycle costs over the long term. In some cases, legislative authority or policy changes may be needed to modify procurement regulations to require life-cycle costing. For example, the Vermont State Agency Energy Plan for State Government requires life cycle cost analyses to be conducted on state purchases, where applicable (Vermont, 2005). (Also see Section 5.2.1, *Financial Vehicles, Capital Budgets and Procurement Budgets.)*
  - Permit long-term contracting, which is often needed to implement performance contracts.
  - Revise financing and leasing regulations so that public entities can pass through tax benefits (i.e., tax credits) to private entities. This is necessary for attracting private investors.
  - Modify budgeting and accounting practices so that agencies or facilities are allowed to keep a portion of the energy cost savings. Otherwise, energy cost savings could simply result in reduced budgets in subsequent years, discouraging facility managers from developing energy efficiency activities.
  - Change state budget "scoring" rules, so that the benefits of performance contracting, bond issues, or other debt obligations are considered along with their costs.

UTAH POLICY TO ADVANCE ENERGY EFFICIENCY IN THE STATE – FINANCING OPTIONS

The governor's policy for improving energy efficiency in state facilities recognizes the need for agencies to explore a variety of methods for funding energy-saving programs in buildings, including:

- Funding from the state legislature
- Utility energy-efficiency contracts
- Performance contracts
- Petroleum violation escrow fund
- Federal grants

Source: Utah, 2006.

- Develop standard agreements for sharing or retaining energy savings. State budget policies sometimes require savings from LBE activities to be deducted from an agency's or department's budget and transferred to the state general fund, rather than benefiting the agency or department. States are addressing this problem by revamping purchasing rules, developing standard agreements and protocols, issuing executive orders, and passing legislation for sharing or retaining energy savings.

- *Aggregate Purchasing Contracts for Green Power, Equipment Procurement, and Service Contracting.* Purchasing authority is often dispersed across agencies. Some states have lowered their costs by aggregating purchasing contracts across state agencies. For example, combining the electricity requirements of several agencies into a single contract enables states to negotiate lower prices for green power.

EXAMPLES: *The California Local Energy Efficiency Program coordinates municipal LBE programs that are, in many cases, very small jurisdictions with limited energy use. By coordinating their green power purchases, these municipalities can obtain better rates for their green power purchases.*

In 2004, the New York Municipal Wind Buyers Group was able to negotiate a 5% price reduction from the initial 2¢/kWh premium on a renewable energy purchase that aggregated the energy demands of 27 communities (Bird and Swezey, 2004).

In Colorado, a 2007 executive order directs the state Department of Personnel and Administration to pursue opportunities to aggregate purchases of hybrid and alternative fuel vehicles with neighboring states (Colorado, 2007).

KING COUNTY, WASHINGTON – WIN WIN PROGRAM

More than 130 government agencies throughout King County, Washington take advantage of the county Fleet Administration Division's Win-Win Program. The program uses savings from aggregated purchases to provide services to regional government agency fleets. These services include acquisition, maintenance, replacement, and disposal of more than 3,000 vehicles and equipment, worth over $2 billion. Agencies can save up to $4,000 per vendor when purchasing fleet-related products through the county. The county provides these services at cost–government agencies can obtain services through the program at the same cost of purchasing on their own, while benefiting from the county's expert advice.

Source: King County, 2006.

- *Address "Split Incentives" Issues.* Split incentives involve situations where the economic benefits of reducing energy consumption do not accrue to the entity that takes the action. Two types of split incentives can occur when implementing LBE programs:

  - State building occupants may not have an incentive to pay the upfront costs of energy efficiency since they do not see the savings from their investments. Increased communications and outreach (e.g., workshops and employee recognition programs) that raise the profile of clean energy LBE activities and their benefits can help overcome this barrier.

  - When states lease facilities from private owners, the owners may pass energy costs on to the building occupants and therefore have no incentive to purchase energy-efficient equipment or implement other clean energy measures. Similarly, designers and contractors for new buildings do not pay life-cycle operating costs, which instead fall on the tenants. Requiring life-cycle cost accounting and taking advantage of financial vehicles – such as performance contracting and municipal lease-purchase agreements – can help address these concerns. Other strategies include making the business case for energy efficiency to building owners and managers, and establishing an award system that gives the owner a share of the benefits.

EXAMPLE: *In Wisconsin, state officials are working to incorporate ENERGY STAR criteria into lease agreements when they are renegotiated for renewal (Mapp et al., 2006).*

5.3 CONDUCT COMMUNICATIONS AND OUTREACH: BUILDING AND MAINTAINING SUPPORT FOR AN LBE PROGRAM

Once an LBE program or activity has been initiated, it is important to continue to build and maintain support to ensure effective program implementation. This

ENERGY EFFICIENCY IN GOVERNMENT-LEASED BUILDINGS

States can lead by example by using their spending power to encourage private sector building owners to adopt energy-efficient building standards. California, Hawaii, and Virginia have used executive orders or legislation to direct state agencies to give preference to ENERGY STAR and LEED-certified spaces when pursuing building spaces for lease or purchase.

Sources: California, 2007; Hawaii, 2006; Virginia, 2007.

section outlines communication and outreach strategies for obtaining ongoing LBE program or activity support from state agency personnel, the public, and other community stakeholders. Additional resources are provided in Appendix E, *Resources for Conducting Communications and Outreach for LBE Programs.*

5.3.1 GAIN STATE AGENCY PERSONNEL SUPPORT

Despite its many benefits, clean energy is often assigned a lower priority than other issues. In addition, the relevant agency, facility, or managers may find it difficult and time-consuming to implement new LBE activities, or may not have the specific knowledge or staff support needed to do so. States can employ a variety of methods to mitigate these barriers while gaining the support of state staff. These strategies include:

- *Develop Contacts With State Employees.* It is important to identify state employees who might represent roadblocks to LBE efforts, as well as those who can be champions for the state LBE program, and to share information about the merits of LBE activities with these individuals. For example:
  - Develop contacts with high-level personnel, especially facility and finance managers, who might present potential roadblocks to LBE efforts.
  - Identify the champions in each state agency who are working to implement clean energy activities and give them the implementation support.
  - Identify staff who may be uncertain about the merits of LBE activities and include them in program planning and implementation.
  - Supplement limited staff availability by hiring interns (Massachusetts, 2006a) and obtaining governor support for hiring additional staff (Utah, 2006).
- *Provide Incentives to Key State Agencies and Personnel.* Giving verbal and/or written credit to state agencies and employees who are instrumental in helping to plan, implement, and participate in LBE activities communicates the importance of these activities, thereby encouraging others to offer support and instill clean energy awareness into the institutional culture.

EXAMPLE: *Colorado recognizes state employees who have promoted the goals and objectives of its Greening the Government program (Colorado, 2005).*

- *Require participation in LBE program design.* States can require key personnel to participate in LBE program/activity development and ensure participation through a regular reporting and meeting process.

EXAMPLE: *When the New York "Green and Clean" State Buildings and Vehicles Executive Order was enacted, the governor obtained support by convening agency heads in a state panel to implement the order and follow up with regular reports to the governor's office (NYSERDA, 2006).*

- *Improve coordination among state agencies.* The expertise required for an effective LBE program is often dispersed across different state agencies. Consequently, coordinating among agencies that have varied technical and programmatic focus (e.g., energy efficiency, finance, facilities construction and management,

MASSACHUSETTS APPROACH TO OBTAINING LBE SUPPORT FROM KEY STATE AGENCIES

A key reason for the success of the Massachusetts State Sustainability Program has been the ability of the lead LBE agency, the Executive Office of Environmental Affairs (EOEA), to successfully develop contacts with key state agency personnel. This process involved engaging high-level EOEA officials to contact each of the agency commissioners and ask them to appoint sustainability coordinators. EOEA also develops contacts with building facility directors and key finance staff. To date, EOEA has been able to obtain the support of key personnel in 50 of the largest state agencies, with the largest potential clean energy impacts. One effective approach for gaining support from these key personnel involved highlighting the non-environmental benefits (e.g., cost savings, personnel savings) in addition to the environmental and energy benefits of the program.

Source: Massachusetts, 2006a.

STATE EMPLOYEE INCENTIVES IN COLORADO

Through its Employee Sustainability and Pollution Prevention Incentive Awards Program, Colorado offers recognition to state employees who excel in promoting the goals and objectives of Executive Order D005 05, Greening of State Government. Selection criteria include:

- Degree of innovation
- Longevity of outcome (i.e., length of impact)
- Potential for environmental results and improvements
- Level of impact
- Application to Executive Order goals
- Effect on public awareness of opportunities for incorporating sustainable practices

Source: Colorado, 2006b.

environmental issues) can be instrumental in implementing clean energy programs.

5.3.2 CONDUCT COMMUNICATIONS AND OUTREACH WITH STATE AGENCY PERSONNEL

Conducting communications and outreach with state agency personnel is integral to gaining and maintaining support for the implementation of clean energy programs. The following strategies can help states ensure that staff at all levels are well informed so that they can effectively implement state LBE program and activities.

- *Develop a communications and outreach plan.* States can develop and implement a communications and outreach plan that outlines their approach for informing staff about the LBE program, its benefits, and how to support these efforts. A successful plan includes identification of the communications goal, target audience, key messages, strategies, specific activities to implement the strategies, and an approach for evaluating the plan's effectiveness. EPA has developed guidelines and support materials for developing a communication plan for ENERGY STAR activities, which can be applied to many clean energy LBE communication activities (U.S. EPA, 2006h). In addition, EPA is developing a guide to help states determine how to design, implement, and evaluate a program to educate and inform stakeholders about climate change and the benefits of clean energy [U.S. EPA, Forthcoming(b)].

- *Emphasize the broad range of clean energy benefits.* The benefits of clean energy LBE programs are sometimes not obvious to state officials, state agency staff, and other participants in the LBE process. Using outreach materials, education and training sessions, and guidance documents to report the dollars and kWh saved, GHG emissions avoided, and other environmental, economic, and energy reliability benefits can be an effective way to promote clean energy (also see Section 5.3.3, *Communicate the Benefits of Clean Energy to Stakeholders*).

- *Develop outreach materials.* States can develop outreach materials to educate state employees about LBE plans and engage their active participation in implementing the plans. Communication materials, from very simple reminders to more detailed materials and fact sheets, can describe the state's LBE activities, agency staff responsibilities, and information about the benefits of LBE programs.

  EXAMPLES: *Minnesota Executive Order 04–08 requires state departments to biannually email fact sheets to state employees about steps they can take at work and at home to reduce air pollution (Minnesota, 2005).*

  California has developed fact sheets describing state LBE measures (e.g., green building initiatives and solar power in state facilities), which include statistics on accomplishments (Green California, 2006b).

- *Provide Training Sessions, Workshops, and Conferences.* LBE training sessions, workshops, and written guidance can help show agencies how to develop their own LBE plans quickly and at low cost.

  EXAMPLE: *In Colorado, Rebuild Colorado offers energy management training workshops for state agency staff. Colorado held a Greening of State Government Conference to inform state employees, including purchasing officials, energy managers, facilities staff, custodial managers, and fleet managers, of the benefits of the state's LBE program and to share information on successful strategies, lessons learned, and available resources (Colorado, 2006a).*

- *Educate new employees.* It is important to ensure that new employees are informed about the LBE program, the specific measures that are being implemented, and related benefits.

- *Develop LBE guidance documents.* Knowing how an LBE activity applies to a particular office and its employees can increase the level of participation by state personnel and improve the effectiveness of an LBE program. Colorado, Massachusetts, Minnesota, and Vermont, for example, have developed guidance documents for state agencies that provide an approach to implementing their LBE program, including strategies for promoting the program and communicating its benefits to state employees.

VERMONT: EMPHASIZING THE BENEFITS OF CLEAN ENERGY

This 2005 state plan includes a chapter describing ways to obtain buy-in from state agency staff through education, promotion, and communication, including to:

Explain why the state LBE program is critical to reducing global warming; what state policies, laws, and agreements have been instituted; and how to implement LBE plans and strategies.

Provide statistics on past and present electrical and heating fuel usage as compared to targeted energy usage goals.

Source: Vermont, 2005.

5.3.3 COMMUNICATE THE BENEFITS OF CLEAN ENERGY TO STAKEHOLDERS

Creating a sustainable, effective LBE program involves persuading stakeholders about the initiative's merit. Thus, it is important to describe the benefits of the LBE program to the public, the private sector, and other community stakeholders, and to explain why these benefits are in their interest. States can communicate these benefits to stakeholders in a variety of ways:

- *Develop a clean energy LBE Web site.* Web sites provide an important source of information for the public.

EXAMPLES: *The Energy Resources Council of Maine has developed a Web site for energy consumers, called MaineEnergyInfo.com. One section of the site describes state LBE accomplishments and activities (Maine, 2006).*

The California Green Action Team, maintains a Web-based online media center that includes links to photos and videos highlighting LBE accomplishments (Green California, 2006a).

- *Issue press releases.* States can issue press releases to announce new LBE policies, explain the benefits of clean energy, and highlight LBE successes.

EXAMPLE: *An August 2006 press release announced the Pennsylvania governor's decision to double the state's green power purchase (e.g., wind and hydroelectric energy) from 10% to 20% of the state government's electricity consumption. The press release states that by leading the way on renewable energy resources, the state will create jobs, enhance homeland security, and provide significant environmental improvements (Pennsylvania 2006d).*

- *Publish newsletters, brochures, and fact sheets.* States can develop outreach materials to explain the benefits of clean energy and illustrate the state's role in taking the lead in clean energy activities.

EXAMPLES: *Massachusetts publishes quarterly newsletters that highlight LBE activities and provide information on innovative and cost-effective sustainability activities at state agencies, authorities, and colleges (Massachusetts, 2006b).*

California has recently initiated an on-line newsletter to share information on the state's actions to meet its energy efficiency and resource conservation goals (Green California, 2006b).

For states targeting municipal LBE programs, it can be helpful to work within "community outreach channels" to help build program support. A community outreach channel is an organization or process that deals with core issues of concern in the community, such as managing public buildings, reducing pollution, creating jobs, serving disadvantaged populations, and/or creating economic development opportunities.

EXAMPLE: *CALeep, for example, used the existing outreach channel of the San Joaquin Valley Regional Jobs Initiative (originally established to increased employment) to promote energy efficiency in municipalities (CALeep, 2006).*

Clean energy LBE activities frequently involve new technologies or practices that might be perceived as unproven, and can present barriers to implementation. Strategies for addressing these perceptions include:

REBUILD COLORADO TRAINING SESSIONS

The Colorado Governor's Office of Energy Management and Conservation's Rebuild Colorado offers a variety of technical services to state agencies and institutions, cities, counties, schools, and other local governments. Services include Energy Management Training Workshops for State Agencies, which are monthly, 90-minute, teleconferences for facilities and maintenance staff of state agencies and higher education institutions. Sessions are held on a variety of topics in energy management, including, for example, retro-commissioning.

Source: Rebuild Colorado, 2006a.

MASSACHUSETTS AGENCY SUSTAINABILITY PLANNING AND IMPLEMENTATION GUIDE

The Massachusetts State Sustainability Program developed a planning and implementation guide for state agencies that articulates the program's goals and offers specific strategies for agencies and employees to increase sustainability in state government. The guide is organized according to five LBE program areas: climate change/energy efficiency, waste reduction and recycling, sustainable design, water conservation, and environmentally preferable purchasing.

It includes a five-step sustainability plan template and a sample action plan worksheet to help agencies identify sustainability activities and the key staff necessary to ensure program success.

The guide serves as a foundation from which agencies can develop sustainability plans. It also encourages agencies to incorporate their own ideas into the program, with the aim of producing greater interest in the program's effective implementation.

Source: Massachusetts, 2004.

- *Conduct communication and outreach.* States can use workshops, presentations, and fact sheets to illustrate successful LBE programs launched by other states, and/or to provide tangible program benefits.

- *Provide incentives.* When developing green buildings, some facilities managers, architects, and designers must commit sufficient effort to make the integrated design process fully effective. States can communicate the importance of these actions by offering designers and architects energy performance bonuses if the building meets an agreed-upon energy efficiency target.

EXAMPLE: *Rebuild Colorado provides grants to state agencies, school districts, and universities as an incentive for public facilities managers to participate in its high-performance building design program (U.S. DOE, 2007).*

- *Offer technical expertise.* In some cases, the perceived concern involves a real operational or financial risk (e.g., new clean energy technologies may involve O&M risks, and some regions might have limited access to ESPs with well-established track records). States can help relieve these risks by obtaining technical expertise and screening or preauthorizing vendors or contractors.

5.4 PROVIDE TECHNICAL AND FINANCIAL ASSISTANCE TO LOCAL GOVERNMENTS

While some local governments are already leading by example through clean energy programs[9], other city and county governments lack sufficient staff and resources to initiate LBE programs. Consequently, it can be important for states to provide technical support and financial assistance to local government agencies – public hospitals; public schools, colleges, and universities; and other city- and county-level government facilities. Assisting local governments with their LBE activities can enable states to meet statewide clean energy and GHG goals.

EXAMPLE: *In July 2007, the Maryland governor launched the emPOWER Maryland initiative, with the goal of reducing statewide per capita energy consumption by 15% by 2015. One of the seven steps intended to help the state government reach this goal is to expand the Community Energy Loan Program (CELP), which provides in low-interest revolving loans to local governments and nonprofit organizations to install energy efficient improvements (Maryland, 2007).*

Working with local governments can also lead to enhanced information-sharing networks that can both increase awareness of the benefits of clean energy at the local level and provide opportunities for local governments to share their LBE successes with states. (Additional resources are provided in Appendix F, *Resources on Technical and Financial Assistance to Local Governments.)*

BENEFITS OF STATE TECHNICAL AND FINANCIAL ASSISTANCE PROGRAMS

- Facilitate development and implementation of local clean energy programs
- Encourage information sharing among state and local agencies
- Help states meet their statewide clean energy targets
- Help ensure the development of consistent and successful clean energy practices

5.4.1 TECHNICAL ASSISTANCE PROGRAMS

A number of states have developed technical assistance programs for local governments and other public entities. Examples of successful state LBE technical assistance programs are presented below.

California: Technical Assistance in Existing and New Buildings

The CEC's Energy Partnership Program offers technical assistance to cities, counties, and hospitals by helping these local groups identify opportunities to improve energy efficiency in buildings. The program provides such technical services as conducting energy audits, preparing feasibility studies, developing equipment performance specifications, reviewing existing proposals and designs, reviewing equipment bid specifications, and assisting with contractor selection and commissioning. The CEC also helps identify state loans and other financing sources for project installation (CEC, 2006b).

Web site: ***http://www.energy.ca.gov/efficiency/partnership/index.html***

[9] *See, for example, Section 3.5.5, Local Governments or Other State/Public Organizations Adopt Programs that Support State Goals and/or Influence State Adoption of LBE Programs and Chapter 2, Potential Lead by Example Activities and Measures.*

New York: Energy-Efficient Product Procurement Assistance

As part of its Energy $mart initiative, NYSERDA administers the New York State Local Government Energy-Efficient Product Procurement Program (GEEP-NY) to provide local governments with tools, education, and guidance to assist them in purchasing or leasing ENERGY STAR equipment. Resources include fact sheets, case study briefs, demonstration projects, an electronic resource center, a model for estimating savings potential, a "how-to" guide, and PowerPoint briefings (NYSERDA, 2004a).

Web site: ***http://www.nyserda.org/programs/geep-ny/index.asp***

Oregon: Energy Audits and Design Reviews for Public Schools and Local Governments

The Oregon Department of Energy provides technical assistance to public schools and local governments by conducting energy audits, assessments, and design reviews. Through its Building Commissioning Program, the department helps train building operators to improve building documentation, detect potential energy deficiencies, and tune up building control systems. Resources include commissioning handbooks and a toolkit that guides public school and local government building managers through the commissioning process (Oregon, 2006b, 2006b).

Web sites: ***http://www.oregon.gov/ENERGY/CONS/GOV/govhme.shtml*** **(Energy Information for Governments)**

http://www.oregon.gov/ENERGY/CONS/BUS/comm/bldgcx.shtml **(Building Commissioning)**

Pennsylvania: Energy Management Plan Assistance

The Pennsylvania Department of Environmental Protection has developed communication materials (including a Web site and a PowerPoint presentation) to provide energy conservation assistance to local governments, and assists local governments in developing energy management plans based on initial evaluations of energy efficiency improvement opportunities. The Web site contains a list of information and resources on conservation and energy efficiency measures, alternative energy approaches, and financial incentives (Pennsylvania, 2006a).

Web site: ***http://www.depweb.state.pa.us/energy/cwp/view.asp?a = 1379&q = 485061***

Texas: Schools and Local Government Program

Administered by the Texas SECO, this program provides services to help public school districts, colleges, universities, and nonprofit hospitals establish and maintain energy efficiency programs through school partnerships, energy management training workshops, and direct energy-related services. The school partnerships component of the program includes activities such as helping schools establish student-involved energy projects and developing energy-related educational materials. The energy management training workshops cover both the administrative aspects of clean energy LBE programs (e.g., energy accounting and retrofit financing) and the technical aspects (e.g., energy management technologies and building design). Direct technical support is provided through facility-related services that address energy accounting, energy-efficient facility O&M, indoor air quality, water conservation, and comprehensive energy planning. SECO also offers a Preliminary Energy Assessment Service to assist energy managers in reducing costs, increasing available capital, spurring economic growth, and improving working and living environments. The assessment service offers recommendations for energy efficiency upgrades at no cost (SECO, 2006a).

Web site: ***http://www.seco.cpa.state.tx.us/sch-gov.htm***

TYPES OF TECHNICAL ASSISTANCE

- Training seminars and workshops
- Guidance documents and resources, including clean energy LBE Web sites for local governments
- Outreach programs
- School partnerships and energy education programs
- Direct assistance, such as conducting energy audits, preparing feasibility studies, and assisting with contractor selection and building commissioning
- Energy management and planning support

Technical Assistance Topics

- Energy efficiency measures
- Energy management technologies
- Green building design
- Building codes
- Energy accounting
- Retrofit financing
- Building commissioning
- ENERGY STAR resources
- Energy-efficient procurement practices

West Virginia: Building Professionals Energy Training Program

This program, administered by the West Virginia Development Office, disseminates information concerning current energy codes and building technologies to local government officials and county and school facilities managers. With the assistance of DOE, program staff organize training seminars covering topics such as "Overview of the 2000 International Building Codes," "High Performance Schools," and "ENERGY STAR Portfolio Manager" (West Virginia, 2006).

Web site: ***http://www.wvdo.org/community/code.html***

NEW JERSEY CLEAN ENERGY PROGRAM: PROVIDING FINANCING FOR SCHOOLS AND LOCAL GOVERNMENTS

New Jersey's Clean Energy Program administers the Clean Energy Financing for Schools and Local Governments program, which offers financial incentives and low-interest financing to schools and governments to develop energy efficiency and renewable energy generation projects. The program combines a rebate program with incentives and financing, giving schools and local governments the flexibility to implement cost-effective projects immediately.

The following sample analysis for a comprehensive energy efficiency building upgrade, developed by the New Jersey Clean Energy Program, illustrates potential costs and savings:

Sample Cost Savings Analysis

PROJECT COSTS	
Comprehensive energy efficiency upgrade (includes lighting and HVAC)	$500,000
Installation of a 200 kW solar energy system	$1,200,000
Total project costs	$1,700,000
FINANCING	
New Jersey Clean Energy Program Grant	$890,000
Total financing—15-year term at 4.8%	$810,000
Total finance payment	$6,321 per month
SAVINGS	
Energy savings (from efficiency upgrades and solar system installation)	$8,917 per month
Monthly cost savings (Years 1–15)	$2,596 per month
Annual cost savings (Years 16–25)	$35,000 per year
Total savings (over and above the cost of the equipment and financing charges)	$817,280

Source: New Jersey, 2005.

5.4.2 FINANCIAL ASSISTANCE PROGRAMS

State agencies responsible for clean energy LBE programs can provide direct financial assistance to local governments and/or provide resources about financial opportunities available through other sources.

A number of state programs offer loans to local governments that can be paid by using savings from the energy efficiency upgrades funded by the loan. Other states help local governments with their energy savings performance contracting and/or provide guidance on financing opportunities for local agencies. Examples of state financial assistance programs for local governments are provided below.

California: Energy Efficiency Financing Program

This CEC program provides low-interest loans to schools, hospitals, and local governments to fund energy audits, feasibility studies, and energy efficiency measures. The interest rate is 4.5%, and the maximum loan per application is $3 million. Recipients who complete their projects within 12 months of the loan and meet all requirements specified in the loan application receive a reduced interest rate of 4.1%. The repayment schedule is negotiable up to 15 years and is based on the annual projected energy cost savings from the aggregated projects (CEC, 2006a).

Web site: ***http://www.energy.ca.gov/efficiency/financing/index.html***

Kansas: Facility Conservation Improvement Program

This program enables local governments to use an energy service performance contract to access financing for planning and implementing LBE activities. The state program has a master agreement with four preapproved ESCOs that provide services ranging from activity identification and assessment to design management. Leases for energy savings activities through the program are tax-exempt to benefit the public agencies, and the interest paid by the lessee is exempt from federal and Kansas income tax (Kansas Corporation Commission, 2003a).

Web site: ***http://www.kcc.state.ks.us/energy/fcip/financing.htm***

Oregon: State Energy Loan Program (SELP)

This program provides low-interest loans for public, residential, and commercial energy efficiency activities (including projects in schools, cities, counties, Indian

tribal communities, and state and federal agencies). Eligible activities include energy production from renewable resources, using recycled materials to create products, using alternative fuels, and installing energy saving technologies such as energy-efficient lighting and weatherization. Limited funds are also available for energy evaluations for schools and public buildings. As of December 2007, 765 loans exceeding $420 million had been made through SELP. Of these, more than 200 loans were made to municipal organizations. Loan terms vary from five to 15 years. The program is self-supported (using no tax dollars) and most loans are designed so the energy savings from the project equal the loan payment (Oregon, 2006d).

Web site: ***http://www.oregon.gov/ENERGY/LOANS/selphm.shtml***

Pennsylvania: Local Government Handbook

Pennsylvania's Department of Environmental Protection (DEP) developed a handbook for local governments, developers, and businesses that describes the DEP's financial and technical assistance programs across a range of environmental and energy topics (Pennsylvania, 2008).

Web site: ***http://www.depweb.state.pa.us/ocrlgs/lib/ocrlgs/localgovernmenthandbook2008.pdf.***

5.5 INFORMATION SHARING: FEDERAL, STATE, AND LOCAL LBE RESOURCES

Clean energy programs and activities are being implemented and funded across the country on federal, state, and local levels. LBE managers and administrators can increase the effectiveness of their programs by coordinating with other agencies, programs, and organizations, sharing information about their experiences, and sharing LBE-related resources and tools.

5.5.1 OPPORTUNITIES FOR NETWORKING AND INFORMATION SHARING

Successful implementation of an LBE program or activity can require considerable information and technical expertise, and involve skills ranging from designing programs to conducting financial analyses. Networking, one-on-one discussions, and sharing information with officials from other states and municipalities can provide insights about methods, best practices, useful tools, and strategies for alleviating barriers (see Appendix G, *State LBE Programs and Contacts,* for a list of LBE initiatives by state, including contact information). In addition, organizations that include representatives from multiple states (e.g., the National Association of State Energy Officials) can serve as clearinghouses for information on clean energy and LBE programs. These organizations provide a forum for discussion and can facilitate information-sharing sessions among governments.

Exchanging information about LBE goals, plans, programs, and issues can be especially helpful when states share similar situations. For example, information sharing can be particularly beneficial among states with extensive college systems that include many large universities with their own physical plant, purchasing officers, and administrators. States, including California and New York, have assembled extensive information on how to implement LBE activities and have shared this information via Web sites, published guidance

LEVERAGING TECHNICAL EXPERTISE AND CREDIBILITY

The Consortium for Energy Efficiency (CEE), which works with private and public sector partners to advance energy efficiency, has assisted municipalities in implementing energy-efficient traffic signals. CEE helps municipalities adopt the ENERGY STAR traffic signal specification, which is based on the Institute of Transportation Engineers standard. This provides cost savings to municipalities that may not have had the resources to develop a specification of their own. But more importantly, having a technically sound and well-established specification helps pave the way for more rapid adoption of energy-efficient traffic signals. Having a credible specification provides an assurance to traffic departments of the safety and reliability of the signals.

Source: CEE, 2006.

MARYLAND'S JANE E. LAWTON CONSERVATION LOAN PROGRAM (JELLP)

Maryland operates the Jane E. Lawton Conservation Loan Program (JELLP) – which recently replaced the Community Energy Loan Program (CELP) – to provide local governments, nonprofits, and businesses with financial assistance to reduce operating costs associated with energy efficiency upgrades (e.g., technical assessments, plans and specifications, and construction costs). Eligible projects include those that save energy and have a simple payback of seven years or less. Energy savings generated by efficiency upgrades can be the major source of loan repayment. Currently, the program funds nearly $1.5 million in new projects each fiscal year; a total of 58 loans have been made providing more than $15 million for energy efficiency improvements, with cumulative energy savings of more than $20 million.

Sources: Maryland, 2006; Maryland, 2008.

documents, presentations, and training sessions (CEC, 2007a and NYSERDA, 2004c).

5.5.2 FEDERAL, STATE, AND LOCAL INFORMATION RESOURCES

Numerous federal, state, and local resources are available to LBE managers and administrators as they establish their programs. An extensive list of resources is provided in the appendices to the *LBE Guide*. This section highlights some of the key federal and state information sources.

Federal Government Information Resources

The federal government sponsors a variety of programs and provides technical assistance to states implementing LBE programs. Table 5.5.1, Federal Government Information Resources, presents a summary of the major federal programs that address clean energy issues and provide guidance documents and other resources relating to LBE programs.

State Information Resources

Several states have developed Web sites with substantial LBE support documents, including language for executive orders, legislation, and regulations; LBE implementation guides; and resources for particular LBE activities. Examples are presented in Table 5.5.2.

Local Information Resources

Local governments are also developing clean energy LBE programs. Table 5.5.2 summarizes some of the LBE guidelines, best practices, and other resources that municipalities have developed.

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TABLE 5.5.1 FEDERAL GOVERNMENT INFORMATION RESOURCES

Title	Description	URL/Source
EPA Clean Energy-Environment State and Local Program	This program assists state and local governments in their clean energy efforts by providing technical assistance, analytical tools, and outreach support. It includes two programs: *The Clean Energy-Environment State Partnership* is a voluntary partnership program that supports state efforts to develop and implement cost-effective clean energy strategies that achieve public health and economic benefits. Through this partnership program, EPA provides technical assistance tailored to states' needs. ▪ The *Clean Energy-Environment Guide to Action* provides an overview of clean energy programs, including LBE opportunities and information resources available to states. The *Clean Energy-Environment Municipal Network* provides resources that supports local governments' efforts to use clean energy strategies to advance their community priorities. ▪ EPA is currently developing *Municipal Clean Energy Best Practices* guidance that will provide best practices information and resources about energy efficiency, energy supply, transportation and air quality, urban planning and design, waste management strategies to reduce energy use, and cross-cutting programs and resources. A key resource for both programs is the: ▪ *Energy Efficiency Resources Database*, which provides planning, policy, technical, analytical, and information resources for state and municipal governments.	Program Web site: *http://www.epa.gov/cleanenergy/energy-programs/state-and-local/index.html* State Partnership Web site: *http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-partnership.html* Guide to Action: *http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-best-practices.html* Municipal Network Web site: *http://www.epa.gov/cleanenergy/energy-programs/state-and-local/local.html* Municipal Best Practices: *http://www.epa.gov/cleanenergy/energy-programs/state-and-local/local-best-practices.html* Energy Efficiency Resources Database: *http://www.epa.gov/cleanenergy/energy-programs/napee/resources/database.html*
EPA Combined Heat and Power Partnership	The voluntary CHP Partnership seeks to reduce the environmental impact of power generation by promoting the use of CHP. The Partnership works closely with energy users, the CHP industry, state and local governments, and other stakeholders to support the development of new projects. ▪ The *Catalog of CHP Technologies* offers information for regulators, policymakers, and agency officials on CHP systems and applications.	Partnership Web site: *http://www.epa.gov/chp* *Catalog of CHP Technologies:* *http://www.epa.gov/CHP/project_resources/catalogue.htm*
EPA ENERGY STAR Program	The ENERGY STAR program provides numerous resources to governments, schools, and businesses to help them achieve superior energy management and realize resulting cost savings and environmental benefits. A list of ENERGY STAR resources applicable to LBE activities is provided in Section 2.1, *Energy Efficiency Measures in Government Buildings*.	*http://www.energystar.gov*
EPA Environmentally Preferable Purchasing	This EPA program provides assistance in purchasing products and services that have a reduced impact on the environment. The Web site describes options for procuring environmentally preferable office equipment, information on green buildings, and opportunities for networking with representatives of other green programs. It also contains a list of Web-based tools to assist with environmentally preferable purchasing.	*http://www.epa.gov/opptintr/epp/pubs/about/about.htm*
EPA Green Power Partnership	The EPA Green Power Partnership is a voluntary program to boost the market for green power sources. State and local government partners receive EPA technical assistance and public recognition. The *Guide to Purchasing Green Power* provides an overview of green power markets and describes opportunities and procedures for buying green power.	Partnership Web site: *http://www.epa.gov/greenpower* *Guide to Purchasing Green Power:* *http://www.epa.gov/greenpower/buygreenpower/guide.htm*

TABLE 5.5.1 FEDERAL GOVERNMENT INFORMATION RESOURCES *(cont.)*

Title	Description	URL/Source
National Action Plan for Energy Efficiency	The National Action Plan for Energy Efficiency presents policy recommendations for creating a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations. The National Action Plan Web site contains resources, technical support, and networking opportunities.	*http://www.epa.gov/cleanrgy/actionplan/eeactionplan.htm*
DOE Building Technologies Program	This program works in partnership with private and public sector organizations to improve building efficiency. The Web site provides assistance on energy efficiency in buildings; it contains guidelines, training information, information on financial resources, and a database of high performance buildings.	*http://www.eere.energy.gov/buildings*
DOE Federal Energy Management Program	FEMP works to reduce the operating costs and environmental impacts associated with federal facilities and to improve the energy efficiency of federally-procured products. Resources include an online database of federal high performance buildings, an annual training conference, and various workshops.	*http://www1.eere.energy.gov/femp/*
DOE Solar Energy Technologies Program	This program aims to develop strategies for implementing solar technologies around the country. Through such programs as the Million Solar Roofs initiative and the Solar America Initiative, the federal government partners with state and local governments to encourage the expansion of solar energy.	*http://www1.eere.energy.gov/solar/*
DOE State Energy Program	This program provides funding and technical assistance resources to state energy offices. Many states have used State Energy Program resources to support LBE programs.	*http://www.eere.energy.gov/state_energy_program/*
DOE Technical Assistance Project	TAP helps state and local officials in cross-cutting areas that are not currently covered by existing DOE programs. Assistance is available on: system benefit charges; renewable or energy efficiency portfolio standards; use of clean energy technologies; and use of renewable energy on public lands.	*http://www.ornl.gov/adm/wfo/exthome.htm*
DOE Wind and Hydropower Technologies Program	This program aims to improve wind energy technology, and develop cost-effective technologies that will enhance environmental performance and improve energy efficiency. The Web site presents opportunities for using wind and water for energy generation and provides resources on financing projects.	*http://www1.eere.energy.gov/windandhydro/*

TABLE 5.5.2 STATE INFORMATION RESOURCES

Title	Description	URL
California	The *Green California* program is the product of the governor's creation of a Green Action Team to implement sustainable policies statewide. The program provides information on how the state is leading by example by reducing energy and resource consumption. The Web site offers information on LBE opportunities, including a library of resources and fact sheets, and multiple guidance documents pertaining to sustainable building design/performance, onsite energy generation, and environmentally preferable purchasing.	*http://energy.ca.gov/reports/efficiency_handbooks/index.html*

TABLE 5.5.2 STATE INFORMATION RESOURCES *(cont.)*

Title	Description	URL
California	California's CALeep helps local governments leverage existing energy efficiency initiatives and resources to design and implement energy efficiency strategies for their communities. CALeep has produced the *Local Energy Efficiency Program Workbook*, which provides guidance for communities establishing energy programs. The CALeep Web site contains resources prepared by other state programs and federal sources. It also includes sources from cities, including the U.S. Council of Mayors *Selected Best Practices for Successful City Energy Initiatives* guide and examples from individual cities.	*www.caleep.com/workbook/workbook.htm*
Colorado	The *Greening Colorado Government* Web site serves as a clearinghouse for government agencies seeking information on LBE opportunities. The site provides resources for planning and tracking LBE programs, strategies for implementing energy-efficiency improvements, links to relevant executive orders and legislation, and information on opportunities for obtaining technical assistance.	*http://www.colorado.gov/greeninggovernment/index.html*
Massachusetts	The Massachusetts State Sustainability Program was developed to reduce the environmental impact of state agency operations and to promote sustainable practices statewide. The program includes initiatives for emission reductions, recycling, sustainable building design, and environmentally preferable purchasing. The Web site provides resources about LBE strategies and opportunities for financial assistance. A *Planning and Implementation Guide* provides information on the environmental impacts of day-to-day operations and how to implement specific LBE actions.	*http://www.mass.gov/envir/Sustainable/* *Planning and Implementation Guide http://www.mass.gov/envir/Sustainable/pdf/ss_guide_web.pdf*
New York	NYSERDA is responsible for implementing and guiding a number of state LBE programs, including a comprehensive program for green buildings and vehicle and equipment procurement. A guideline document—*"Green and Clean" State Buildings and Vehicles Guidelines*—provides information to assist state entities in developing detailed implementation plans and directing future projects.	*http://www.nyserda.org/programs/State_Government/default.asp?i = 13*
Pennsylvania	The *Governor's Green Government Council* assists the state government in adopting sustainable practices. The Council Web site provides information on its LBE programs, including green building, energy conservation, and environmentally preferable purchasing, and provides guides for adopting green practices in offices and schools. The section on high performance green buildings program provides an extensive list of resources and tools for state officials.	*http://www.gggc.state.pa.us/gggc/site/default.asp*
Vermont	The *Vermont State Agency Energy Plan for State Government* provides a strategy and guidance to address energy resource consumption issues in three primary areas of state governmental operations including building infrastructure development and operations and maintenance, state purchasing and contract administration policies and practices, and transportation	*http://www.bgs.state.vt.us/pdf/VTStateEnergyPlan.pdf*
Database of State Incentives for Renewable Energy	This database is a comprehensive source of information on state, local, and selected federal incentives that promote renewable energy and energy efficiency.	*http://www.dsireusa.org*

TABLE 5.5.3 LOCAL GOVERNMENT INFORMATION RESOURCES

Table 5.5.3. Local Government Information Resources		
Title	**Description**	**URL/Source**
Alameda County, California	Alameda County has developed Implementation Guidelines for its model environmental procurement policy. The county's model policy has been adopted by several California local governments.	*http://www.ciwmb.ca.gov/epp/LawPolicy/AlaPolImp.doc*
Boulder, Colorado	Boulder, Colorado has developed a *Historic Building Energy Efficiency Guide* for implementing energy efficiency measures in historic government buildings. Energy efficiency measures can be implemented without compromising historic authenticity and architectural or aesthetic integrity.	*http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=8217&Itemid=22*
Hennepin County, Minnesota	The Board of Commissioners in Hennepin County has authorized the creation of a Lead by Example Incentive Fund that will award a combined $100,000 to county departments that invest in environmentally preferable products. The Board has developed a set of *Lead by Example Initiative Guidelines* to assist department staff in meeting the program's requirements.	*http://wwwa.co.hennepin.mn.us/files/HCInternet/EPandT/Environment/Green%20Government/LBE%202007%20guidelines%20and%20instructions.pdf*
King County, Washington	The King County Environmental Purchasing Program has established a *Model Environmentally Preferable Products Policy* for local governments and other organizations.	*http://www.metrokc.gov/procure/green/mdpolicy.htm*
Madison, Wisconsin	The Madison Mayor's Energy Task Force has developed a *Blueprint for Madison's Sustainable Design and Energy Future* to recommend strategies for the city to lead by example in energy efficiency and renewable energy.	*http://www.cityofmadison.com/mayor/pdfs/GreenCapitalReport_1.pdf*
Philadelphia, Pennsylvania	The *Philadelphia High Performance Building Renovation Guidelines* provide guidance on major government renovation projects. Each guideline includes an overview of project materials, implementation strategies, and benefits.	*http://www.phila.gov/pdfs/PhiladelphiaGreenGuidelines.pdf*
San Antonio, Texas	San Antonio has developed an *Energy Efficiency Plan* that outlines measures the city plans on implementing to reduce energy consumption in local government facilities and operations.	*http://www.sanantonio.gov/enviro/pdf/Cosa Energy Plan Rev 10-03.doc*
San Francisco, California	The *San Francisco Municipal Green Building Compliance Guide* provides guidance for the design and construction of new government buildings in San Francisco.	*http://www.sfenvironment.com/aboutus/innovative/greenbldg/gb_compliance_guide.pdf*

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CHAPTER SIX

Tracking, Evaluating, and Reporting LBE Program Progress

This chapter provides information on how to track, evaluate, and report on the performance of LBE programs and projects.

This information is primarily intended to help states measure and improve their LBE programs and projects after they have been implemented. The tracking and benchmarking methods presented here can be used for other purposes, such as developing energy use baselines to help in establishing LBE goals (see Chapter 2, *Getting Started*) and screening LBE activities and measures to determine which are the most likely to meet LBE energy savings goals (see Chapter 4, *Screening LBE Activities and Measures*).

An overview of the tracking, evaluating, and reporting process is summarized in Figure 6.1. The following four steps are involved:

- *Step 1: Plan.* The tracking, evaluation, and reporting plan defines what will be tracked and evaluated, when to conduct the evaluation, and how to present the results to target audiences. (See Section 6.1, *Step 1: Develop a Tracking, Evaluation, and Reporting Plan.)*

- *Step 2: Track and Benchmark.* Tracking is the process of recording and documenting the performance of key indicators (e.g., energy savings and cost savings), or changes in key indicators, associated with an LBE program or project. The benchmarking process involves comparing the energy use of a building or group of buildings with other structures with similar characteristics and/or assessing how energy use varies from a

DOCUMENT MAP

CHAPTER SIX CONTENTS

Related appendices:

Appendix H, State LBE Tracking Tools and Resources. Provides information to help states identify and effectively use a variety of tracking tools, including tools for assessing building performance, emission inventory tools, energy savings tools and others.

Appendix I, M&V Protocols and Guidance. Summarizes federal guidelines that are designed for determining savings from individual projects (e.g., IPMVP, FEMP M&V Guidelines, and ASHRAE Guideline 14) as well as state and utility Program M&V guidelines

Appendix J, Resources for Reporting the Results of LBE Programs. Provides examples of how states have reported the results of their LBE programs and summarizes guidance on state reporting.

baseline. (See Section 6.2, *Step 2: Conduct Energy and Emissions Tracking and Benchmarking*.)

- *Step 3: Evaluate*. Evaluation involves collecting and analyzing new data and using it in conjunction with information gathered from the tracking and benchmarking process to assess the LBE program or project. (See Section 6.3, *Step 3: Conduct Evaluations* and Section 6.4, *Summary of Tracking and Evaluation Approaches*.)

- *Step 4: Report Progress*. Once an LBE program has been implemented, it is important to periodically report on the program results and use the evaluation results to to modify and improve the LBE program, as appropriate. Reports can be targeted to different audiences, including a high level executive summary for the public and political leaders, and a detailed assessment for state agency staff and others. (See Section 6.5, *Step 4: Report LBE Program Results*.)

Tracking LBE program and project data, conducting evaluations, and reporting results are critical to successful LBE efforts. These actions help states:

- Assess the performance of the state's LBE program and projects.
- Improve existing and future programs and projects.
- Present findings and conclusions to the governor, agency director, the public, and others.

The program performance metrics that states typically assess include energy savings (kWh) and cost savings. Some states also quantify and report demand savings (kW),[1] avoided air pollution and greenhouse gas (GHG) emissions, and other program benefits such as investment or job creation.[2] Techniques for evaluating savings range from simple analyses with limited physical measurements to the use of sophisticated surveys and analysis tools with real-time monitoring of energy and emissions data.

[1] *Demand is expressed in kW and refers to the power requirement of a system at a given time (e.g., a specific time of day), or the amount of power required to supply customers at a given time. For example, annual average demand savings are defined as total annual energy savings divided by the hours in the year. Peak demand reductions involve determining the maximum amount of demand reduction during a specified period of time (NAPEE, 2007).*

[2] *The LBE Guide focuses on the direct benefits of LBE programs, defined as energy savings (in kWH), demand savings (in kW), cost savings, and emission reductions. Additional information on how to assess these and other energy system benefits, environmental quality and related human health benefits, and economic benefits will be provided in EPA's A Guidebook for Assessing the Multiple Benefits of Clean Energy (U.S. EPA, Forthcoming).*

The remaining sections in this chapter provide guidance for those who are directly involved in carrying out tracking, evaluation, and reporting functions. For additional information on evaluation issues and methods, see the National Action Plan for Energy Efficiency's *Model Energy Efficiency Program Impact Evaluation Guide* (NAPEE, 2007).

TRACKING AND EVALUATION TERMINOLOGY

Terms used for tracking and evaluation can have different meanings for different applications. Common definitions are described below.

- **Baseline**: Conditions, including energy consumption and related emissions, that would have occurred in the absence of a program or project or that existed prior to program implementation. The baseline period is also referred to as the business-as-usual (BAU), pre-implementation, or pre-installation period.
- **Benchmarking**: Establishing energy use, emissions, or generation characteristics best practices standards (e.g., miles per gallon, energy use per square foot, emissions per unit of energy consumed, percent renewables per agency) for the purposes of comparing the performance of existing operations and establishing targets for those operations. Automated benchmarking enables states to electronically upload building utility data into a performance rating system, such as ENERGY STAR. This capability allows governments to set up a system that automatically measures and tracks energy performance of all facilities, sets baselines, tracks CO2 emissions, and receives the benefits of a performance rating system with no manual data entry.
- **Evaluation**: Conducting studies and activities aimed at determining the effects of a program or project. Evaluation can include any of a wide range of assessment activities associated with understanding or documenting program/project performance; assessing program -related markets and market operations; or assessing program-induced changes in energy efficiency markets, levels of demand or energy savings, and program cost-effectiveness.
- **Indicator**: A value or set of values that together or individually provide an indication of the status or direction of a project or program.
- **Measurement and Verification (M&V)** . Data collection, monitoring, and analysis associated with calculating gross energy and demand savings from individual sites or projects. M&V can be a subset of program impact evaluation. When M&V is used to evaluate projects as part of a program evaluation, the term EM&V can be used.
- **Reporting Period**: The time following implementation of a program or project during which savings are to be determined. The reporting period is also referred to as the post-implementation or post-installation period.
- **Tracking**: Recording and documenting critical information or indicators that define the program and its quantitative and qualitative performance—used for baseline establishment, program management, and evaluation.

FIGURE 6.1. AN APPROACH TO TRACKING, EVALUATION, AND REPORTING

Source: Schiller, 2006

6.1 STEP 1: DEVELOP A TRACKING, EVALUATION, AND REPORTING PLAN

Developing a plan for tracking, evaluating, and reporting LBE program and/or project results is an important first step. It is important to develop this plan during the LBE program design phase so that the program budget, schedule, and resources can properly take evaluation requirements into account. It is also a way to ensure that data collection required to support expected efforts is accommodated at the time of program or project implementation.

DEFINITION OF PROGRAM VERSUS PROJECT

A program refers to a group of projects with similar characteristics that are used in similar applications. For example, a program could be an LBE activity to improve the energy efficiency of its existing public buildings or the implementation of energy-efficient procurement across all agencies within a state. The term is also used more generally to refer collectively to the overall suite of state clean energy LBE actions.

Project refers to a single activity at one location, such as an energy-efficient lighting retrofit in a state building or the purchase of energy-efficient products within a state facility or agency.

Programs are often evaluated using a sample (versus a census) of projects, with the results applied to all projects that comprise that program.

Source: NAPEE, 2007.

The plan describes the key performance indicators that will be tracked, specifies an evaluation approach, and outlines reporting requirements. A well-designed plan can help ensure that tracking and evaluation efforts are effective, reported results are meaningful, and adequate resources are available. Figure 6.1.1 summarizes the basic components and steps for developing the plan. An overview of selected issues related to LBE planning is provided below.

DETERMINE EVALUATION GOALS

When determining program evaluation goals, it is important to consider key characteristics of the LBE program, including the stage of development (i.e., pilot programs, full-scale implementation, and mature programs). Table 6.1.1 illustrates how different stages of LBE program development are likely to have different program, evaluation, and tracking goals. For example, when implementing a new LBE program to improve the energy efficiency of state office buildings, a state may decide to conduct a pilot program in a limited number of facilities before implementing the program on a larger level. The evaluation goals and approach for this pilot program may be different than for a well-documented, "mature" program that has been operating for a number of years.

FIGURE 6.1.1. SAMPLE OUTLINE FOR A TRACKING, EVALUATION, AND REPORTING PLAN

Overview of a Tracking, Evaluation, and Reporting Plan

- Identify evaluation goals and objectives in light of overall LBE program goals
- Specify characteristics of the program and project
- Specify implementation strategies
- Specify types of evaluations (i.e., impact, process, and/or market) that will be conducted
- Specify level of accuracy for the tracking and evaluation analysis
- Determine the timing of tracking, evaluation, and reporting
- Define budget and resource requirements
- Develop quality assurance procedures

Tracking (see Sections 6.2 and 6.4)

- Determine the type of information to be tracked (e.g., are data to be collected for state-owned facilities, facilities for which the state pays the utility bills, or all facilities, including those the state rents and does not pay utility bills?)
- Determine the specific data to collect
- Determine who will collect the data and conduct the tracking
- Determine the format and period of data collection
- Identify the software tools that will be used to collect and track the data
- If benchmarking will be used, define the parameters, sources of data, and tools for establishing the benchmark. Energy benchmarking is externally-based (e.g., buildings are compared to other, similar buildings) or internally-based (e.g., energy use at a state government building or group of buildings is compared to other buildings owned by the state).

Evaluation (see Sections 6.3 and 6.4)

- Identify type(s) of evaluation to be conducted (i.e., impact, process, and/or market effects evaluations) and how it will occur. For example, for an impact evaluation:
- Decide who will conduct the evaluation
- Specify the M&V options, methods, and techniques to be used for each LBE measure
- Specify data analysis procedures, algorithms, assumptions, data requirements, and data products
- Specify the metering points, period of metering, and analysis and metering protocols (if any)

Reporting (see Section 6.5)

- Specify the target audience. Consider developing multiple reports based on audience.
- Specify the report format, contents, and how results will be documented
- Identify reporting schedule.

WHY TRACK, EVALUATE, AND REPORT?

Tracking, evaluating, and reporting on LBE programs and projects provide states with timely information to improve program implementation. Tracking and evaluation can help states answer the following questions:

- Is the program/project achieving its objectives? If so, how and why?
- How well has the program/project worked? What is the magnitude of program/project savings?
- How reliable is the program/project? will it continue to generate benefits into the future?
- What changes are needed to improve the program/project?
- Should the program/project be expanded, adjusted, or cancelled?

By answering these questions, states can:

- Identify program approaches that are the most effective and determine how to improve future programs.
- Decide where to focus for greater savings.
- Identify metrics that can be used in future estimates of benefits (e.g., energy savings per square feet of office space).

By communicating results and benefits to key audiences, states can document progress being made towards their LBE goals and promote the benefits of clean energy, describe recommendations for improvement, and obtain continued support for their programs and projects.

DETERMINE LEVEL OF DETAIL FOR PLAN

Plans can change over time and vary in level of detail, depending on the desired scale and rigor of the tracking and evaluation effort. For example, an evaluation effort might cover a five-year program implementation period plus three years of additional follow-up evaluation. However, if the first two years of evaluation indicate benefits consistent with what was expected, evaluation efforts could be scaled down for the final years. A well-prepared but simple plan is more useful than a complex but incomplete one.

DETERMINE TIMING FOR THE EVALUATION

Timing of evaluations is a key issue. While tracking occurs continuously during the development and implementation of a program or project, evaluation typically occurs at fixed intervals. The best time to conduct evaluations is at the mid-point of a program or at regular intervals (e.g., annually) so that they can provide more timely and useful information. Evaluations that occur only at program completion are not suited to influencing or improving the program or related follow-on efforts.

TABLE 6.1.1 SAMPLE GOALS FOR KEY PROGRAM TYPES

Program Type	Sample Program Goals	Sample Evaluation and Tracking Goals
Pilot Program	▪ Develop and document theory of how program will work (i.e., a "program logic model"). ▪ Define program outcomes. ▪ Assess cost-effectiveness. ▪ Establish indicators of, and metrics for, program performance. ▪ Measure participant satisfaction. ▪ Assess measurement methods and program scope.	▪ Evaluate and track established indicators to determine if program achieves expected savings and if it should be expanded or curtailed required accuracy is high. ▪ Test tracking, evaluation, and analysis methods. ▪ Document costs and benefits. ▪ Use information to estimate potential for expanded program. ▪ Include thorough process evaluations.
Full-Scale Implementation	▪ Attain program goals and benefits. ▪ Incorporate program refinements into formal program design. ▪ Transform the market.	▪ Track and evaluate established indicators to determine if program achieves expected savings and if it should be continued–required accuracy is medium (assuming higher accuracy evaluation in the pilot program confirmed benefits). ▪ Document costs and benefits. ▪ Document impacts attributable to the program. ▪ Analyze implementation processes (process evaluation). ▪ Continue process evaluations. ▪ May include market evaluation element.
Mature Program	▪ Strengthen goals and continue benefits. ▪ Transform the market.	▪ Same as full-scale implementation, but with a market evaluation component. ▪ Accuracy requirements may be low, since benefits are already well-documented through pilot and full-scale implementation evaluations.

ASSESS AVAILABLE RESOURCES

Another key issue to consider is budgeting. Evaluation budgets are typically between 1% to 8% of total program budgets. Challenges include balancing the cost, effort, and rigor of various approaches with the value of the information generated by these efforts. States can compare the costs of achieving high levels of confidence in the evaluation with the value of the benefits. In this way, evaluation involves risk management, where low-risk projects require less evaluation rigor than high-risk projects. The amount of acceptable risk is tied to: (1) the amount of savings expected from the program, (2) whether programs are expected to grow or shrink, (3) the uncertainty of expected savings, (4) the risk of not knowing the program results, and (5) the resources available to state agencies.

It is important to plan early to ensure that adequate resources (e.g., staffing, funding) are available to meet the tracking, evaluation, and reporting objectives and realistically anticipate the required costs and levels of effort. A simple and less rigorous, but well thought out and adequately funded, evaluation effort usually provides better results than a rigorous but under-funded effort.

Readers seeking additional information on evaluation planning can see Section 7 of the *Model Energy Efficiency Program Impact Evaluation Guide*. It addresses how evaluation planning and reporting is integrated into the program implementation process, as well as key issues and questions to determine the scope and scale of an impact evaluation.

WYOMING ENERGY CONSERVATION IMPROVEMENT PROGRAM: MEASUREMENT AND VERIFICATION PLAN GUIDELINES

The Wyoming Business Council State Energy Office (WBC) administers the Wyoming Energy Conservation Improvement Program (WYECIP), which supports public and non-profit facility owners in using energy performance contracts (EPCs) to finance energy conservation improvement projects.

WBC has established a guidance manual for facility managers on how to use EPCs and work with ESCOs. The manual includes guidelines for developing a project-specific M&V plan that includes the following information:

- Details of baseline conditions and data collected.
- Documentation of all assumptions and data sources.
- Items that will be verified.
- Responsibilities for conducting the M&V activities.
- Schedule for all M&V activities.
- Discussion of risk and savings uncertainty.
- Details of engineering analysis performed.
- Details of baseline energy and water rates.
- Performance period adjustment factors for energy, water, and O&M rates, if used.
- Methodology for energy and cost savings calculations.
- Details of any O&M cost savings claimed.
- Definition of O&M reporting responsibilities.
- Definition of, and format for, post-implementation, commissioning, annual, and periodic reports.
- Discussion of how and why the baseline may be adjusted.
- Definition of preventative maintenance responsibilities.

Source: Wyoming Business Council, 2007, 2007a.

6.2 STEP 2: CONDUCT ENERGY AND EMISSIONS TRACKING AND BENCHMARKING

This section focuses on data requirements and methodology issues for tracking and benchmarking energy use, demand, energy savings, and avoided emissions from energy efficiency and renewable energy programs and projects.

6.2.1 ESTABLISHING A TRACKING SYSTEM

All energy and demand savings analysis involves gathering data on baseline and reporting period energy use, together with information that affects energy use. This tracking process generally involves:

- Collecting data to define the baseline or benchmarks before a program or project starts. This includes documenting:
  - Key indicators such as baseline energy use and demand, saved energy and demand, reduced energy costs, and emission reductions.
  - Factors that affect baseline energy use and demand, such as weather (e.g., heating and cooling degree days),[3] facility occupancy, square feet of building(s) involved, and facility operating hours.
  - Baseline equipment and systems
- Collecting data that describe the same conditions after program implementation.

Baseline and post-implementation energy use and demand can be determined through site surveys; spot, short-term, or long-term metering; engineering analyses; computer simulations; and/or billing data analysis. Regardless of analysis approach, the types and quantities of data to be collected and tracked can be extensive and complex so it can be important to establish a database of this information. Some states have already established comprehensive databases that contain information for a wide range of program needs, and that can be tapped when developing an LBE program or project tracking system.

EXAMPLE: *Vermont has developed a robust IT system that contains historical and current customer information including for example, building characteristics, key staff/contacts, metered energy and demand, implemented measures, measure savings assumptions, project tracking, and other data. This data system supports improved planning and evaluation, and serves as a tool for increased management effectiveness (Parker et al., 2008).*

The first step in tracking LBE program progress is to establish an *inventory* of energy use for at least one year. This first year of data helps form a baseline or benchmark, which can then be used to measure the success of future LBE programs or projects.

Data on energy use can be collected at four different monitoring levels[4]:

[3] *Heating and cooling degrees, typically reported on a monthly basis, are calculated as the difference between outside air temperature and typical heating and cooling indoor temperature settings. They are indicative of relative heating and cooling requirements and ambient temperatures.*

[4] *The four levels are described in terms of energy use at facilities or buildings. However, the same hierarchy can be used for generation assets (for renewable energy programs) or vehicle fleets (for transportation programs).*

- *State Level:* State authorities gather information on energy consumption for all government agencies. Typically, one state agency (e.g., the real estate/facilities or energy/environmental agency) takes the lead, setting up a reporting template and aggregating the data.

- *State Agency Level:* Facility managers collect the information necessary to monitor energy consumption for all facilities owned or leased by their agency.

- *Facility Level:* Agencies owning or leasing multiple buildings can collect data for each facility. This level is particularly suited for benchmarking, and captures the interactive effects of a particular project (e.g., energy efficient lighting typically gives off less heat than conventional systems and may result in an increase in heating loads in winter). However, complications can occur if an agency does not pay for utilities in one or more of its rented facilities and/or rents space in a building without submeters.

- *Project Level:* Within facilities, it is possible to measure energy consumption by end use (e.g., lighting, cooling, ventilation, space heating, and appliances) to evaluate the impact of specific energy efficiency measures. While this level of monitoring requires project-specific evaluation processes, it yields more detailed, end-use level information about savings, cost-effectiveness, and savings potential, thereby helping states prioritize across individual strategies and measures. However, end-use level monitoring does not capture the interactive effects of whole building analysis.

The information to collect depends on the desired level of detail and type of system or software used. States collecting data on energy use and/or costs by for all government-owned facilities can follow one of two key approaches (both of which can be conducted by consultants or internal staff):

- Collecting energy provider invoices and utility billings that are paid by each state agency
- Sending an energy consumption questionnaire to each state agency.

While the first method is typically faster, the second method has the advantage of transferring more responsibility to the state agency level, requiring them to collect and track their own energy consumption data.

Once energy consumption (and/or demand) information is gathered, states can use commercially available *energy accounting* software to construct a database to store and display the data by multiple criteria, such as consumption by fuel type, by building or vehicle type, or by agency. Management of energy bills can also be subcontracted to private service and product providers (SPPs) that help organize and assess agency energy consumption, including organizing data into a database. These firms assess this information to provide the state with detailed information on energy costs and use, enabling identification of cost saving opportunities, better management, and improved efficiency. A list of SPPs is provided in Appendix H, *State LBE Tracking Tools and Resources*.

MASSACHUSETTS' DATA COLLECTION APPROACH: ENERGY AND CO2 INVENTORY

Massachusetts established an Energy and CO2 Inventory for FY 2002 for all state agencies. Fuel consumption data were gathered and analyzed to determine total government CO2 emissions, individual agency emissions, emissions from each fuel type, and emissions categorized by end-use function (i.e., buildings and transportation).

For fuel oil, gasoline, diesel, ethanol, compressed natural gas (CNG), and propane, data were collected centrally from purchasing records and vendor reports from state contracts. This was accomplished with the cooperation of the Operational Services Division, the state's central purchasing agency. Electricity and natural gas data were more difficult to obtain, since statewide contracts for these energy types were not in place. When consumption data were not available, the procurement records of cost data from the state accounting system were used to estimate consumption for those agencies. The state is working to obtain more accurate agency-by-agency natural gas and electricity consumption data in the future.

Source: Massachusetts, 2004.

GEORGIA'S ENERGY TRACKING SYSTEM

The Georgia Environmental Facilities Authority issued an RFP to develop an energy accounting system to track and analyze energy consumption and costs for all state facilities. The goal is to secure an in-house system that enables the state to accurately report its energy consumption and identify, initiate, and manage facility-specific or agency-wide cost savings strategies. The system will enable benchmarking of buildings against similar buildings using the EPA Portfolio Manager tool. It will also feature the ability to:

Create groups of similar facilities (e.g., prisons, office buildings, dorms)

Compare facilities (within a group and between groups) according to criteria such as cost per kWh, cost per therm, energy expenditure per square foot, energy expenditure per occupant, and energy use per square foot per degree day basis.

Sources: Georgia, 2006a, 2006b, 2006c.

ENERGY ACCOUNTING

Energy accounting is the term used to describe the process of tracking energy consumption and costs on a regular basis.

CEC's handbook, Energy Accounting: A Key Tool in Managing Energy Costs, provides background information about energy accounting, and describes energy accounting methodologies. Information on commercially available energy accounting software packages is also provided.

Source: CEC, 2000.

Another option for states and municipalities is to track energy use and conduct building energy benchmarking using EPA's Portfolio Manager tool, which rates facility performance relative to similar buildings nationwide based on EPA's national energy performance rating system. Benchmarking enables states to rank their individual facilities on energy performance and to compare each facility with other buildings (and to itself) over time. EPA has worked with SPPs to integrate the ENERGY STAR energy performance rating system into their efficiency assessments in order to directly calculate the ENERGY STAR score for eligible building types.[5] By using Portfolio Manager, SPPs can apply the energy performance rating system without duplicating data entry efforts (see Section 6.2.3, *Benchmarking and Assessing Potential Energy Savings* for more information about benchmarking and Portfolio Manager).

TRACKING RENEWABLE ENERGY CONSUMPTION

Renewable energy can replace conventional energy sources through the installation of on-site renewable energy devices. For example, the installation of solar panels or solar hot water heaters results in reduced energy consumption from traditional providers. Consumption of on-site renewable energy is frequently accounted for separately and is treated as "direct" energy savings rather than being included in total energy consumption.

The CEC and the Western Governors' Association is developing a renewable energy tracking system, the Western Renewable Energy Generation Information System (WREGIS), to track and account for renewable energy generation and registering RECs (CEC, 2006).

Information on WREGIS is at: *http://www.energy.ca.gov/portfolio/wregis/index.html.*

Tracking total energy consumption and demand requires collecting information on all forms of energy, including electricity, natural gas, propane, fuel oil, and gasoline. To assess energy use, states also distinguish between the energy consumed for building operation and the energy used for transportation. This distinction enables states to construct indicators related to energy use, such as building energy consumption and demand per square foot, and vehicle fuel use per mile.

To compare energy consumption data and accurately estimate energy and demand savings, states often account for the quantity of upstream energy that is consumed to produce the electricity consumed onsite. In this case, it is important to distinguish between *site energy*, which includes only the amount of energy consumed at the facility, and *source energy,* which includes the site energy plus the energy required to generate, transmit, and distribute electricity to a site (e.g., a building). Source energy can be a better measure than site energy for comparing total building energy use across fuel types since it enables a complete assessment of the impacts of clean energy in a building, including the associated environmental and economic impacts.[6] EPA's Portfolio Manager tool rates energy performance based on source energy.

If the electricity is purchased from the grid, site energy is converted to its source equivalent using standard site-source energy conversion factors such as those shown in Table 6.2.1. As illustrated in the table, for electricity use, the source energy consumed annually by a building is about three times the site energy consumed annually by that building. Because the conversion factors are based on the national average, it is preferable to use more accurate state- or region-specific factors, which may be available from utilities, energy service providers, or state energy or public utility agencies (U.S. EPA, 2007a, 2007b).

TABLE 6.2.1 SITE AND SOURCE ENERGY CONVERSION FACTORS[a]

Fuel Type	Site	Source
Electricity	1	3.340
Steam	1	1.45

[a] National averages do not account for regional electricity generation differences.

Source: U.S. EPA, 2007a.

[5] *The energy performance rating (measured from 1 to 100) indicates the percentile rank of the buildings compared to similar buildings nationwide. The rating system accounts for the impacts of year-to-year weather variations, building size, location, and several operating characteristics. Buildings with ratings of 75 or greater may qualify for the ENERGY STAR label.*

[6] *EPA's Portfolio Manager energy performance rating system is based on source energy (U.S. EPA, 2007).*

6.2.2 TRACKING AIR EMISSIONS

Emissions from electricity generation and fuel combustion include criteria air pollutants and GHGs. Criteria air pollutants include the six most common air pollutants in the United States: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. The primary GHG is CO_2, although states also track other GHGs with high global warming potential, such as methane.

Air emissions are categorized as either *direct* or *indirect*. Direct emissions occur at the site being evaluated (e.g., from fuel combustion in boilers or gasoline used in a truck). Indirect emissions occur off-site (e.g., in a power plant that generates the electricity used in a facility). Indirect emissions are typically accounted for through inventories of energy-using systems and equipment. GHG accounting standards, such as the DOE's 1605b program (U.S. DOE, 2007) and the California Climate Action Registry (California Climate Action Registry, 2007) protocols provide methods for these calculations.

Once an energy use inventory has been constructed, it is possible to calculate emissions resulting from energy consumption by using emissions factors, which are expressed in units of emissions per unit of energy consumed or per volume consumed (e.g., pounds of NO_x per kWh produced, pounds of CO per thousand gallons of gasoline consumed). Table 6.2.2 describes databases and tools for identifying emission factors and tracking air emissions.

TABLE 6.2.2. TOOLS AND RESOURCES FOR TRACKING AIR EMISSIONS AND IDENTIFYING EMISSION FACTORS

Portfolio Manager: In addition to tracking and benchmarking the energy use of facilities, Portfolio Manager uses EGrid, a comprehensive data source on the environmental characteristics of all domestic electric power generation, to provide estimated carbon emissions for facilities based on their energy consumption.

Emissions & Generation Resource Integrated Database (eGRID): This EPA tool provides a comprehensive data source on the environmental characteristics of all domestic electric power generation. It contains default emission factors at varying levels of detail, including by generating company, state, North American Electric Reliability Council (NERC) region, and U.S. average. It provides numerous search options, including by individual power plants, generating companies, states, and regions of the power grid. The current version contains U.S. power plant emission totals for 1996 through 2000, and 2002 through 2004. Web site: *http://www.epa.gov/cleanenergy/egrid/index.htm*

Model Energy Efficiency Program Impact Evaluation Guide – Chapter 6, Calculating Avoided Air Emissions: A resource of the National Action Plan for Energy Efficiency, this chapter describes two general approaches for determining avoided air emissions: emission factor and scenario analysis approaches. It presents several methods for calculating both direct onsite avoided emissions and reductions from grid-connected electric generating units and describes considerations for selecting a calculation approach. Web site: *http://www.epa.gov/cleanenergy/documents/evaluation_guide.pdf*

Power Profiler Tool: This is a Web-based tool that generates reports on the air emissions rates of electricity consumption by ZIP code. Web site: *www.epa.gov/cleanenergy/powerprofiler.htm*

EPA Emission Inventory Improvement Program (EIIP): The EIIP is sponsored jointly by EPA and the National Association of Clean Air Agencies (NACAA). It provides guidance on how to conduct emissions inventories and can be used as a reference for methodological issues. Web site: *http://www.epa.gov/ttn/chief/eiip/*

GHG Protocol: The World Resources Institute and the World Business Council for Sustainable Development (WRI/WBCSD) developed internationally-recognized GHG accounting standards and corresponding tools for developing local GHG inventories. The EPA Climate Leaders Program also provides guidance for developing local inventories based on the WRI/WBCSD protocol. Web sites: *http://www.ghgprotocol.org* and *http://www.epa.gov/climateleaders/resources/index.html*

Clean Air and Climate Protection (CACP) Software: This Windows-based software tool helps state and local governments develop GHG and criteria air pollutant emissions inventories and strategies to reduce GHG and air pollution emissions. It allows the user to create a cross-sector emissions inventory, including building, transport, and waste management sectors, and helps quantify the emissions reduction of existing and proposed measures. Web site: *http://www.cacpsoftware.org/*

Combined Heat and Power Emissions Calculator: This tool compares the anticipated carbon, CO2, SO2, and NOx emissions from a CHP system to the emissions from a number of systems using separate heat and power, and calculates the emissions reductions achieved by the CHP system. It also presents the carbon equivalency of these emissions reductions in terms of acres of trees planted and number of cars removed from the road. Web site: *www.epa.gov/chp*

(Additional resources are available in Appendix H, State LBE Tracking Tools and Resources.)

6.2.3 BENCHMARKING

Once a baseline description of energy consumption, demand, energy costs, and/or air emissions has been developed, states can use this information to identify potential energy savings from LBE programs and projects, set targets to reduce energy consumption, prioritize LBE projects, and track progress over time. One way to gauge the efficiency of energy use is to compare, or benchmark, an LBE project with similar projects. States can conduct the following types of benchmarking:

- *External Benchmarking.* External benchmarking involves comparing the building(s) being evaluated with other, similar buildings (e.g., other office buildings or K-12 schools). In addition to helping states track performance against similar facilities, the results can be used to compare energy performance against a national performance rating, identify best practices for improving buildings performance, increase understanding of how to analyze and evaluate energy performance, and identify high-performing buildings. States can use the ENERGY, STAR Portfolio Manager tool, described in more detail on in the text box at right, to conduct this benchmark comparison for select building types. Portfolio Manager normalizes for weather and other buildings and operational characteristics, and provides a benchmark score on a scale of 1-100. Portfolio Manager data are based on a national Commercial Building Energy Consumption Survey (CBECS) survey conducted every four years by the Department of Energy's Energy Information Administration, which includes data on building characteristics and energy use from thousands of buildings across the United States. (U.S. EPA, 2008; U.S. EPA, 2008a).

- *Internal Benchmarking.* With internal benchmarking, states can compare the energy use and demand (e.g., building efficiency), energy generation (e.g., via clean power), or emissions for the building or portfolio of buildings that they are evaluating with other state-owned or leased buildings. Energy performance benchmarks are typically defined in terms of energy use and/or demand per square foot, and can be as simple as the average energy consumption per square foot of all the state's buildings. This comparison enables states to identify buildings with the greatest potential for improvement, establish best practices that can be replicated in other state-owned or leased facilities, and to track performance over time, States that commit to a 10% improvement in energy efficiency – regardless of their starting levels of efficiency – can receive assistance and recognition under the ENERGY STAR Challenge. (U.S. EPA, 2008; U.S. EPA, 2008a).

- *Energy Utilization Indices.* States can also conduct benchmarking based on developing their own benchmark metrics (e.g., the energy use performance of facilities in the top percentile of the existing state facility stock). For example, states can use energy accounting to develop information on performance or energy utilization indices (EUIs) for all buildings of interest based on such factors as building type (e.g., office buildings, hospitals, prisons), size (e.g., less than 10,000 square feet, between 10,000 and 100,000 square feet, and greater than 100,000 square feet), or vintage (e.g., pre-1960, between 1960 and 1990, and newer than 1990). The state

PORTFOLIO MANAGER AND AUTOMATED BENCHMARKING

EPA's Portfolio Manager is an on-line, interactive, software tool that allows the user to monitor and manage energy data. It uses basic building data (e.g., size, type, and annual energy use) to calculate energy performance compared to similar buildings nationwide. States can use this rating to determine whether a building has a high, low, or typical energy-use intensity compared to other buildings.

Data can be entered for individual or groups of buildings. Buildings can be grouped by various criteria, including by agency and by building manager. Portfolio Manager includes an easy-to-read facility summary page that provides detailed information for each building entered. The software also tracks changes in energy intensity (e.g., energy per square foot) over time.

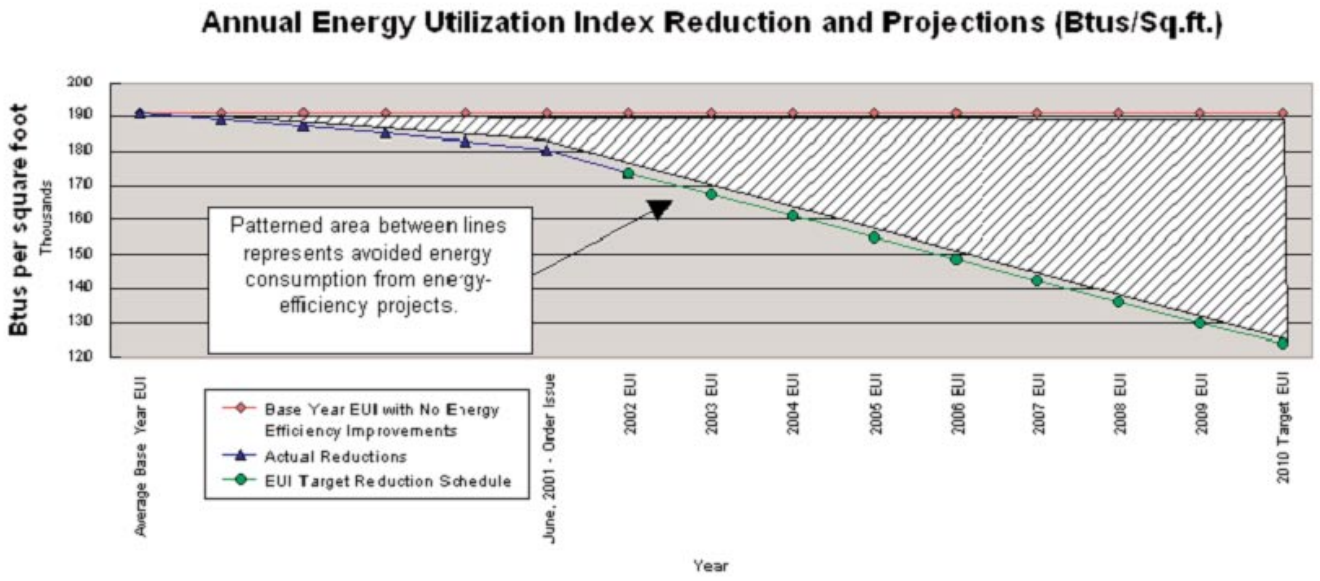
To minimize the data entry associated with Portfolio Manager, a data transfer technique called automated benchmarking has recently been developed. This user-friendly capability uploads building utility bills directly into Portfolio Manager. This allows governments to set up a system that automatically measures and tracks energy performance of all facilities, sets baselines, and estimates CO2 emissions, with no manual data entry. EPA is collaborating with SPPs (which provide energy information, management, and bill handling services to states and other organizations) to offer ENERGY STAR benchmarking as part of their standard software package for planning, tracking, and managing energy costs.

California provides an example of a state that conducts automated benchmarking. The state owns 1,566 facilities across 34 state departments and about 16,000 buildings, and has adopted EPA's Portfolio Manager as its benchmarking tool. To meet Green Building Executive Order S-20-04, the Department General Services, the California Energy Commission, and the state's investor-owned utilities worked together to integrate automated benchmarking capabilities into the utility billing process. With this capability, it will be easier for facility managers to track energy consumption against the 2003 baseline, and help meet the state's energy reduction goal of 20% by 2015.

Sources: U.S. EPA, 2007; ENERGY STAR, unpublished; and Miller, 2008.

FIGURE 6.2.1 NEW YORK'S ENERGY UTILIZATION INDEX (EUI)

NYSERDA benchmarking efforts compare energy reduction targets for buildings against an energy use per square foot metric, which encompasses the square footage of most of the state buildings (i.e., 14,000 buildings at a total of 400 million square feet). This EUI metric accounts for the expansion (e.g., new building construction, building purchases) and contraction (e.g., facility consolidation, building sales) of state-owned and -operated space when compared to a base year. The EUI projection for each year is compared to the EUI for the base year of 1989 to 1990. The figure below illustrates projected EUI reduction targets to 2010 (35% reduction) and the energy consumption that will be avoided as a result of these energy efficiency improvements, compared to the base year. In 2002, the average reduction in EUI per square foot was close to 17,000 Btus/Sq. ft. or 9%, representing about 25% of the 2010 target EUI reduction of about 67,000 Btus/Sq. ft.



Source: NYSERDA, 2003.

can then look at all the buildings that are larger than, say, 50,000 square feet and set an EUI benchmark (or target) equal to the 80th percentile in terms of kWh per square foot. Thus, 20% of the 50,000 square foot and larger buildings would meet or exceed the benchmark and 80% would have a target for improvement. Figure 6.2.1 provides an example of how New York established an EUI and target for its public buildings.

To share resources and experiences, states can work with other organizations that actively benchmark buildings, including the International Facility Management Association (IFMA, 2006), the Building Owners and Managers Associations (BOMA, 2006), and Tradeline, Inc. (Tradeline, 2006).

6.3 STEP 3: CONDUCT EVALUATIONS

As shown in Table 6.3.1, states can conduct three types of evaluations to assess their LBE programs: impact, process, and market effects evaluations. Impact evaluations involve determining the net benefits (e.g., energy savings, demand savings, emission reductions, renewable energy generated, cost savings) resulting from a program or project and are the focus of this section (see Section 6.3.1). Process evaluations and market effects evaluations are described briefly in Sections 6.3.2 and 6.3.3, respectively.

In terms of scope, impact and process evaluations can be conducted at the program and project levels, while market evaluations are appropriate only for program-level analyses. Program evaluations estimate the total effects of all similar projects undertaken by the state, such as all energy efficiency lighting retrofits in state office buildings or a state LBE green power purchasing program. Project-level evaluations assess individual installations (e.g., an evaluation of an energy efficiency retrofit in a single building or a stand-alone PV system).

TABLE 6.3.1 TYPES OF EVALUATIONS

Evaluation Types	Description	Information Derived
Impact Evaluations	Quantifies direct and indirect benefits of a program or project.	Determines the amount of energy and/or demand saved, the value of cost reductions, the amount of emissions reductions, and possibly, levels of indirect benefits.
Process Evaluations	Indicates how to improve the structure of a program or project. These evaluations often involve conducting a survey of program stakeholders, analyzing their feedback, and using this information to identify opportunities for program improvement.	Determines how well program or project processes are performing and if these systems can be improved.
Market Effects Evaluations	Indicates how a program affects the overall supply chain and market, including the extent to which a program influences future programs.	Determines changes that have occurred in state operations and/or private markets, and evaluates how the marketplace is different as a result of the program.

6.3.1 IMPACT EVALUATIONS

Impact evaluations involve determining and quantifying the direct and/or indirect benefits of a program or project. Direct benefits include net energy savings, cost savings, and emission reductions. Indirect benefits include job creation associated with the development of a green building industry, the health benefits of reduced air emissions from reduced fuel combustion, and economic benefits associated with reduced spending on imported energy supplies. This section focuses on *direct* benefits associated with reduced energy use (i.e., energy efficiency) and more efficient or cleaner generation (e.g., cogeneration and clean power).

MODEL ENERGY EFFICIENCY PROGRAM IMPACT EVALUATION GUIDE

This Action Plan guide provides detailed information on the processes and approaches for quantifying energy and demand savings, and avoided emissions resulting from energy efficiency programs. While the Guide focuses on impact evaluations, it also presents information on process and market evaluations.

The Guide is intended to assist in the implementation of the National Action Plan for Energy Efficiency's five key policy recommendations for creating a sustainable, aggressive national commitment to energy efficiency.

Source: NAPEE, 2007.

Measurement and verification (M&V) is a subset of impact evaluation that refers to the process of determining the direct benefits associated with reduced energy demand and or efficient or cleaner generation at a single project site (e.g., an energy-efficient lighting retrofit in a state facility) using one or more techniques ranging from simple estimates of savings to actual measurements and computer simulations. For simplicity, this section refers to energy savings M&V, although M&V approaches can also be applied to cost savings and emissions reductions through the use of conversion factors (e.g., to $/kWh or CO_2 per kWh).

ASSESSING THE MULTIPLE BENEFITS OF CLEAN ENERGY

EPA is currently developing a guidance document for state energy, environmental, and economic policy makers on assessing the many benefits of clean energy. This guidebook will address energy savings, energy system benefits, environmental quality and related human health benefits, and economic benefits of clean energy. While they are sometimes reported in qualitative terms, these benefits can also be estimated using computer simulations of a state's economy (e.g., job creation, reduction in trade deficits), public health models (e.g., reductions in asthma), and other analytic tools.

The guidebook will describe each type of benefit; present methods, tools, and resources for estimating each type of benefit; and provide information on how states can use the results to build support for their clean energy programs.

Source: U.S. EPA, Forthcoming.

A key step in conducting project-level M&V is to collect baseline and reporting period data, including energy, demand, and cost savings. This enables the analyst to make initial comparisons of the baseline and reporting period (i.e., post-implementation). In terms

of reporting, results are typically presented for the first year of performance followed by regular interval (e.g., annual) M&V activities aimed at: (a) verifying the operation of the installed equipment/systems, (b) determining current year savings, and (c) estimating results for subsequent years to assess the persistence of savings.

Numerous resources are available to help states evaluate the direct impacts from clean energy activities, including energy savings, cost savings, and emission reductions from LBE programs (see Appendix H, *State LBE Tracking Tools and Resources*.) Other indirect energy, economic, and environmental benefits can also be measured. Methods and tools for estimating these benefits are described in EPA's forthcoming guidebook on *Assessing the Multiple Benefits of Clean Energy* (U.S. EPA, Forthcoming).

Measurement and Verification Basics

Energy savings from an LBE project can be determined by comparing energy use before and after implementation of an energy savings project, using the following equation:

Energy savings = (Baseline energy use) – (Reporting period energy use) ± (Adjustments)

- *Baseline Energy Use* is the energy consumption that would have occurred without implementing the project or program. It is sometimes referred to as "business-as-usual" (BAU) energy use.

- *Reporting Period Energy Use* is the energy consumption that occurs after the project or program is implemented. It is sometimes referred to as "post-installation" energy use.

- *Adjustments* ensure that baseline and post-installation energy use are measured under the same set of conditions (e.g., weather conditions, building occupancy, operating hours). For example, corrections for weather and occupancy may be required if the project involves heating or air-conditioning systems in a building (e.g., a more efficient air conditioner may consume more electricity after it is installed if the weather is warmer after installation as compared to before installation) or the number of occupants changes. On the other hand, weather does not influence the energy savings associated with most retrofits to industrial processes. Additional information on how to address these issues is provided below in *Impact Evaluations – Savings Adjustments*.

CALCULATING THE BASELINE

A first step in conducting impact evaluations is to establish a baseline. The baseline, also referred to as the "business-as-usual" scenario, defines the conditions, typically including energy consumption and may also include related demand and emission reductions that would have occurred without implementing a project or program.

Results are then calculated as the difference in energy use (and demand and emissions, as appropriate) between the baseline and the new project or program. The two primary options for determining baselines are:

- **Project-specific baselines**. A project-specific baseline uses the circumstances associated with the project or program to define the baseline. With an energy efficiency project this might involve using historical energy use or emissions data for a particular facility. For a renewable energy generation project, the baseline might be associated with historical power purchases from a local distribution company.

- **Multi-purpose or standards baselines**. For this type of baseline, energy use and emissions calculations are based on the energy codes or regulations that define energy use (e.g., state equipment efficiency standards) or conventional building practice guidelines.

The basic approach to M&V is illustrated in Figures 6.3.1 and 6.3.2. Figure 6.3.1 presents a sample calculation of energy and cost savings from a school energy-efficient lighting project. Figure 6.3.2 illustrates the process of comparing energy use patterns of the pre-installation (baseline) period to the post-installation period.

One or more approaches can be used to estimate baseline and post-installation energy use, including:

- *Inspections*—inspections can document the existence, characteristics, and operation of baseline or post-installation equipment and systems, as well as factors affecting energy use.

- *Engineering Methods*—standard formulas and assumptions can calculate the energy use of the baseline and post-installation energy systems.

- *Statistical Analyses*—analyses can be conducted to compare "before" and "after" electric bills while taking into consideration changes in weather, facility occupancy, factory operating hours, and other factors. These assessments often involve using multivariate statistical models.

- *Computer Simulation of System Performance*—many computer models can predict the energy use of system performance, including F-Chart for active and passive solar energy systems (F-CHART Software, 2005),

FIGURE 6.3.1. SAMPLE ENERGY EFFICIENCY PROJECT—CALCULATION OF DIRECT BENEFITS

A school district replaces its existing lighting with energy-efficient lighting. More than 100 school buildings replace 30,000 fixtures that each consume 92 watts with the same number of fixtures that each consume 61 watts. The hours of operation for the lights are estimated at 3,000 per year. In this case, a typical M&V approach would involve conducting an inventory of all the pre-retrofit and post-retrofit lighting fixtures to determine the reduction in power demand and then measuring the operating hours of a sample of fixtures in all the schools to determine actual energy savings.

The savings are equal to the difference between the baseline energy use and the post-retrofit energy use. (This assumes, for example, that the school classroom hours do not change and that the retrofit does not increase the number of lighting fixtures.) For this project, the baseline energy usage is the sum of the baseline kWh consumption for the original fixtures and the post-retrofit energy usage is the kWh for the new fixtures.

The following simplified equation can be used to determine estimates of energy savings for lighting efficiency projects:

kWh savings $_t$ = **[(kW/fixture** $_{baseline}$ x **Quantity** $_{baseline}$**) – (kW/fixture** $_{post}$ x **Quantity** $_{post}$**)] x Operating hours**

Where:

- **kWh savings** $_t$ = kWh savings realized during post-installation time period t
- **kW/fixture** $_{baseline}$ = lighting baseline demand per fixture
- **kW/fixture** $_{post}$ = lighting demand per fixture during post-installation period
- **Quantity** $_{baseline}$ = quantity of affected fixtures before the lighting retrofit
- **Quantity** $_{post}$ = quantity of affected fixtures after the lighting retrofit
- **operating hours** = total number of post-installation operating hours (assumes number is the same before and after the lighting retrofit)

(Note that there are 1,000 watt-hours in a kWh)

Thus, the energy savings equal:

[(92 watts/fixture x 30,000 fixtures) – (61 watts/fixture x 30,000 fixtures)] x 3,000 hours= 2,790,000,000 watt hours or about 2.8 GWh hours per year.

During the pre- and post-installation inventories of light fixtures, wattage values can be determined by fixture measurements with a power meter or from manufacturer data. Operating hours can be obtained from measurements of the number of hours that the fixtures are operating. This is typically done for a sample of the fixtures using a type of meter that records, over a period of time, the on and off status of light fixtures.

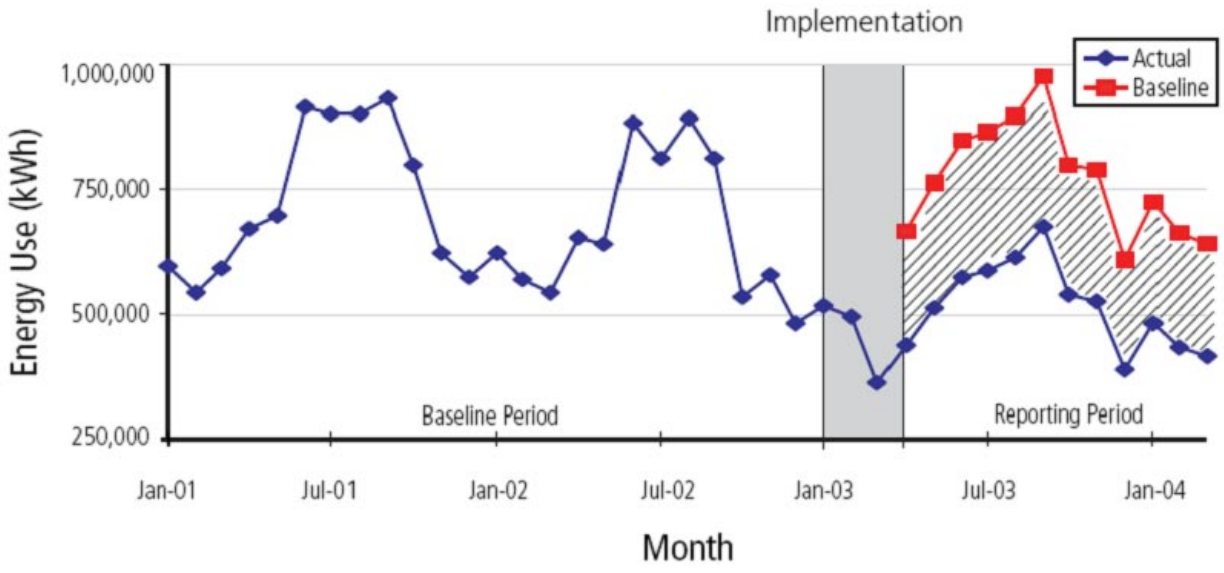
The calculated savings can be modified to account for a variety of factors. For a lighting project, these could include uncertainty in the savings calculation (e.g., uncertainty in operating hour measurements), baseline adjustments (e.g., minimum lighting fixture standards imposed by a state), and/or addition of savings for transmission and distribution losses between the school buildings and the power plant. Another common modification might be to account for the interactive savings associated with the lighting retrofit. For example, there might be a reduction in savings associated with an increase in classroom heating due to less lighting and thus less heat from the lights. However, for simplicity, no modifications are assumed in this example.

To determine cost and emission savings, factors can be applied to the electricity savings estimate. For example:

- Costs savings, based on $0.10/kWh, would be $279,000 per year
- CO_2 emission reductions, based on 1.5 pounds per kWh, would be 2,092 tons per year of CO2 reduction

Source: Schiller, 2006.

FIGURE 6.3.2. HYPOTHETICAL COMPARISON OF ENERGY USE BEFORE AND AFTER A PROJECT IS IMPLEMENTED



DOE-2 for buildings (LBNL, 2006; U.S. DOE, 2006), and a number of other calculation tools (Texas A & M, 2006) These models are typically calibrated with actual performance data.

- *Metering and Monitoring*—baseline and post-installation energy use can be measured and monitored through metering and accounting for non-energy factors, such as weather conditions.

- *Integrative Methods*—these methods combine some or all of the preceding approaches. For example, metering and engineering methods can calibrate computer simulations of baseline and post-installation buildings that receive efficiency retrofits.

Savings Adjustments

Before considering how to adjust for changes in energy use from the baseline to the reporting period, it is important to understand the factors that cause energy use to vary, including:

- *Building Area Change*: Changes in building size strongly influence energy consumption. If square footage is added to a facility, energy use is expected to increase.

- *Operations and Schedule Changes*: Changes in building occupancy or schedules for building and equipment operation affect energy use. If a building is open longer hours, more energy is used for heating, cooling, and lighting. If a school cafeteria brings in pre-cooked meals in disposable containers instead of cooking and dishwashing on site, kitchen energy use is reduced.

- *Weather*: Energy used for heating and cooling varies because of changing temperatures. Seasonal changes cause increased energy use for heating in the winter and increased use of electricity for cooling during the summer.

Variations in energy consumption due to the *structural* or *activity changes* described above need to be factored out of the impacts calculation. This can be accomplished by collecting basic activity data such as the square footage of buildings, number of occupants, miles traveled per vehicle, and weather characteristics. Indicators such as energy consumption per square foot allow for normalization of facility energy consumption based on the area in which energy is consumed. Such indicators are useful for comparing energy consumption among various buildings, projects, or facilities.

WEATHER NORMALIZATION

To isolate the impact of clean efficiency, the effects of weather (e.g., fluctuation in annual mean temperatures over time) on overall energy consumption need to be considered. This ensures that energy consumption calculations reflect comparable year-to-year energy consumption rather than changes due to variation in weather. The best way to normalize weather impacts is to use regression models that indicate a statistically valid relationship between energy use and outdoor ambient air temperature on a project-by-project basis. However, a simplified approach is to use heating and cooling degree days.

Heating and Cooling Degree Days (HDDs or CDDs) are measures of how cold or warm a location is over a period of time relative to a base temperature, most commonly specified as 65°F (i.e., if the average outside air temperature on a given day is below this base temperature, heating will be required; if the temperature is above this base temperature, cooling will be required).

HDDs are summations of negative differences between the mean daily temperature and the 65°F base; CDDs are summations of positive differences from the same base. For example, CDDs for a station with daily mean temperatures during a seven-day period of 67°, 65°, 70°, 74°, 78°, 65°, and 68°, are 2 (i.e., 67°–65°), 0, 5, 9, 13, 0, and 3, for a total of 32 CDDs for the week.

HDDs and CDDs are used in energy analysis as an approximate indicator of heating and cooling energy requirements. States can normalize energy consumption by dividing the space heating- or air conditioning-related energy consumption of a particular month or year by the HDDs or CDDs corresponding to that month or year.

BUILDING ENERGY SIMULATION PROGRAMS

For over 30 years, engineers and scientists have been developing computerized models that describe how the energy use of buildings changes in response to independent variables, such as weather. The sophistication and complexity of these models is quite varied. To learn about some of the building simulation models that are publicly available, see the Lawrence Berkeley National Laboratory Simulation Research Group Web page at *http://gundog.lbl.gov* and the Texas Energy Systems Laboratory Web page at < http://esl.eslwin.tamu.edu/ >.

Source: NAPEE, 2007.

Rigor of M&V Analysis

Two ways to categorize M&V approaches for estimating energy or demand savings are by using either a "deemed savings" approach or a project-specific measurement ("measured savings") approach. For simpler energy efficiency measures whose performance characteristics are well known and consistent, a deemed savings approach may be appropriate. This method involves multiplying the number of installed measures by

the estimated (or deemed) savings per measure, which are derived from validated historical evaluations.

"DEEMED" AND "MEASURED" SAVINGS

Deemed savings usually apply to the most common energy efficiency measures. Deemed savings are the per-unit energy savings that can be claimed from installing consistent and well-understood measures. Examples include agreed-to savings per fixture for a lighting retrofit or per vehicle for purchasing alternative fuel vehicles. Since they are stipulated and not subject to change, deemed savings can help simplify program planning and design. However, deemed savings can result in inaccurate estimates of savings if the projects or products do not perform as expected (e.g., if energy-efficient lights fail earlier than expected.)

Measured savings approaches typically result in a higher level of rigor through the application of end-use metering, billing regression analysis, or computer simulation. Measured savings approaches are usually used for custom measures and large-scale projects. These approaches add to administrative costs but may provide more accurate savings values.

Source: U.S. EPA, 2006a.

As discussed earlier in this chapter, more rigorous M&V approaches may be appropriate for larger and more complex efficiency projects, projects with a significant amount of savings, and projects with significant savings uncertainties. One way to identify the appropriate level of rigor – and to increase transparency – is to adopt a formal M&V protocol.such as the commonly-used International Performance Measurement and Verification Protocol (IPMVP).[7] Many states base their M&V approaches on the IPMVP, coupled with their own requirements (e.g., the level of required accuracy and precision).

Regardless of the specific methods adopted, there are two key elements to the M&V process:

- *Verifying the potential to generate savings:* this involves confirming that (1) baseline conditions are properly defined, and (2) the proper equipment and systems were installed and are performing to specification. This is evaluated through a review of designs, pre-installation savings estimates, and inspections.

- *Estimating energy savings*: energy savings are calculated based on deemed savings values, energy bills, or calibrated computer simulation. As described above, it may be sufficient to verify the potential to generate savings and then simply stipulate that the LBE project savings will be deemed savings. In other situations, it may be preferable to determine the measured savings using one of four IPMVP options (described in more detail in the next section). When selecting the M&V option to use for a LBE project, it is important to review the objectives of the impact evaluation.

Some states, particularly those with aggressive timelines for implementing energy efficiency programs and with limited budgets, reach an advanced agreement on which LBE projects can be estimated using deemed savings and which projects require measured savings approaches. In general, deemed savings approaches are most reliable for technologies that:

- Deliver energy savings independent of human factors, such as contractor installation practices or consumer behavior (e.g., plug-in products).

- Have a clear standard by which to compare efficient and less efficient products [e.g., the Federal National Appliance Energy Conservation Act (NAECA) Standard or ENERGY STAR designation].

- Have been promoted by other efficiency programs; have well-established usage patterns, measure life, and performance history; and where usage is not driven by weather.

The IPMVP and Other M&V Protocols

A variety of M&V protocols and procedures have been established, including national-level guidelines such as the IPMVP (which are designed for determining savings from individual projects) and state guidelines (which specify their jurisdictional requirements for M&V). Table 6.3.2 lists some of the key M&V protocols and guidance. More detailed information on each resource is provided in Appendix I, *M&V Protocols and Guidelines*.

The IPMVP provides a framework and definitions that can help states develop M&V plans for their projects (e.g., implementing individual energy efficiency measures in a facility, conducting a whole building analysis).[8] It includes guidance on current best practice techniques for determining energy savings and verifying the results of energy efficiency, renewable energy, and water efficiency projects in commercial

[7] *A 2007 version of the IPMVP was recently released; see http://www.evo-world.org/.*

[8] *IPMVP covers project rather than program energy savings and describes what should be included in a project M&V plan. Some state programs, such as NYSERDA and the California Public Utilities Commission, already use the IPMVP.*

TABLE 6.3.2 M&V PROTOCOLS AND GUIDELINES FOR INDIVIDUAL PROJECTS[a]

Title	URL
National or International EM&V Protocols and Guidelines	
ASHRAE Guideline 14-2002 Measurement of Energy and Demand Savings	*http://www.ashrae.org/;* ASHRAE, 2006
Federal Energy Management Program M&V Guidelines	*http://ateam.lbl.gov/mv/;* Applications Team, 2006 *http://ateam.lbl.gov/mv/docs/26265.pdf;* U.S. DOE, 2000
International Performance Measurement and Verification Protocol	*http://www.evo-world.org/index.php?option = com_content&task = view&id = 61&Itemid = 80*
Model Energy Efficiency Program Impact Evaluation Guide	*http://www.epa.gov/cleanenergy/pdf/evaluation_guide.pdf*
State and Utility Program M&V Guidelines	
California Utility Standard Performance Contracts (SPC) Program	*http://www.pge.com/biz/rebates/spc_contracts/2001_manuals_forms/index.html;* PG&E, 2006
NYSERDA Energy $martSM Commercial/Industrial Performance Program	*http://www.nyserda.org/programs/Commercial_Industrial/cipp.asp;* NYSERDA, 2004
State of Hawaii Guide to Energy Performance Contracting	*http://www.hawaii.gov/dbedt/info/energy/efficiency/state/performance/*
State of Texas Programs	*http://www.oncorgroup.com/electricity/teem/candi/default.asp;* TXU Electric Delivery, 2007
Texas Loan Star Program	*http://www.seco.cpa.state.tx.us/ls_guideline.htm;* SECO, 2007

[a] *For the purposes M&V, the terms protocol and guideline are typically used interchangeably.*

and industrial facilities. It is not a "cookbook" of how to perform specific project evaluations, but provides guidance and key concepts that are used in the U.S. and internationally (IPMVP, 2002).

The IPMVP provides a flexible set of four M&V approaches (Options A, B, C, and D) for evaluating energy savings in buildings. These four generic M&V options are summarized in Table 6.3.3. These options provide a range of approaches designed to match project costs and savings requirements with particular energy efficiency measures and technologies. States can select an option based on the specific project features, including:

- Complexity of the project
- Uncertainty of the project savings
- Potential for changes in key factors between the baseline and post-installation period
- Value of project savings

M&V options differ in their approach to the level, duration, and type of baseline, as well as the project performance period. For example, in terms of measurement levels:

- M&V evaluations using Options A and B are made at the end-use, system level (e.g., lighting, HVAC).
- Option C evaluations are conducted at the whole building or whole-facility level.
- Option D evaluations, which involve computer simulation modeling, are made at the system or the whole-building level.

In terms of measurement type and duration:

- Option A involves using a combination of stipulation and measurement of the key factors needed to determine energy savings.

- Options B and C involve using spot, short-term, and continuous measurements.
- Option D may include spot, short-term, or continuous measurements[9] to calibrate the model.

[9] *Spot measurements are one-time measurements (e.g., of the power draw of a motor). Short-term measurements can take place for a week or two, such as determining the operating hours of lights in an office. Continuous metering involves measuring key factors, such as power consumption or outdoor temperature, throughout the term of the valuation, which may continue for years.*

While these options are directly associated with energy efficiency projects, the basic concepts are also applicable to clean power, transportation, and distributed generation activities. Each option has advantages and disadvantages based on project-specific factors and the needs and expectations of the participants. While each option defines a savings determination approach, it should be noted that options A-D produce *estimates* of savings and not direct measurements. Since M&V

TABLE 6.3.3 IPMVP MEASUREMENT AND VERIFICATION OPTIONS

M&V Option	How Savings Are Calculated	Cost	Typical Applications
Option A. Partially Measured Retrofit Isolation: Savings determined by partial field measurement of the energy use of the system to which a measure was applied, separate from the energy use of the rest of the facility. Focuses on physical assessment of equipment changes to ensure the installation is to specification. Key performance factors (e.g., lighting wattage or chiller efficiency) are determined with spot or short-term measurements. Operational factors (e.g., lighting operating hours or cooling ton-hours) are stipulated based on analysis of historical data or measurements. Performance factors and proper operation are measured or checked annually.	Engineering calculations using spot or short-term measurements, computer simulations, and/or historical data.	Dependent on number of measurement points. Approximately 1% to 5% of project construction cost of items subject to M&V.	Lighting retrofit where power draw is measured periodically. Operating hours of the lights are assumed to be one-half hour per day longer than a store's open hours. Used for simple project types where high accuracy is not required.
Option B. Retrofit Isolation: Savings determined after project completion by short-term or continuous measurements taken throughout the term of the contract at the device or system level. Performance and operations factors are monitored.	Engineering calculations using metered data.	Dependent on number and type of systems measured and the term of analysis/metering. Typically 3% to 10% of project construction cost of items subject to M&V.	Application of controls to vary the load on a constant speed pump using a variable speed drive. Electricity use is measured by a kWh meter installed on the electrical supply to the pump motor. In the base year, this meter is in place for a week to verify constant loading. The meter is in place through the post-retrofit period to track variations in energy use. Used for simple project types where high accuracy is not required.
Option C. Whole Facility: After project completion, savings determined at the "whole-building" or facility level using current year and historical utility meter (gas or electricity) or sub-meter data. Short-term or continuous measurements are taken throughout the post-retrofit period.	Analysis of utility meter (or sub-meter) data using techniques from simple comparison to multivariate (hourly or monthly) regression analysis.	Dependent on number and complexity of parameters in analysis. Typically 1% to 10% of project construction cost of items subject to M&V.	Multifaceted energy management program affecting many systems in a building. Energy use is measured by gas and electric utility meters for a 12-month base year period and throughout the post-retrofit period. Used for comprehensive and/or multi-site project types. Varying levels of accuracy possible.

TABLE 6.3.3 IPMVP MEASUREMENT AND VERIFICATION OPTIONS *(cont.)*

M&V Option	How Savings Are Calculated	Cost	Typical Applications
Option D. Calibrated Simulation: Savings determined through simulation of facility components and/or the whole facility. Simulation routines must be demonstrated to adequately model actual energy performance measured in the facility.	Calibrated energy simulation/ modeling; calibrated with hourly or monthly utility billing data and/ or end-use metering.	Dependent on number and complexity of systems evaluated. Typically 3% to 10% of project construction cost of items subject to M&V.	Multifaceted energy management program affecting many systems in a building but where no base year data are available. Post-retrofit period energy use is measured by gas and electric utility meters. Base year energy use is determined by simulation using a model calibrated by the post-retrofit period utility data. Used for comprehensive and/or multi-site project types. Varying levels of accuracy possible.

Source: IPMVP, 2002.

STATE APPLICATIONS OF THE IPMVP

California

- The 2006 California Energy Efficiency Evaluation Protocols require the IPMVP as the basis for planning M&V activities for impact evaluations. A basic level of M&V is defined as involving a statistically adjusted engineering model with metering/ monitoring per IPMVP Option A.
- An enhanced level of rigor is also defined that is based on IPMVP Option B (retrofit isolation) or Option D (calibrated simulation).
- Details are defined in a program M&V plan that is expected to be reviewed for adequacy on a case-by-case basis.

New York

NYSERDA's Commercial/Industrial Performance Program offers several strategies to obtain financial incentives for energy efficiency projects in government, industrial, commercial, and other buildings. M&V protocols are based on the 2002 IPMVP (Options A–D) and FEMP M&V Guideline 2.2.

Source: Schiller, 2006.

involves measuring the absence of energy, direct estimates are not possible.

One readily available resource for tracking energy efficiency at the whole building level is the ENERGY STAR Portfolio Manager. It employs an M&V methodology that is similar to IPMVP Option C, as described above. Table 6.3.4 presents a comparison of the energy rating requirements of IPMVP Option C and Portfolio Manager. Both methodologies encourage monitoring at the whole building level, which assesses the interactive effects of multiple energy conservation measures (ECMs). One minor difference is that the IPMVP determines savings separately for each meter or sub-meter serving a building so that performance changes can be assessed for separately metered parts of the facility, whereas Portfolio Manager aggregates all meters in a building so that performance changes can be assessed at the facility level. This approach promotes system-wide energy reductions and facilitates the recognition of top-performing buildings. Additionally, because the Portfolio Manager approach combines multiple meters, it must account for differences among fuel types. This is done by converting utility meter data into source energy (or primary energy) consumption. If a building has only one meter and one fuel type, such as a supermarket powered by electricity, the two methods of analysis are identical.

Program-Based EM&V Guidance Documents

The IPMVP and other M&V guidance documents described above focus on determining energy savings from individual projects. Evaluation, Measurement, & Valuation (EM&V) protocols provide established procedures for determining savings from a large number of similar projects, or a program. These procedures are usually associated with utility-sponsored energy efficiency programs where a regulatory body oversees and/or reviews the evaluation results for the purposes of ensuring ratepayer value and improving programs. In these situations, a sample of projects is investigated and the savings from these investigated projects are

TABLE 6.3.4 COMPARISON OF IPMVP OPTION C AND ENERGY STAR PORTFOLIO MANAGER REQUIREMENTS

IPMVP Option C Requirements	ENERGY STAR Portfolio Manager Requirements
Uses utility meters or whole building sub-meters to assess energy performance of a whole building.	Same.
Several meters may be used to measure the flow of one energy type into a building.	Same; participants of Portfolio Manager may enter/use several meters for measuring energy flow.
Meters serving non-interacting energy flows for which savings are not to be determined can be ignored, such as separately metered outdoor lighting circuits.	Same; only meters that are associated with indoor or space type energy savings are included in energy savings calculations.
If several different meters are read on separate days, each meter having a unique billing period should be separately analyzed. The results can be combined after each individual analysis.	Portfolio Manager combines all utility meters in a single building and then performs an analysis on the whole building.
Energy data are often derived from utility meters, either through direct reading of the meter, or from utility invoices.	Same.
Savings reported under Option C include the impact of any other changes made in facility energy use (positive or negative).	Same.
Savings should be determined separately for each meter or sub-meter serving a building so that performance changes can be assessed for separately metered parts of the facility.	Savings are determined at the building level and not at the individual meter level.
Must have 9 to 12 months of continuous energy use data to establish a base year before implementation of an energy management plan.	Same; must have 11 months of continuous use data to establish a benchmark before implementation of an energy management plan.
Option C usually requires 12, 24, or 36 months (i.e., one full year or multiple years) of continuous base year (daily or monthly) energy data, and continuous data during the post-retrofit period.	Users can compare any two 12-month periods, even if they overlap. They can choose to set the 12-month periods to comply with IPMVP.
The plan should specify details of how calculations of variables should be made or measured (e.g., run-time hours, electrical consumption in a lighting fixture, kW/ton).	Same; variables and units are displayed on the screen in Portfolio Manager.
Energy use is normalized for weather (degree days may be used) and occupancy (e.g., hours of operation, days of occupancy/week). Other parameters predicted to have a significant effect on energy savings should be included in routine adjustments.	Same; in addition, other parameters predicted to have a significant effect on energy savings are included in regression models (vary depending on space type).
Savings targets are advised to be ≥ 10% at the facility level.	Portfolio Manager users may set targets at any level; EPA typically encourages targets of 10% or better.

Source: U.S. EPA, 2006b.

then extrapolated to the entire population of participants. The overall approach is called *program impact evaluation*. A key resource for information on program-based evaluation methods and policy guidance is the Action Plan's *Model Energy Efficiency Program Impact Evaluation Guide*. The California Measurement Advisory Council (CALMAC) also has established guidance for conducting program impact evaluations.

6.3.2 PROCESS EVALUATIONS

The goal of process evaluations is to produce improved and more cost-effective programs. These evaluations usually consist of surveying program stakeholders, analyzing their feedback, and identifying opportunities for program improvement. Thus, process evaluations indicate whether best practices are being incorporated

EVALUATION RESOURCES

- The Nation Action Plan for Energy Efficiency's Model Energy Efficiency Program Impact Evaluation Guide provides:
  - A framework that jurisdictions and organizations can use to define their "institution-specific" evaluation requirements
  - Standard evaluation planning and implementation process that can be used for calculating savings
  - Definitions, best practices on key evaluation issues, and a list of evaluation resources.

  Web site: *http://www.epa.gov/cleanenergy/documents/evaluation_guide.pdf*
- The CALMAC Web site provides a comprehensive resource for program impact evaluation guidance. The site contains:
  - California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals. These protocols and predecessor versions have been used for hundreds of evaluations of California programs (*http://www.calmac.org/publications/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf*; California, 2006).
  - A searchable database of over 400 evaluation reports on a variety of general and program specific topics. Web site: *http://www.calmac.org;* (CALMAC, 2007)
- The CEE Market Assessment and Program Evaluation Clearinghouse provides a source of evaluation reports for programs throughout the United States. Web site: *http://www.cee1.org/eval/clearinghouse.php3*.

and consider participant satisfaction. Administrators often want early and timely process evaluation feedback to make program changes as needed or to review early findings. Process evaluations are particularly valuable when:

- The program is new or has many changes
- Benefits are being achieved more slowly than expected
- There is limited program participation or stakeholders are slow to begin participating
- The program has a slow startup
- Participants are reporting problems
- The program appears not to be cost-effective

Process evaluations are usually accomplished through data collection (e.g., surveys, questionnaires, and interviews) from administrators, designers, participants (such as facility operators), implementation staff (including contractors, subcontractors, and field staff), and key policymakers. Other elements of a process evaluation can include: (1) workflow and productivity measurements; (2) reviews, assessments and testing of records, databases, program-related materials, and tools; and (3) collection and analysis of relevant data from third-party sources (e.g., equipment vendors, trade allies). To ensure credibility, the process evaluation is often conducted by a third-party that is independent of the program implementers.

Table 6.3.5 lists examples of the issues that are typically assessed during a process evaluation. Typical process evaluation results involve recommendations for changing a program's structure, implementation approaches, or program design, delivery, and goals.

TABLE 6.3.5. ELEMENTS OF A TYPICAL PROCESS EVALUATION

Program Design

- The program mission
- Assessment of program logic
- Use of new practices or best practices

Program Administration

- Program oversight
- Program staffing
- Management and staff training
- Program information and reporting

Program Implementation

- Quality control
- Operational practice how program is implemented
- Program targeting, marketing, and outreach efforts
- Program timing

Participant Response

- Participant interaction and satisfaction
- Market and government allies interaction and satisfaction

6.3.3 MARKET EFFECTS EVALUATIONS

Market effects evaluations estimate the extent to which a program influences future clean energy activities. These evaluations often involve a significant undertaking since they are designed to determine whether the market, in and outside of government, is changing. For example, a market effects study could evaluate increases in the adoption of the products or services being promoted by an LBE program. Such an evaluation might answer the question of whether more state office buildings are implementing energy efficiency technologies as a result of the LBE effort. Market effects are sometimes considered the ultimate test of a program's success, since they indicate whether LBE best practices will continue in the government and marketplace, even after the LBE program ends.

Market effects evaluations usually consist of surveys, reviews of market data, and analysis of the survey results and collected data, and ask the following questions:

- Are the state agencies that undertook LBE programs implementing additional programs or incorporating additional technologies in their facilities that were not directly induced by the LBE program? This might indicate that the facility operators have become convinced of the value of the initial LBE programs, and are undertaking their own programs.
- Are agencies that did not implement LBE programs now adopting LBE-encouraged concepts and technologies? This might indicate that pilot programs have convinced other facility operators of the advantages of the LBE concepts.
- Are private facility operators undertaking programs that were influenced by public sector LBE activities? This might indicate a "crossover" of public to private investments.

Possible results from a market assessment include:

- Total market effects
- Estimate of how much of the market effect is due to the program being evaluated
- Estimate of whether the market effect is sustainable.

6.3.4 EXAMPLE OF A PROGRAM EVALUATION

Figure 6.3.3 presents a case study of an evaluation of San Diego's Local Government Energy Efficiency (LGEE) program. This study combined an impact evaluation to estimate the electric and natural gas energy savings from the program with a process evaluation to assess the program design and implementation process.

FIGURE 6.3.3. EVALUATION, MEASUREMENT AND VERIFICATION OF THE 2004-2005 THE SAN DIEGO LOCAL GOVERNMENT ENERGY EFFICIENCY PROGRAM

Metric	Net Savings Goals	Project Savings		% of Goal
		Gross	Net	
Coincident Peak kW	650	466	373	57%
Annual kWh	6,499,574	4,662,034	3,729,627	57%
Therms	85,447	33,812	27,050	32%

The San Diego LGEE program is a performance contract incentive program that targets energy efficiency retrofit projects of local government facilities. Sponsored by the San Diego Regional Energy Partnership (SDREP) and administered and implemented by the San Diego Regional Energy Office (SDREO), the program is designed to reduce local governments' upfront costs for upgrading or installing cost-effective, high-efficiency energy savings measures and energy management and information systems in local government-owned and tenant-occupied buildings, water facilities, and other high-energy use facilities.

- SDREO conducted a process and impact evaluation of its 2004-2005 LGEE program, which included 68 energy efficiency projects and 29 energy management system projects. The evaluation included the following data collection and analysis activities: Review of program documents and development of an LGEE Program Logic Chart
- Analysis of data in the Program Activity Tracking Database
- In-person and telephone interviews with local government partners and SDREO program managers
- Telephone interviews with a program M&V consultant
- Site inspection and analysis of claimed energy savings of a sample of completed projects

The SDREO impact evaluation concluded that while the program achieved significant electrical energy savings, the savings were below program goals. A larger shortfall for natural gas savings was identified.

Process evaluation activities focused on assessing the LGEE program design and implementation process. SDREO examined the LGEE program objective, market barriers, and elements of the program design (e.g., market sector, program strategy, program offerings, incentive pricing) by reviewing program and project activities, characterizing program participation, and surveying local government participants.

Program recommendations included:

- A timeframe of at least three years, and preferably four years, should be allowed for contract negotiations with the program administrator, investor-owned utility (IOU) service provider, and local government participants.
- Additional time should be provided following implementation for contractors to complete M&V reviews.
- The project management offering could be reworked so that human resources are offered, rather than just project management money. Cities that choose not to take project management funds should have access to more funds in the form of incentives.

Source: Nexant, 2006.

6.4 SUMMARY OF TRACKING AND EVALUATION APPROACHES

Table 6.4.1 summarizes typical evaluation approaches, performance indicators, and data to be collected for different types of LBE programs. Note that the primary performance indicator is usually energy saved, with other indicators flowing from the energy savings.

6.5 STEP 5: REPORT LBE PROGRAM RESULTS

After a state's LBE program is up and running, energy savings are being tracked, and the evaluation plan is in place, it is important for states to report on the ongoing results of its program. While reporting requirements are frequently imposed by the legislation or executive

TABLE 6.4.1 SUMMARY OF TRACKING AND EVALUATION APPROACHES BY TYPE OF CLEAN ENERGY PROGRAM

Program Type and Description	Typical Evaluation Approaches	Examples of Performance Indicators to be Tracked and Evaluated	Data Collected to Measure Primary Indicators
Energy efficiency in new buildings designing new and renovated state-owned facilities that reduce energy use and minimize environmental impacts.	▪ Impact, process, and market evaluations. ▪ Typical impact evaluations compare energy use of energy efficient designs with standard buildings or existing building codes benchmarking is often used. ▪ Energy savings usually analyzed with computer simulations.	▪ Energy savings per square foot ▪ Energy cost savings (and cost-effectiveness) ▪ Emissions reduced ▪ "Sustainability" indicators ▪ Emerging technology indicators ▪ Job creation	▪ Number and characteristics of buildings retrofitted or built ▪ Energy efficient building characteristics ▪ Schedule ▪ Program costs ▪ Weather data ▪ Building characteristics ▪ Building occupancy ▪ Energy costs ▪ Emission factors per unit of energy ▪ Characteristics of standard design buildings
Energy efficiency in existing buildings implementation of energy conservation measures to improve the energy efficiency of existing state and local facilities.	▪ Impact and process evaluations. ▪ Typical impact evaluations compare energy use of retrofitted building with what energy use would have been without retrofit benchmarking is often used. ▪ Energy savings usually calculated with deemed savings, some measurements, computer simulations, and/or utility bill analyses.	▪ Energy savings per square foot ▪ Energy cost savings (and cost-effectiveness) ▪ Emissions reduced ▪ "Sustainability" indicators ▪ Emerging technology indicators ▪ Job creation	▪ Number and characteristics of buildings retrofitted ▪ Types of retrofits ▪ Schedule ▪ Program costs ▪ Weather data ▪ Building characteristics ▪ Energy costs ▪ Emission factors per unit of energy

TABLE 6.4.1 SUMMARY OF TRACKING AND EVALUATION APPROACHES BY TYPE OF CLEAN ENERGY PROGRAM *(cont.)*

Program Type and Description	Typical Evaluation Approaches	Examples of Performance Indicators to be Tracked and Evaluated	Data Collected to Measure Primary Indicators
Energy-efficient products procurement minimum energy efficiency specifications are established for a range of products (e.g., appliances, equipment, vehicles).	▪ Impact, process, and market evaluations. ▪ Typical impact and market evaluations compare changes in number and types of energy-efficient products that are sold; can be compared with other markets that do and do not have similar programs.	▪ Program purchases in dollars, percent of total purchases, energy and cost savings, emissions savings ▪ Environmental benefits ▪ Job creation ▪ Cost-effectiveness of procurement program ▪ Percentage of procurement affected ▪ Impact on vendor ▪ Procurement practices ▪ Lessons learned	▪ Types and number of equipment purchases (e.g., number of light bulbs purchased) ▪ Schedule ▪ Equipment and program costs ▪ Schedule ▪ Number and location of vendors and manufacturers involved
Green power purchasing purchase and use of renewable energy for state and local facilities.	▪ Impact, process, and market evaluations. ▪ Typical impact and market evaluations compare changes in amount of green power purchases (e.g., MWh) and types of green power purchases (e.g., PV, wind); can be compared with other markets that do and do not have similar programs.	▪ Program purchases in dollars and kWh ▪ Program purchases as a percent of total of power purchases ▪ Energy and cost savings ▪ Emissions savings ▪ Job creation ▪ Cost-effectiveness of purchasing program ▪ Price stability impacts ▪ Impact on green power industry ▪ Lessons learned	▪ Types of power procured ▪ kWh of power procured ▪ Location of power sources
Clean energy generation generating onsite renewable power (e.g., wind and PV) and/or using near-site clean DG technologies for backup or emergency power.	▪ Impact and process evaluations. ▪ Market evaluation can include whether program has influence on increased sales of clean energy generation systems.	▪ Clean energy generated per year ▪ Energy cost savings (and cost-effectiveness of system) ▪ Net energy use of facility (considering fuel purchases) ▪ Emissions impact ▪ Peak demand reductions from use of on-site generation. ▪ Job creation ▪ Price stability impacts	▪ Number and characteristics of generation systems ▪ Operational schedule ▪ Program costs ▪ Weather data ▪ Facility characteristics ▪ Energy costs ▪ Emission factors per unit of energy ▪ Lessons learned

order initiating the LBE activities, it should be undertaken by program managers regardless. The audience for LBE reporting varies by state but usually includes state agencies, including the budget agency and any advisory council; the governor; the state legislature; and the public.

Reporting requirements vary by state, but typically include some or all of the following:

- *A Narrative Description of the LBE Actions Taken During the Year.* The *State of Colorado Greening Government Status Report*, for example, includes a description for each state agency of (1) new high performance building projects, (2) energy management activities, and (3) energy performance contracting (Colorado, 2006). Some states also include specific factors that contributed to program successes and the barriers and challenges faced during implementation (Washington, 2005). Other states provide in-depth descriptions of some of their key clean energy projects.

- *Data on Energy Use.* A key component of LBE reports is information on annual energy use compared to baseline energy use and LBE targets, by state facility, agency, or the entire state. For example, Wisconsin reports annual energy use in BTU/sq. ft./year for its baseline year and subsequent years. Data are provided for each state agency and school system, and for individual facilities (Wisconsin, 2006).

- *Additional Data Tracked by the State.* Some states also report detailed information on other data that they track to evaluate their LBE programs. In New York, for example, NYSERDA issues an annual energy report based on data provided by individual agencies that includes (New York, 2003):
  - Building square footage
  - Number of buildings
  - Energy use (in MMBTUs) and the percentage of state energy use by fuel type
  - Estimated cost of energy by fuel type
  - NO_x, SO_2, and CO_2 emissions and emission reductions by fuel type (other states track and report GHG emissions)
  - Average EUI in BTUs/sq. ft. for base year, reporting year, and target year
  - Avoided cost savings
  - Peak electricity demand
  - Number of clean vehicles purchased
  - Renewable generation—both kWh purchased and generated on-site
  - Number of buildings that meet ENERGYSTAR criteria

- *Summary of Findings from Program Evaluations.* State reports can also include a summary of the findings from any program evaluation that has been conducted. A complete analysis of evaluation results may be provided as a separate document.

- *Recommendations for Revising the LBE Approach.* It is important to include any recommendations for changing or adding new LBE activities to better meet LBE targets. In addition, tracking and evaluation methods can be reviewed and revised, as needed.

Appendix J, *Resources for Reporting the Results of LBE Programs*, provides additional information on ways that states are reporting the results of their LBE activities. It includes state reports, tracking forms, agency survey forms, and additional guidance.

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APPENDIX A

State Executive Orders, Legislation, Policies, and Plans Initiating LBE Programs

This appendix provides a catalogue of state LBE executive orders, legislation, and policies through April 2008. Additional examples and details can be found throughout each chapter of the guide.

LEGEND:

- ● Executive Order, legislation, policy, and/or plan that directs or requires implementation of LBE actions, requires attainment of a specific LBE goal, or otherwise establishes numerical targets for specific LBE activities.
- ○ Executive Order, legislation, policy, and/or plan that promotes --but does not require -- an LBE action, recommends an LBE action, establishes general or non-numerical goals, or requires pursuit of opportunities to implement LBE activities generally.
- * Executive Order, legislation, policy, and/or plan is currently under consideration.

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008)

Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Title	Description	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
AL	Executive Order 33	Executive order directs state agencies to reduce energy consumption in all conditioned facilities by 10% by the end of FY 2008 and 20% by the end of FY 2010 from 2005 levels. An Energy Officer is to be assigned by each agency to oversee the implementation of energy-efficient programs. Agencies are directed to adopt energy conservation practices in construction and operation of state facilities and purchase ENERGY STAR equipment when cost-effective. *http://www.governorpress.alabama.gov/pr/ex-33-2006-05-10.asp*	●	●			●	●						
AZ	Executive Order 2005-05	Executive order requires all new state-funded buildings to derive at least 10% of their energy from renewable sources. All new state-funded buildings shall meet LEED-Silver certification. *http://azgovernor.gov/dms/upload/2005_05.pdf*	●			●			●					

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
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	Executive Order 2006-13	Executive order establishes a goal to reduce GHG emissions in the state to 2000 levels by 2020 and to 50% below 2000 levels by 2040. Order requires all state agencies to purchase only vehicles that are hybrid, meet low GHG emissions standards, or use E-85 fuel, biofuels, or other low GHG alternative fuels, with the goal that by January 1, 2010 all state vehicles shall be hybrid, meet low GHG emissions standards, or use E-85 fuel, biofuels, or other low-GHG alternative fuels. *http://www.governor.state.az.us/dms/upload/EO_2006_13_090806.pdf*									●	●		○
	ARS 9-500.04	Statute requires a city or town in a county of more than 1.2 million people to develop and implement a vehicle fleet plan for the purpose of encouraging and progressively increasing the use of alternative fuels and clean burning fuels. The plan shall include a timetable for increasing the use of alternative fuels and clean burning fuels in fleet vehicles either through purchase or conversion. *http://www.azleg.state.az.us/FormatDocument.asp?inDoc=/ars/9/00500-04.htm&Title=9&DocType=ARS*										○		
	ARS 34-451	House Bill 2324 (2003) requires the Arizona Department of Commerce to adopt and publish energy conservation standards for newly constructed state buildings. The Department of Administration, the Board of Regents, and the Department of Transportation are required to reduce energy use in state buildings by 10% per square foot of floor area on or before July 1, 2008 and by 15% per square foot of floor area on or before July 1, 2011, using July 1, 2001 through June 30, 2002 as the baseline year. This bill requires state agencies to purchase ENERGY STAR products where available. *http://www.azleg.gov/legtext/46leg/1r/bills/hb2324p.pdf*	●	●			●	●						
		House Bill 2606 (2007) revises ARS 34-451 to require the three affected agencies to reduce energy consumption per square foot by 30% by July 1, 2020 based on FY 2002 levels. Bill also requires all state agencies, on or before July 1, 2012, to purchase at least 10% of the energy from green power. In addition, all new or leased state buildings must be designed in accordance with the LEED rating system. *http://www.azleg.gov/FormatDocument.asp?inDoc=/legtext/48leg/1r/bills/hb2606p.htm*	●	●		●	●	●	●					
	ARS 34-452	Statute requires that new state building projects over 6,000 square feet must follow prescribed solar design standards. Solar improvements must be evaluated on the basis of life-cycle costs. *http://www.dsireusa.org/documents/Incentives/AZ05R.htm*	●						●	●				

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	ARS 41-803	Statute requires that for each year after December 21, 2000, specifically designated counties with a population of more than 250,000 persons must operate at least 75% of their government fleet on alterative fuels and clean burning fuels. Purchases of all new motor vehicles for state fleets shall meet EPAct requirements for alternative fuel compatibility, including a requirement that for model year 2001 and all subsequent model years, 75% of new motor vehicles purchased shall be capable of operating on alternative fuels or clean burning fuels. *http://www.azleg.state.az.us/FormatDocument.asp?inDoc=/ars/41/00803.htm&Title=41&DocType=ARS*										●		
AR	Session Act 1770 (2005)	Act (House Bill 2445, the "Arkansas Energy and Natural Resource Conservation Act") states that agencies conducting a public building project or rehabilitation project are encouraged to refer to the LEED certification system. The Act outlines supplemental provisions for state buildings adopting LEED standards. *http://170.94.58.9/ftproot/acts/2005/public/act1770.pdf*	○	○		○								
CA	Executive Order S-7-04	Executive order directs state agencies to work with legislators to: 1) build a network of hydrogen refueling stations by 2010; 2) ensure that hydrogen vehicles are commercially available for purchase; 3) incorporate hydrogen vehicles into the state fleet; 4) develop safety standards for hydrogen refueling stations and vehicles; and 5) establish incentives to encourage the use of hydrogen vehicles and encourage the development of renewable sources of energy for hydrogen production. *http://www.hydrogenhighway.ca.gov/media/execorder_s704.pdf#search=%22california%20s-7-04%22*									●	●	●	
	Executive Order S-20-04	Executive order directs state agencies to cooperate in taking measures to reduce grid-based energy purchases for state buildings by 20% by 2015 from 2003 levels. Measures should include: seeking ENERGY STAR-labeled buildings for lease and purchase, purchasing ENERGY STAR-qualified products, adopting LEED-Silver standards for all new and existing state-funded buildings . The California Public Utilities Commission is urged to: inform building operators about the economic benefits of energy efficiency measures; improve commercial building efficiency programs to help achieve the 20% goal; and submit a biennial progress report to the Governor commencing in September 2005. A complementary Green Building Action Plan outlines cost-effective measures. The Plan creates the Green Action Team to oversee implementation. *http://www.dot.ca.gov/hq/energy/ExecOrderS-20-04.htm*	●	●	●	●	●	●		●				

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

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	California Government Code Section 14684	2001 legislation modified CA Government Code 14684 to require the Department of Administration, in consultation with the State Energy Resources Conservation and Development Commission, to ensure that solar energy equipment is installed, no later than January 1, 2007, on all state buildings and state parking facilities, where feasible. The department shall establish a schedule designating when solar energy equipment will be installed at each facility. *http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=14001-15000&file=14660-14684.1*	●	●					●	●				
		Assembly Bill 532 (2007) extends a previously established deadline requiring the Department of Administration, in consultation with the State Energy Resources Conservation and Development Commission, to install solar energy equipment on all state buildings and state parking facilities where feasible. The deadline is now January 1, 2009 (previously January 1, 2007). AB 532 also requires all new state buildings or parking facilities to install solar energy where feasible if construction begins on or after January 1, 2008. According to the original code - CA Government Code 14684 - installation of solar energy is feasible if there is adequate space on the building and the solar energy equipment is cost-effective. *http://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_0501-0550/ab_532_bill_20071013_chaptered.pdf*								●				
	AB 2321 (2006) (not enacted)	Bill would codify the existing Governor's Green Action Team (created under Executive Order S-20-04) with the expanded mission of overseeing and directing progress toward reducing electricity purchases for state-owned buildings by 20% by 2015 and to achieve comparable reductions in electricity purchases for other entities of state government, for local government, for schools, and for commercial buildings. The Governor's Green Action Team would be required to develop and implement a 10-year action plan to accomplish certain action items and to coordinate programs in certain areas. The team would be required to annually assess progress made. *http://www.leginfo.ca.gov/index.html*	*	*	*	*	*	*		*				
	Public Resources Code Division 34	The Sustainable Building Act of 2007 would require the California Integrated Waste Management Board to adopt regulations for sustainable building standards for the construction or renovation of state buildings after July 1, 2010. The Board would be required to consider the requirements of existing guidelines, including LEED's Gold Standard, EPA's "Federal Green Construction Guide for Specifiers," and DOE's "Green Federal Facilities." *http://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_0001-0050/ab_35_bill_20070919_enrolled.pdf*	●			●								

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	AB 722 (2007) (under consideration)	The "How Many Legislators Does it Take to Change a Light bulb Act" would ban the sale of incandescent light bulbs after January 1, 2012, in favor of energy-saving compact fluorescent light bulbs. *http://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_0701-0750/ab_722_bill_20070222_introduced.pdf*												
	Section 25722.7 Public Resources Code	Statute (Assembly Bill 2264) modifies existing law that requires a 10% reduction in energy used by the state fleet. The bill requires the Energy Commission to define a minimum permissible miles per gallon (mpg) for passenger vehicles and light-duty trucks in the state fleet that are powered solely by internal combustion engines using fossil fuels by June 1, 2007. All new fleet purchases after January 1, 2008 must adhere to this standard. *http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_2251-2300/ab_2264_bill_20060929_chaptered.pdf*									●	●		
	California Energy Plan (2005)	Key action items include improving energy efficiency in state buildings and increasing the use of fuel flexible vehicles and dedicated non-petroleum-fueled vehicles in the state's fleet of passenger cars and light-duty trucks. Plan calls for an increase in the use of non-petroleum fuels in the state's fleet of medium and heavy-duty on-road and off-road vehicles. *http://www.energy.ca.gov/energy_action_plan/2005-09-21_EAP2_FINAL.PDF*		○							○			
CO	Executive Order D 014 03	Executive order directs state agencies to conduct a feasibility study for a performance contract that is comprehensive in scope to implement a wide range of cost-effective energy-saving projects in all buildings, considering a financing term of 12 years or more to capture substantial avoided costs. Where determined feasible, agencies shall implement performance contracts. *http://www.colorado.gov/governor/eos/d01403.pdf*					●							
	Executive Order D 005 05	Executive order directs the Executive Directors of all state agencies and departments to evaluate business operations in accordance with the goals of this Order and develop and implement policies and procedures to promote environmentally sustainable practices, including, but not limited to: adopting the LEED rating system for existing and new buildings to ensure reductions in energy use; and initiating an energy management program to monitor and manage utility usage and costs. Requires an energy management program to monitor and manage utility use and costs. Establishes the Colorado Greening Government Coordinating Council (Council) to include representatives from each state agency and department. *http://www.colorado.gov/governor/eos/d00505.pdf*	●	●		●								

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	Executive Order D 0011 07	Order creates a Greening Government Manager to facilitate statewide LBE efforts, requires the Greening Government Council to prepare an annual report card on the achievements under this order, and requires the Council to develop educational materials for state employees. The Department of Public Health and Environment shall maintain an environmental outcomes database to track environmental measurements for Greening Government efforts. Order directs agencies to: reduce energy consumption by 20% by 2012, based on 2006 levels; assess an implement the development of state renewable energy projects; reduce paper and water use by 2012 by 20% and 10%, respectively; reduce petroleum consumption by state fleets by 25% by 2012, based on 2006 levels, while increasing fleet efficiency. *http://www.colorado.gov/governor/press/pdf/executive-orders/2007/ExecutiveOrder-Greening-State-Government-GoalsObjectives.pdf*		●					●		●			●
	Executive Order D 0012 07 (Regarding Implementation of Executive Order D0011 07)	Requires agencies to: develop energy management plans; to engage in performance contracting (where not feasible, agencies shall strive to reduce energy use by 10% by 2012 from 2006 levels); work to achieve a goal of "zero waste" from construction and operation of buildings; purchase equipment that is ENERGY STAR certified; require consideration of life-cycle costs in purchasing policies; give priority to replacing pre-1996 vehicles that have ratings of less than 25 mpg; use a minimum of B20 for diesel vehicles; adopt a goal of fueling flex fuel and diesel vehicles with alternative fuels a minimum of 50% of the time. Energy Office must provide technical support for the use of on-site renewable energy. Greening Council must develop sustainable standards for new leases of state facilities. *http://www.colorado.gov/governor/press/pdf/executive-orders/2007/ExecutiveOrder-Greening-Government-ImplementationMeasures.pdf*		●			●	●			●	●	●	●
	CRS 24-30-1104	Statute requires that by July 10, 2010, the Executive Director of the Department of Personnel must adopt a policy that at least 10% of all state-owned bi-fuel vehicles must be fueled exclusively with an alternative fuel. Requires the state to adopt uniform rules for motor vehicle acquisition, operation, maintenance, repair, and disposal standards. Uniform rules pertaining to acquisition of motor vehicles by lease or purchase shall provide that low energy consumption shall be a favorable factor in determining the low responsible bidder. The size of any passenger motor vehicle shall not be greater than necessary to accomplish its purpose. *http://198.187.128.12/colorado/lpext.dll?f=templates&fn=fs-main.htm&2.0*										●		

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement			Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Title	Description	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
	CRS 24-82	Statute requires that all state buildings designed or rehabilitated after 1981 to: 1) be designed or improved to achieve a 55 BTU/square foot/year energy performance goal for heating, cooling, lighting, and ventilation energy; 2) make maximum use of passive solar concepts such as energy conservation, natural lighting, and orientation and incorporation of thermal-mass; 3) make maximum use of economically feasible renewable energy systems; and 4) pursue the feasibility of retrofit with renewable energy systems. State buildings which are not office buildings shall be designed for maximum use of passive solar concepts. *http://198.187.128.12/colorado/lpext.dll?f=templates&fn=fs-main.htm&2.0*	●	●					●					
	CRS 24-30-1301	Statute requires Office of the State Architect to adopt a high performance standard certification program. State-funded buildings are to be certified as meeting these standards if the cost premium can be recovered within 15 years. *http://www.leg.state.co.us/CLICS/CLICS2007A/csl.nsf/fsbillcont3/8EFE2CB5022F6CF687257251007C22D3?Open&file=051_enr.pdf*	○	○										
	SJR 06-032	Enacted in 2006, this bill "urges" the state of Colorado and its agencies and departments to design and construct facilities to achieve LEED silver certification to the extent it is cost effective as a choice in design, construction, and renovation in order to provide operational and/or other savings over a twenty-year period. *http://www.colorado.gov/greeninggovernment/legislation/resolution.pdf*	○			○								
CT	Executive Order 32	Executive order requires state to use the Shared Savings Program, with a portion of savings going towards the purchase of green power. Order directs state agencies and universities to replace increasing shares of electricity with renewable energy by 20% in 2010, 50% in 2020, and 100% in 2050. *http://www.ctenergy.org/pdf/ExOrder32.pdf*					●		●					
	Public Act 07-242	Act modifies CGS 16a-38k to require that building construction standards for state-funded new construction or major renovation be developed by January 2007. The standards must be consistent with, or exceed, the Silver rating of the LEED rating system, and must include energy standards that exceed ASHRAE Standard 90.1 by at least 20%. Act requires the Department of Administrative Services and other purchasing agencies to buy appliances and equipment that meet federal ENERGY STAR standards. *http://www.cga.ct.gov/2007/ACT/Pa/pdf/2007PA-00242-R00HB-07432-PA.pdf*	●			●	●	●			●	●		

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
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	PA 08-98	PA 08-98 requires the state to reduce greenhouse gases 10% below 1990 levels by 2020 and 80% below 2001 levels by 2050. The Act requires identification of activities and improvements to state facilities to save energy, and identification of policies and regulations to achieve GHG targets. The Act also requires the establishment of a Subcommittee to address the impacts of climate change on natural resources and ecological habitats, public health, agriculture, and infrastructure. *http://www.cga.ct.gov/2008/ACT/PA/2008PA-00098-R00HB-05600-PA.htm*		●			●		●		●	●		●
	CGS 4a-67	Statute requires that cars and light-duty trucks purchased by the state on or after January 1, 2003, must have an average EPA estimated fuel economy of at least 40 mpg. Purchases must comply with EPAct's state fleet acquisition requirements and must obtain the best achievable fuel economy per pound of carbon dioxide emitted in its vehicle class. State agencies shall procure only equipment and appliances that meet or exceed federal energy conservation standards set forth in EPAct. Purchases of equipment and appliances for which energy performance standards have been established shall be made consistent with those standards. *http://www.cga.ct.gov/2005/pub/Chap058.htm#Sec4a-67d.htm*					●				●		●	
	Climate Change Action Plan (2005)	Plan includes recommendations for 1) establishing incentives and initiatives to encourage acquisition of low-GHG vehicles for state fleets; 2) building energy-efficient, cost-effective buildings; 3) identifying new ways to encourage agencies to undertake energy efficiency initiatives; 4) benchmarking public buildings; 5) promoting procurement of environmentally preferable products and services by state agencies; and 6) promoting the use of renewable energy sources and CHP systems in state facilities. Plan establishes a goal for new construction and major renovations of all building projects that receive some State funding must meet LEED standards. Recommends that the state undertake a pilot project using a biodiesel blend for heating applications at state facilities. *http://ctclimatechange.com/StateActionPlan.html*	○	○		○	○		○	○	○			○
	Governor's Policy Memo, 12-14-2005	In a policy memorandum titled "Energy Efficiency Call to Action," the governor directed state agency heads to set an example of conservation and savings by cutting energy consumption in state buildings by 10% in 2006, and by implementing various steps to encourage a 'culture of energy efficiency' in state government. The governor called for energy efficiency goals to be included in each state agency's budget and for state agencies to purchase clean-fuel, low-emission, and/or hybrid-electric vehicles and energy-efficient products, when feasible. *http://www.ct.gov/governorrell/cwp/view.asp?A=1761&Q=307676*		●			●				●			

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
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	Connecticut Energy Plan (2006)	Establishes goals for: adopting high-performance building standards for all State projects and municipal projects that received at least 25% State funding; state government to use of 10% biofuels by state vehicle fleet by 2012; purchase of 20% of the power for State of Connecticut facilities from Class I clean renewable sources by 2010, increasing to 50% by 2020 and 100% by 2050 as mandated by Executive Order 32; installing renewable energy sources at highly visible State facilities such as State office buildings, schools and universities; use of alternative fuel vehicles and biodiesel fuel for heating State buildings; and purchasing of "green" environmentally-friendly products, ENERGY STAR-rated products, and energy-conserving vehicles whenever possible. *http://www.ct.gov/governorrell/cwp/view.asp?A=1809&Q=320142*		○			○	○	●	○	○	●		
DC	Green Building Act of 2006	Statute establishes requirements for public buildings. New non-residential buildings greater than 10,000 square feet must be designed to achieve 75 points on the ENERGY STAR Target Finder rating scale and be benchmarked annually using the ENERGY STAR Portfolio Manager tool. Additionally, non-residential projects other than public school shall be verified as achieving LEED-Silver standards within two years of occupancy. Residential buildings greater than 10,000 square feet must fulfill or exceed the Green Communities 2006 standard or a substantially equivalent standard. Where renovations to existing buildings involve HVAC systems, buildings in excess of 30,000 square feet are required to meet LEED certification. *http://www.dccouncil.washington.dc.us/images/00001/20061218152322.pdf*	●	●	●	●								
	Clean and Affordable Energy Act of 2007	The Clean and Affordable Energy Act of 2007 would modify the requirements of the Green Building Act of 2006 to require D.C. government buildings or 10,000 square feet or more to be benchmarked annually using ENERGY STAR Portfolio Manager beginning in 2009. Private commercial buildings of 10,000 square feet or more would also be required to be benchmarked beginning in 2010 and following a schedule that is based on the size of the building. New construction and major renovation projects of 10,000 square feet or more in the district must use Target Finder to estimate design performance beginning in 2012. *http://www.dccouncil.washington.dc.us/images/00001/20071108120109.pdf*	*	*	*									
	DC Code 1-1181.1 to 1-1191.2	The Procurement Practices Act has been amended by the ENERGY STAR Efficiency Amendment Act of 2004 to allow Washington, D.C. agencies to enter into energy performance-based contracts for products procurement. The ENERGY STAR Efficiency Amendment Act directs that for the purchase or lease of energy-using products, the agency shall include a specification that the products be ENERGY STAR labeled; provided, that there are at least 3 manufacturers that produce products with the ENERGY STAR label, and that there are at least 3 responsible vendors offering ENERGY STAR-labeled products. *http://counsel.cua.edu/dclaw/GovCont/Procurement.cfm*					●	●						

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	City Administrative Policy	In 2004, the Washington, D.C. City Administrator's Office enacted a policy requiring 90% of the city government's light-duty vehicle acquisitions to be alternative fuel vehicles (AFVs). *http://www.eere.energy.gov/afdc/pdfs/37407.pdf*										●		
	Regional Green Building Standards	In December 2007, the Metropolitan Washington Council of Governments, which includes 21 jurisdictions within the Washington, D.C. region, adopted green building standards for new government and commercial structures. The standards require affected buildings to be built to achieve LEED certification. *http://www.mwcog.org/news/press/detail.asp?NEWS_ID=282*	●			●								
	Comprehensive Energy Plan	Plan establishes a goal for Washington, D.C. government to reduce energy consumption by 1% per year. It recommends that each agency to submit an energy management plan and to implement project SAVE (save agencies valuable energy). Plan recommends that agencies implement building automation and control systems adopted by ASHRAE. All new buildings will incorporate these networks. The plan includes recommendations for incorporating LEED standards for existing buildings. The plan recommends performance contracting and procurement of energy-efficient equipment, particularly ENERGY STAR products. *http://dceo.dc.gov/dceo/frames.asp?doc=/dceo/lib/dceo/DC_Comprehensive_Energy_Plan_III.pdf*	○	●	○	○	○	○						
DE	Executive Order 31	Executive order creates the state Energy Task Force to be charged with the task of developing the Delaware Energy Plan, which addresses the use of clean energy, energy efficiency, and expansion of renewables market in the state. The resultant draft Energy Plan established a goal for state facilities to reduce energy consumption by 10% by 2010 from 2000 levels through such strategies as purchasing requirements, energy audits, and alternative energy sources. *http://www.state.de.us/governor/orders/webexecorder31.shtml#TopOfPage*		○			○		○					
	Executive Order 82	Executive order calls for legislation to enable the state to purchase a portion of its electricity from renewable sources. The order requires the Energy Office to complete a state energy consumption profile by March 8, 2006. The order requires the state to work with local governments, schools, and institutions of higher education to aggregate electricity consumption. The order requires the state to develop strategies for implementing energy savings and conservation techniques for state agencies, including the use of performance contracting and demand-side management. *http://www.state.de.us/governor/orders/e%20o%20%2082.shtml*		○					○					
	Title 29, Delaware Code (pertaining to procurement)	Statute [House Bill 435 (2004)] requires state agencies to purchase ENERGY STAR qualified products if they are available competitively. *http://www.legis.state.de.us/LIS/LIS142.NSF/vwLegislation/HB+435?Opendocument*					●	●						

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FL	Executive Order 05-241	Executive order directs agencies to continue energy conservation efforts to reduce energy demand. Agencies are further encouraged to develop innovative conservation initiatives to serve as a model for all Floridians. In addition, all departments and agencies, as well as all local governments, are encouraged to develop and implement long-term conservation initiatives. Executive order calls for state agencies to assist in the development of a comprehensive energy plan. *http://www.flaseia.org/ExecutiveOrderNumber05-241.pdf*		○							○			
	Executive Order 07-126	Order establishes targets for state agencies under the direction of the executive to reduce GHG emissions from current levels by 10% by 2012, 25% by 2017, and 40% by 2025. Order directs each agency to audit energy consumption during FY 06-07 and to post the baseline assessment on Florida's Governmental Carbon Scorecard. Order directs Department of Management Services to adopt LEED standards for all new construction and existing buildings and to strive for Platinum certification. All new leases must be in ENERGY STAR-labeled buildigns. The Department is directed to develop energy conservation measures and guidelines for all new and existing office spaces greater than 20,000 square feet. The Department is directed to develop a Climate Friendly Preferred Products List that includes energy efficiency as a criteria. *http://www.flgov.com/pdfs/orders/07-126-actions.pdf*	●	●	●	●	●				●			●
	Florida Energy Conservation in Buildings Act of 1974	Florida law requires use of solar technologies and energy efficiency strategies in state buildings when life-cycle costs indicate they are economically feasible. The Florida Energy Conservation in Buildings Act of 1974 mandates the use of energy-efficient equipment and design and the use of solar energy devices for heating and cooling state buildings where life-cycle cost analysis determines that the solar systems will be cost-effective over the life of the building. *http://www.dsireusa.org/library/includes/GenericIncentive.cfm?Incentive_Code=FL04R&currentpageid=3&EE=1&RE=1*							●	●				
	Florida Statute 403.714	Statue requires each state agency and institution of higher learning to work with the Department of Management Services for the collection of all recyclable materials generated in state offices and institutions throughout the state. The purpose of the "Greening Florida Government" program is to get the word out on the importance of recycling and what better group to start with than state employees. *http://www.dep.state.fl.us/waste/categories/recycling/pages/GreenGovMain.htm*												●
	Chapter 2006-230 Session Laws Section 72	The Florida Energy Act of 2006 requires the state Department of Environmental Protection to develop a report detailing the state's LBE activities. The report must outline current programs and provide recommendations for a rebate program for purchases of energy-efficient appliances. *http://www.dep.state.fl.us/energy/energyact/default.htm*		○			○							

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	Leadership by Example - Energy Efficiency and Conservation Report	This report was completed in accordance with the Florida Energy Plan and resultant Florida Energy Act of 2006. The Act requires this report to present information on state LBE activities, including costs and savings. Additionally, the report is to set forth recommendations for a rebate program for purchases of energy-efficient appliances. The report recommends that state agencies purchase ENERGY STAR qualified products. *http://www.dep.state.fl.us/energy/reports/files/energy_leadership_report.pdf*					○	○						
	Florida Energy Plan (2006)	Plan recommends an energy council to provide policy advice and counsel to the Governor, Speaker of the House, and President of the Senate. Recommends that all new state government buildings to meet LEED standards. Establishes a goal for a reduction of energy consumption in existing state facilities by 25% from 2002 levels by 2007. Promotes continued investment in green fleets and AFVs. The recommendations of this plan were codified into legislation with the passing of the Florida Energy Act of 2006. *http://www.dep.state.fl.us/energy/fla_energy/files/energy_plan_final.pdf*	●	●		●					●	●		
GA	Executive Order 2.28.06.01	Executive order calls for the creation of a State Facilities Energy Council responsible for developing strategies for state facilities that will reduce costs and consumption of energy by state government. *http://www.gov.state.ga.us/ExOrders/02_28_06_01.pdf*		○										
	Executive Order 2.28.06.02	Executive order directs agencies to "lead by example" through promotion of energy efficiency, use of renewable energy, and other innovative energy savings strategies. Agencies are required to prioritize high fuel efficiency and flexible fuel vehicles in their procurement decisions. State-owned fueling facilities will maximize the purchase of alternative fuels. *http://www.gov.state.ga.us/ExOrders/02_28_06_02.pdf*									●	●	●	
	State Energy Strategy for Georgia	Plan encourages the state to lead by example. The Plan recommends that state agencies commit to purchasing a certain amount of electricity generated from renewable Georgia resources when economically feasible. Plan calls for governments to create energy management teams and plans that establish baselines, audit buildings, implement energy efficiency measures, and monitor performance with the goal of reducing energy consumption in public buildings. Encourages state employees to use mass transit and to reduce the total vehicle miles traveled by state fleets. Recommends procurement of energy-efficient products and encourages the use of ENERGY STAR standards. *http://www.georgiaenergyplan.org/suppmat/STATE_ENERGY_STRATEGY_FINAL_12_14_06.pdf*		○			○	○	○		○		○	

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HI	Administrative Directive 98-03	Administrative directive mandates that effective January 1, 1999, all plans and designs for new or renovated facilities using state funds or located on state land and incorporating the use of hot water shall conduct a comparative analysis to determine the cost-benefit of using conventional water heating systems or solar water heating systems. If the life-cycle analysis is positive, the facility shall incorporate solar water heating. *http://www.hawaii.gov/dbedt/info/energy/efficiency/state/ad98-03.pdf*	●	●					●					
	Administrative Directive 06-01	Administrative directive states that for all state-funded buildings, newly constructed and renovated buildings must adhere to LEED standards, and adhere to LEED-Silver standards where feasible. Agencies must incorporate energy efficiency measures to prevent heat gain by providing insulation and high-performance windows, and where possible, buildings are to be oriented to maximize natural ventilation and daylighting and to optimize roof exposure for solar water heating. Solar water heating systems should be installed where cost-effective. Requires agencies to use life-cycle analysis to purchase energy-efficient equipment such as ENERGY STAR products. Agencies are required to implement waste management and water-efficient strategies as well. *http://www.hawaii.gov/dbedt/info/energy/efficiency/state/AD-06-01.pdf*	●	●		●	●	●	●	●				●
	Act 96 (2006)	Act (House Bill 2175) codifies the requirements of Administrative Directive 06-01. Additionally, the statute directs that state agencies shall purchase the most fuel-efficient vehicles possible, and purchase alternative fuels and ethanol blended gasoline when available. In the fiscal year beginning July 1, 2006, at least 20% of newly purchased light-duty vehicles shall be energy-efficient, increasing 10% annually over the next two years, thereafter increasing 5% annually. Directs agencies to seek leases and purchases of buildings with ENERGY STAR label. *http://www.hawaii.gov/dbedt/info/energy/efficiency/state/Act96_reprint.pdf*	●	●	●	●	●	●	●	●	●	●		●
ID	Executive Order 2005-12	Executive order requires energy conservation strategies to be used in state facilities to reduce energy use. Strategies include adjusting settings for thermostats, shutting off lights and computers, and evaluating machinery (HVAC) for efficiency. *http://gov.idaho.gov/mediacenter/execorders/eo05/eo_2005-12.htm*		●										
IL	Executive Order 6 (2002)	Executive order requires the Department of Central Management Services and affected executive state agencies to purchase sufficient quantities of renewable energy so that 5% of the overall annual electricity requirements of buildings owned or operated by executive state agencies will be met through renewable energy resources by 2010, increasing to 15% by 2020. *http://www100.state.il.us/PressReleases/ShowPressRelease.cfm?SubjectID=3&RecNum=1751*							●					

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	Executive Order 11 (2001)	Executive order requires state agencies to adopt energy-efficient best practices, including purchasing ENERGY STAR-approved appliances, reducing the amount of gasoline and diesel fuel used in state fleets, increasing use of ethanol in state fleets, and establishing green building guidelines. Order establishes requirements for waste management operations as well. The Illinois Green Government Council is tasked with providing state agencies with technical assistance. *http://www.illinois.gov/PressReleases/ShowPressRelease.cfm?SubjectID=3&RecNum=1603*	●	●			●	●			●	●	●	●
	Executive Order 11 (2006)	The Order on Climate Change and Greenhouse Gas Reduction creates the Illinois Climate Change Advisory Group to advise the governor on how to reduce statewide GHG emissions. The order pronounces the intent of the state to join the Chicago Climate Exchange and to reduce emissions from governmental activities by 6% by 2010. Calls on the Illinois EPA to produce an annual report to the governor tracking GHG emissions by state government. *http://www.illinois.gov/Gov/pdfdocs/execorder2006-11.pdf*												○
	Governor's Renewable Energy Challenge	Illinois Lt. Governor has committed the state to the "3-4-5 Renewable Energy Challenge." The state is committed to buying 3% of its energy needs from RECs beginning in January 2007, ramping up to 4% in May 2008, and to 5% in 2009. This goal supersedes the earlier goal established by Executive Order 6 in 2002. *http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=IL06R&state=IL&CurrentPageID=1&RE=1&EE=1*							●					
	30 ILCS 500/25-75	House Bill 4137 (2007) amends the state procurement code to require all automobiles purchase using state funds to be flex-fuel vehicles. *http://www.ilga.gov/legislation/billstatus.asp?DocNum=4137&GAID=8&GA=94&DocTypeID=HB&LegID=21989&SessionID=50*										●		
	30 ILCS 500/45-60	Statue requires that in awarding contracts that require procurement of vehicles, state agencies must give preference to an otherwise qualified bidder who will fulfill the contract through the use of vehicles powered by ethanol produce from Illinois corn or biodiesel fuels produced from Illinois soybeans. *http://www.ilga.gov/legislation/ilcs/ilcs4.asp?DocName=003005000HArt%2E+45&ActID=532&ChapAct=30%26nbsp%3BILCS%26nbsp%3B500%2F&ChapterID=7&ChapterName=FINANCE&SectionID=7815&SeqStart=13100000&SeqEnd=14700000&ActName=Illinois+Procurement+Code%2E*										●		

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	20 ILCS 3105/10.04	Statute [Senate Bill 0250 (2005)] requires any construction or renovation of state-owned facilities to use the best available energy conservation technologies. Requires training to raise awareness about green buildings and rating systems. Mandates that 3 projects be used as case studies to achieve certification from a green building rating system. Establishes a Green Building Advisory Committee to assist in determining guidelines for which State construction and major renovation projects should be developed to green building standards *http://www.ilga.gov/legislation/fulltext.asp?DocName=09400SB0250lv&SessionId=50&GA=94&DocTypeId=SB&DocNum=250&GAID=8&LegID=&SpecSess=&Session=&print=true*	●	●										
	20 ILCS 3105/ 10.09-5	Public Act 094-0815 (Senate Bill 2868) requires the adoption of rules implementing a statewide energy code for the construction or repair of state facilities. The energy code shall incorporate standards promulgated by ASHRAE. *http://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=094-0815*	●	●										
	Senate Joint Resolution 027 (2007) (under consideration)	Proposes that all new and renovated State of Illinois "shall be designed to and achieve a minimum delivered fossil-fuel greenhouse gas (GHG) emitting energy consumption performance standard of one-half the U.S. average for that building type as defined by the Environmental Protection Agency (EPA) in the EPA's Target Finder." The fossil fuel reduction standard for all new buildings shall be increased to: 60% in 2010, 70% in 2015, 80% in 2020, 90% in 2025, and carbon-neutral by 2030. *http://www.ilga.gov/legislation/fulltext.asp?DocName=&SessionId=51&GA=95&DocTypeId=SJR&DocNum=27&GAID=9&LegID=29887&SpecSess=&Session=*	*	*										
IN	Executive Order 05-21	Executive order requires state agencies to establish goals and work to reduce office paper usage whenever possible. Order requires that environmentally preferable products be specified whenever possible. All fleet vehicles based in Indianapolis capable of using E-85 are directed to refuel with E-85 whenever possible. Facilities shall continue to implement measures to enhance energy efficiency in new building projects and in ongoing building and equipment operations. This order continues the Indiana Greening the Government Initiative established by Executive Order 99-07. *http://www.in.gov/gov/media/eo/EO_05-21_Greening_the%20Govt.pdf*	○	○								●		○
	Lieutenant Governor's Press Release	In a February 2007 press release, the Lt. Governor announced that state buildings located in Marion County will purchase 10% of their energy from renewable energy resources by 2010, beginning with 7% in 2007. *http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=IN07R&state=IN&CurrentPageID=1&RE=1&EE=1*							●					

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement			Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Title	Description	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
	State Strategic Energy Plan	Plan recommends that the state to replace all fleet vehicles with flexible-fuel units as they are retired, with the goal of the entire fleet becoming flexible-fuel compatible by 2010. Recommends that the state commit to purchasing 10% of its electric load for all state government buildings in Marion County from renewable generators in Indiana by 2010 and 25% by 2025. *http://www.in.gov/gov/media/pdfs/2006StrategicEnergyPlan.pdf*							○			○		
IA	Executive Order 41	Executive order directs state government to implement energy-efficient measures and increase the consumption of ethanol blended and biodiesel fuels. Requires the state to reduce energy consumption per sq. ft. per degree day in all "conditioned facilities" an average of 15% by 2010 from 2000 levels. Requires that 10% of electricity purchased by state-owned facilities come from alternative energy, preferably from on-site sources. By 2010, the state's light-duty vehicle fleets must consist of hybrid and/or AFVs, with the exception of law-enforcement vehicles. Bulk diesel fuel purchased by the state must contain 5% renewable fuel (such as biodiesel) by 2007, increasing to 20% by 2010. Agencies shall retain energy cost savings and apply them to reinvest in facilities. *http://www.dsireusa.org/documents/Incentives/IA09R.pdf*	●	●			●		●	●	●	●		
	Executive Order 6 (2008)	Establishes Green Government Initiative. A Steering Committee is to provide guidance for task forces. An Energy Excellent Buildings Task Force shall focus on greening new and existing office buildings and evaluating leased space to identify opportunities for energy efficiency improvements with payback periods shorter than the remaining lease term. The goal of this force is to reduce energy use in buildings by at least 15% in five years, accounting for workforce growth and changes in building operations. A Biofuels Task Force shall focus on increase use of biofuels in the state fleet, reducing vehicle miles traveled, and increasing fuel efficiency of the fleet. A third task force is to focus on using sustainable materials. Order calls for mandatory audits for all state agencies. *http://www.governor.iowa.gov/administration/docs/eo/06-080221.pdf*	○	○							○	○	○	○
	Iowa Energy Plan (2004)	Plan establishes a goal to reduce energy consumption in state-government-owned or -occupied buildings by an average of 10% by 2008. The Department of Natural Resources and the Department of Administrative Services will work to develop a baseline of energy consumption information for state facilities for a report of progress and recommendations. *http://www.iowadnr.com/energy/info/files/04plan.pdf*		●										
	Iowa Energy Independence Plan (2007)	Plan recommends requiring all existing state-owned buildings to have energy audits and implement energy efficiency measures, and that all new state buildings be designed to achieve high energy performance standards. Recommends creating opportunities for state employees to reduce VMT through telecommuting and other measures. *http://www.energy.iowa.gov/OEI/docs/Final_Plan.pdf*	○	○							○		○	

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

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KS	Executive Directive 07-373	Directive calls for a survey of state employees to develop a list of energy efficiency measures. Directs the Department of Administration to adopt a policy to require that any facilities consider for leasing be audited for energy consumption. The department is directed to collect energy data from all state-owned and -leased facilities and to ensure that all vehicles purchased beginning in 2010 have mileage ratings at least 10% higher than the 2007 average. Directs the department to ensure that products purchased are energy efficient and are ENERGY STAR-qualified. *http://da.ks.gov/ps/subject/arc/executivedirectives/2007/ExeDir%2007%20373.pdf*		●			●	●			●			
	Senate Bill 262 (2007)	Act requires state agencies to purchase vehicles that utilize E85 fuels whenever the E85 vehicle is less than $250 more expensive than a conventional vehicle of the same model. *http://www.kslegislature.org/bills/2008/262.pdf*										●		
	K.S.A. 75-4616	Statute codifies federal EPAct requirements: as of Model Year 2000, 75% of new light-duty motor vehicle acquisitions by the state fleet and its agencies are to be AFVs. *http://kansasstatutes.lesterama.org/Chapter_75/Article_46/75-4616.html*										●		
	K.S.A. 74-616	Statute [House Bill 2642 (2006)] creates the Energy Policy Advisory Group, which will become effective January 1, 2007. The Group shall advise the Governor and others on energy policies and make recommendations beneficial for the state in that regard. The group has the task of identifying conservation opportunities. *http://www.kslegislature.org/bills/2006/2642.pdf*												
KY	Executive Order 122 (2005)	Executive order establishes a Utility Savings Council to evaluate all state agencies' energy costs and to make recommendations. The Council's objective will be to reduce overall state government energy costs by at least 10%. *http://apps.sos.ky.gov/Executive/Journal/EJimages/2005-CRREST-172806.pdf*		●										
	Executive Order 2006-1297	Executive order requires the Department of Education to assist school districts in designing and planning energy-efficient schools that can be ENERGY STAR-certified. Also calls on the Department of Education to request that the Capital Planning Advisory Board develop recommended guidelines for incorporating energy-efficient criteria into the school design procedure. *http://apps.sos.ky.gov/Executive/Journal/EJimages/2006-CRREST-177212.pdf*	●		●									

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Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
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	Executive Order 2006-1298	Executive order requires the Finance and Administration Cabinet to improve the fuel efficiency of Kentucky's fleet by procuring more fuel-efficient/alternative-use vehicles. Requires the Office of Energy Policy to commit $1,000,000 over the next biennium to the research, development, deployment, and commercialization of clean energy projects, including a study of the net benefits for consumers to purchase ENERGY STAR products. *http://apps.sos.ky.gov/Executive/Journal/EJimages/2006-CRREST-177213.pdf*									●	●		
	K.R.S. Chapter 152	Statute [House Bill 299 (2006), Kentucky Energy Security National Leadership Act] requires a life-cycle cost comparison of at least two types of energy-efficient HVAC equipment, including geothermal equipment when feasible, for every bid for new construction or for existing facility upgrade. *http://www.lrc.ky.gov/RECORD/06RS/HB299/bill.doc*	●	●										
	K.R.S. Chapter 56 and 45A	House Bill 1 (2007) creates a new section of KRS 56.770 to 56.784 to encourage the Finance and Administration Cabinet to use the LEED or Green Globe rating systems and to incorporate ENERGY STAR products into state procurements. Amends KRS 56.784 to encourage a review of utility usage in state-owned property and amends KRS 56.782 to require reporting. Creates a new section of KRS Chapter 45A to require a strategy for a cleaner state vehicle fleet and directs an LRC staff study on energy-efficient building and design practices. *http://www.lrc.ky.gov/record/07S2/HB1.htm*	○	○			○	○			○	○		○
	Kentucky Energy Plan	Plan recommends that the state encourage high-performance, energy-efficient design for new state facilities. Plan recommends that the state require its state fleet to use a 10% blend of ethanol (E10) and gasoline and a 2% blend of biodiesel (B2) wherever these clean fuels are available, and encourage Kentucky's post secondary institutions to adopt similar initiatives. The state should design policies to promote the use of a 20% blend of biodiesel in the public school bus fleet. *http://www.energy.ky.gov/NR/rdonlyres/8E6F3FFE-5DC6-4FC6-9B5A-EA9D2AC89E7A/0/KentuckyEnergyPlan.pdf*	○									○		
LA	Executive Order 2008-08	Order directs the Division of Administration to set energy efficiency goals for state facilities by August 2008 and to establish programs for energy analyses in state-owned buildings and identify opportunities for energy consumption reductions, giving special consideration to opportunities for performance contracting. Order directs the Division to evaluate its purchasing practices to ensure 100% compliance with existing state requirements for energy conservation, to adopt best practices for purchasing energy-efficient products, and to increase procurement standards to meet ENERGY STAR specifications. Order directs Division to develop fleet fuel economy goals and to ensure those goals are met by 2010. Goals should address use of hybrid and AFVs. *http://www.deq.louisiana.gov/portal/portals/0/news/pdf/2008EOGreenGovernment.pdf*		○			○	○			○	○	○	○

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

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	Revised Statutes 40:1730.49	Senate Bill 240 (2007) directs the Office of Facility Planning and Control to adopt rules and regulations that optimize energy performance in state-funded buildings, increase use of materials made in Louisiana, improve environmental quality by conserving energy and using local renewable energy sources, encourage life-cycle cost analysis, encourage obtaining ENERGY STAR designation for facilities. Major projects are to be designed to exceed the state building energy code by at least 30% as long as the payback period is 30 years or less. *http://www.legis.state.la.us/billdata/streamdocument.asp?did=449761*	●		○				○	○				○
ME	Executive Order 8 (2003)	Executive order requires newly constructed and renovated buildings to adhere to LEED standards in order to maximize energy efficiency and sustainability. *http://www.maine.gov/tools/whatsnew/index.php?topic=Gov_Executive_Orders&id=21346&v=Article*	●	●		●								
	Executive Order 11 (2004)	Executive order requires the Department of Environmental Protection to annually report on the fleet fuel economy for state vehicles and emissions profiles for all new vehicles purchased by the state. The Department of Administrative and Financial Services will work with agencies to identify state positions that incur paid mileage expenses for travel in excess of 20,000 miles per year. The State shall purchase or assign the most fuel efficient, lowest emission vehicles, considering life cycle costs, available resources, and other appropriate considerations. Order requires each agency to report vehicle miles traveled. Promotes teleconferencing and carpooling by state employees as strategies for reducing vehicle miles traveled. *http://www.maine.gov/governor/baldacci/news/executive-orders/EX_ORDER_3_17_04.doc*									●	●	●	
	MRSA Title 38 343-H	Statute establishes the Clean Government Initiative to assist state agencies and state-supported institutions of higher learning in meeting applicable environmental compliance requirements and to incorporate environmentally sustainable practices into all state government functions. Initiative is intended to facilitate improvements in energy efficiency, including facility siting, design, construction, and management and increase procurement of environmentally friendly commodities and services, recycling of waste products, and enhanced fleet efficiency. *http://janus.state.me.us/legis/statutes/38/title38sec343-H.html*	○	○			○				○			○
	MRSA Title 5 1764-A	Statute requires that state-funded new buildings and renovations over 5,000 square feet involve consideration of architectural designs and energy systems that are based on life-cycle costing, and that include an energy-use target that exceeds at least 20% of the energy efficiency standards in effect for commercial and institutional buildings. *http://janus.state.me.us/legis/statutes/5/title5sec1764-A.html*	●	●										

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	MRSA Title 5 1770	Statute establishes a goal for state facilities to reduce energy consumption by 25% by 2010 relative to 1998, as long as the achievement of the goal is accomplished in a manner that does not interfere with other goals, plans or policies of the state. Statute also requires the Department of Environmental Protection to develop an energy savings pilot project in at least 10 facilities to achieve the above goal using performance-based contracts. This goal is consistent with the Conference of New England Governors and Eastern Canadian Premiers goal of improving energy efficiency in public facilities by 25% by 2012. *http://janus.state.me.us/legis/statutes/5/title5sec1770.html*		●										
	MRSA Title 5 1766-A	LD 785, passed in 2007, requires that no later than January 1, 2010, all electricity consumed in state-owned buildings must be supplied by renewable resources. The chair of the state Energy Resources Council shall develop a plan to implement this rule and shall submit that plan including suggested legislation to the state legislature by April 1, 2008. *http://janus.state.me.us/legis/LawMakerWeb/externalsiteframe.asp?ID=280023361&LD=785&Type=1&SessionID=7*							●					
	MRSA Title 5 1812-E	Statute mandates that except for cars and light-duty trucks purchased for law enforcement and other special use purposes as designated by the State Purchasing Agent, the State Purchasing Agent may not purchase or lease any car or light duty truck for use by the state or any department or agency of the state unless the car has a manufacturer's estimated highway mileage rating of at least 45 mpg and the light-duty truck has a manufacturer's estimated highway mileage rating of at least 35 mpg. *http://janus.state.me.us/legis/statutes/5/title5sec1812-e.html*									●			
	MRSA Title 38 575	Statute codifies state goal of reducing GHG emissions to 1990 levels by January 1, 2010, and to 10% below 1990 levels by January 1, 2020, as established by the Conference of New England Governors and Eastern Canadian Premiers. Requires the development of a GHG emissions inventory for state-owned facilities and state-funded programs. *http://janus.state.me.us/legis/statutes/38/title38ch3-Asec0.html*												●
	Governor's Environmental Agenda	Agenda establishes a goal for state government to purchase at least 50% of its electricity from renewable power sources, paid for by energy conservation improvements in all state buildings. This goal was met by a contract agreement committing over 800 accounts under one service agreement in 2003. As of March 2007, 100% of the state's power demand is met by renewable energy sources. The state government is purchasing renewable energy credits for 70% of its demand, while the remaining 30% is obtained through the statewide renewable energy portfolio standard. *http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=ME08R&state=ME&CurrentPageID=1&RE=1&EE=1*							●					

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	State Environmentally Preferable Procurement Policy	This policy statement directs the state to identify and set graduated targets for the procurement of environmentally preferable products, and to eliminate non-environmentally preferable products. *http://www.maine.gov/cleangovt/rulesanddocuments/eeppolicyprogdocs.doc*					●							
MD	Executive Order 01.01.2001.02	Executive order establishes a goal for 6% of electricity purchased by state-owned facilities to come from "green energy." Order requires that new and renovated state buildings follow LEED and ENERGY STAR-modeled guidelines, to be developed the Green Buildings Program. Requires the procurement of ENERGY STAR products. Requires facilities to reduce energy consumption per gross sq. ft. by 10% by 2005 and 15% by 2010 relative to 2000 levels. Directs the state to ensure that 50% of fuel used by bi-fuel and flex-fuel vehicles be alternative fuel. The state shall help develop infrastructure to make certain types of AFVs practical. Order calls for agencies to increase pollution prevention by recycling at least 20% of waste created. *http://www.mde.state.md.us/assets/document/EO-0101200102.pdf#search=%22maryland%20executive%20order%2001.01.2001.02%22*	●	●	●	●	●	●	●	●		●		●
	Maryland Code: State Finance and Procurement Section 4-808	Requires the Department of General Services to include an evaluation of the use of renewable energy generation systems and energy-efficient measures in creating standards for determining a building's life-cycle costs. An energy consumption analysis is required for each major piece of equipment added to building systems. *http://mlis.state.md.us/asp/statutes_Respond.asp?article=gsf&section=4-808&Extension=HTML*	○	○			○							
	Board of Public Works Policy	A September 2007 Board of Public Works policy statement requires state agencies to increase use of hybrid and bio-fueled vehicles. The policy will increase the number of hybrid vehicles in the state fleet from 40 to 1000 within three years. In addition, the policy will increase the fleet's number of vehicles that run on biofuels or ethanol from 2,000 to 2,400 over the same period. *http://www.eere.energy.gov/state_energy_program/project_brief_detail.cfm/pb_id=1202*										●		
	Chapter 427 - Session Laws 2006	Senate Bill 267 (2006) requires the Department of General Services to set reductions in energy consumption for State buildings: 5% by 2009 and 10% by 2010. This bill excludes the Department of Transportation's buildings. *http://mlis.state.md.us/2006rs/bills/sb/sb0267e.pdf*		●										

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	Chapter 115 - 2007 Session Laws	Senate Bill 332 establishes the Maryland Green Building Council. On or before September 30, 2007, the council shall evaluate current high performance building technologies and provide recommendations concerning the most cost-effective green building technologies that the state might consider requiring in the construction of state facilities, including consideration of the additional cost associated with the various technologies. On or before November 1, 2007, and every year thereafter, the council shall report to the governor and the general assembly. *http://mlis.state.md.us/2007RS/billfile/sb0332.htm*	●											
	EmPOWER Maryland Initiative	The governor's EmPOWER initiative includes steps for state government to reduce electricity consumption by 15% by 2015. The initiative calls for: energy-efficient building operations, energy performance contracting, increased funding for the State Agency Loan Program, requirements for new buildings over 20,000 square feet to designed based on the recommendations of the state Green Building Task Force, ENERGY STAR-qualified product procurement. The governor created the position of Director of the Office of Energy Performance and Conservation to oversee these activities. *http://www.energy.state.md.us/press/2007-07-02.pdf*	○	○			○	○						
MA	Executive Order 438	Executive order creates a Sustainability Coordinating Council to develop a State Sustainability Program. With the assistance of the Program, state agencies shall develop programs to reduce energy consumption through energy efficiency and conservation, improve state energy efficiency in products procurement, sustainable design, and renewable energy development, and well as implement other sustainable programs for recycling and waste reduction. *http://www.lawlib.state.ma.us/ExecOrders/eo438.txt*	●	●			●		●					●
	Executive Order 484 (2007)	Requires agencies to reduce energy consumption by 20% by 2012, and 35% by 2020, based on 2002 levels. Agencies must reduce GHG emissions by 25% by 2012, 40% by 2020, and 80% by 2050. Agencies are required to obtain 15% of electricity from renewable sources by 2012, 30% by 2020. Agencies must use biofuels for 3% of heating oil in winter of 2007-2008, 5% in winter 2008-2009. Agencies must meet state LEED-Plus building standards for all new construction and major renovations - and obtain third-party commissioning - and consider energy performance when leasing. Agencies must reduce potable water consumption 10% by 2012, 15% by 2020. Facilities larger than 100,000 sq. ft. must be retrofitted for energy efficiency by 2012. Order prohibits purchase of incandescent light bulbs and requires purchase of energy-efficient products, particularly ENERGY STAR-qualified products. *http://www.mass.gov/Agov3/docs/Executive%20Orders/Leading%20by%20Example%20EO.pdf*	●	●		●	●	●	●					●

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	Executive Office for Administration and Finance Bulletin 11	Bulletin directs the State Sustainability Coordinating Council to convene a State Agency Conservation Task Force that will guide state government agency conservation programs. Bulletin requires state agencies to reduce building energy consumption by 15% by 2010. Calls for procurement of ENERGY STAR equipment and implementation of energy saving maintenance practices. *http://www.mass.gov/Eeoaf/docs/administrativebulletin11.doc*		●			●	●						
	Executive Office for Administration and Finance Bulletin 12	Effective September 1, 2006, all executive agencies shall follow new sustainable design and construction standards for all new construction and major renovation projects where the cost of renovation is greater than 50% of the assessed value of the building. Standards are designed to ensure that state buildings are at least 20% more efficient than the current energy code. For projects of 20,000 square feet or larger, all agencies shall adhere to the newly created "Massachusetts LEED Plus" standard for new construction and major renovation projects. *http://www.mass.gov/Eeoaf/docs/administrativebulletin12.doc*	●	●		●								
	Executive Office for Administration and Finance Bulletin 13	Bulletin empowers the Office of Administration and Finance to set minimum percentage requirements for E85 usage in state flex-fuel vehicles. Mandates that by FY 2010, all agencies will use a minimum of 15% biodiesel in both on-road and off-road diesel engines. These requirements can be met through use of B5 and/or B20, or any other blend, as long as a minimum of 5% by FY 2008 and 15% by FY 2010 of total diesel fuel used is equivalent to 100% biodiesel. Bulletin calls for state agencies, no later than the winter of 2007-2008, to use a minimum of 3% biodiesel in all #2 fuel oil applications. This requirement can be met through the use of average B3 blend or any other blend as long as a minimum of 3% of the total #2 fuel consumed is equivalent to 100% biodiesel. *http://www.mass.gov/Eeoaf/docs/administrativebulletin13.doc*										●		
	SB 1797 (not enacted)	Bill would establish a commission to study the state government's energy use and reduce it by 10 %. *http://www.mass.gov/legis/bills/senate/st01/st01797.htm*												
	SB 2220 (not enacted)	In October 2005, SB2220 passed the state senate and was referred to committee in the House. If passed, it would have required Massachusetts to purchase AFVs or hybrids at a rate of at least 5% (of the total vehicle purchases) annually, and that 50% of the state's fleet is AFV or hybrid by 2010. *http://www.dsireusa.org/documents/Incentives/MD07R1.pdf*										*		

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MI	Executive Directive 2005-4	Executive directive requires the Department of Management and Budget to establish an energy efficiency savings target for all state buildings. The goal shall be to attain a 10% reduction in energy use by December 31, 2008 and a 20% reduction in grid-based energy purchases by December 31, 2015, when compared to energy use and energy purchases for the state fiscal year ending September 30, 2002. The directive calls for the establishment of a program based on ENERGY STAR to analyze building energy use, and for building design to be LEED compatible. Directive also requires the purchase of ENERGY STAR-qualified equipment. It also requires state departments and agencies to purchase hybrid vehicles and alternative fuels, where cost-effective and available. *http://www.michigan.gov/gov/0,1607,7-168-21975_22515-116177--,00.html*	●	●	●	●	●	●			●	●		
	Executive Directive 2007-22	Directive supersedes ED 2005-4. Requires Department of Management and Budget to reduce energy consumption in state buildings by 10% by 2009, and reduce grid-based electricity use by 20% by 2015, based on FY 2002 use. Agencies within executive branch are to reduce energy use using a baseline of FY 2006. Department is directed to include hybrid vehicles in the state fleet, to use alternative fuels when feasible, and encourage use of biodiesel. Department shall require agencies to consider life-cycle costs when purchasing products and to specify ENERGY STAR products. Department shall seek to design and lease ENERGY STAR-labeled buildings. New buildings, and renovated existing buildings, shall be designed to meet LEED certification. *http://www.michigan.gov/gov/0,1607,7-168-36898-180298--,00.html*	●	●	●	●	●	●			○	○		○
MN	Executive Order 04-08	Executive order directs state agencies to reduce air polluting emissions by implementing the following actions: 1) purchase or lease the most fuel-efficient and least polluting vehicles possible; 2) refuel with the cleanest fuel available; 3) encourage employees to consider alternative transportation strategies; 4) reduce state energy use through purchasing energy-efficient office equipment; 5) employ energy-conserving strategies in state-owned or leased buildings; 6) procure and use products with the lowest potential to contribute to air pollution; 7) employ landscaping that reduces the need for gasoline-powered equipment; and 8) purchase electricity from renewable sources. State agencies are required to produce fact sheets describing steps employees can take to reduce pollution. *http://www.governor.state.mn.us/priorities/governorsorders/executiveorders/2004/PROD005584.html*		●			●		●		●	●	●	●

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	Executive Order 04-10	Using 2005 as a baseline, the State of Minnesota shall reduce the use of gasoline by on-road vehicles owned by state departments by 25 % by 2010 and by 50 % by 2015, and the use of petroleum-based diesel fuel by those vehicles 10 % by 2010 and 25 % by 2015. At least 75% of purchases of new on-road vehicles must use "cleaner fuels" and have a fuel efficiency rating that exceeds 30 mpg for city usage and 35 mpg for highway usage. The Commissioner for the Department of Administration shall chair a SmartFleet Committee to assist state departments in implementing the requirements of the order. *http://www.governor.state.mn.us/priorities/governorsorders/executiveorders/2004/PROD005586.html*									●			
	Executive Order 05-16	All state agencies will take measures to reduce energy usage in state owned buildings by 10% over the next calendar year, including but not limited to: specified maximum and minimum heating temperatures for state facilities; incorporating Minnesota Sustainable Guidelines for new construction; implementing energy efficiency improvements in existing buildings through partnering with energy services companies and funding the projects through lease purchase agreements; and procuring alternative heating fuels. *http://www.governor.state.mn.us/priorities/governorsorders/executiveorders/2005/PROD005605.html*	●	●										
	Executive Order 06-03	Executive order directs that all state employees utilizing vehicles from the state's fleet shall, whenever practical, use E85 fuel when operating flexible-fuel vehicles. The Smart Fleet Committee is directed to develop a plan to facilitate usage of E-85 and biodiesel in state vehicles. This includes actively pursuing the establishment of additional E-85 refueling facilities at public retail outlets throughout the state. *http://www.governor.state.mn.us/priorities/governorsorders/executiveorders/2006/march/PROD005613.html*										●		
	Minnesota Statutes Section 216C	Senate File 145 (2007) establishes a goal of reducing per capital fossil fuel consumption by 15% by 2015 and 25% by 2025 statewide. Bill directs the Commissioner of Commerce to develop a report for the legislature on policy options, barriers, and economic benefits and costs for state government operations to achieve the energy savings goals set forth in Section 216B.2401. Bill establishes a goal for reducing statewide GHG emissions 15% below 2005 levels by 2015, 30% by 2025, and 80% by 2050 *https://www.revisor.leg.state.mn.us/bin/bldbill.php?bill=S0145.2.html&session=ls85*												
	Minnesota Statutes Section 216C	Statute requires Commissioner of Commerce to issue a report to the legislature by February 1, 2008 identifying policy options, barriers, and economic benefits and costs for state government operations to achieve the energy savings goals established for the state as a whole (annual energy savings equal to 1.5% of annual retail energy sales of electricity and natural gas). *http://www.revisor.leg.state.mn.us/bin/bldbill.php?bill=S0145.2.html&session=ls85*		○										

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Title	Description	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
MO	CSR 140-7	Rule establishes a minimum energy efficiency standard for construction of a state building, substantial renovation of a state building where major energy systems are involved, or a building which the state or state agency considers for acquisition or lease. The minimum energy efficiency standard is to conform with the ASHRAE 90.1 and 90.2 standards. *http://www.sos.mo.gov/adrules/csr/current/10csr/10c140-7.pdf*	●	●										
	RSMo 414.365	On or before October 1, 2003, the Missouri Department of Transportation shall develop a program that provides for the opportunity to use fuel with at least the biodiesel content of B-20 in its vehicle fleet and heavy equipment that use diesel fuel. Such program shall have the following goals, provided that such program and goals do not prohibit the department from generating and selling EPAct credits pursuant to section 414.407: on or before July 1, 2004, at least 50% of the department's vehicle fleet and heavy equipment that use diesel fuel shall use fuel with at least the biodiesel content of B-20; on or before July 1, 2005, at least 75% of the department's vehicle fleet and heavy equipment that use diesel fuel shall use fuel with at least the biodiesel content of B-20. *http://www.moga.mo.gov/statutes/C400-499/4140000365.HTM*										●		
	RSMo 414.400 and 410	Statute directs that any state agency operating a fleet of more than 15 motor vehicles must develop an alternative fuel plan, and ensure that 50% of new vehicles acquired by the fleet are capable of running on alternative fuels. Any state agency which operates a fleet of more than fifteen motor vehicles shall acquire vehicles capable of using alternative fuels as follows: at least 10% of the agency's fleet vehicles acquired between July 1, 1994, and July 1, 1996; at least 30% of the agency's fleet vehicles acquired between July 1, 1996, and July 1, 1998; and at least 50% of the agency's fleet vehicles acquired between July 1, 1998, and July 1, 2000, and each biennial period thereafter. Excess acquisitions of AFVs may be credited towards future biennial goals. *http://www.moga.mo.gov/STATUTES/C414.HTM*										●		
MT	Governor's 20x10 Initiative	In November 2007, the governor announced this initiative to reduce energy consumption by state agencies by 20% by 2010. This initiative was announced along with the state Climate Change Action Plan. *http://governor.mt.gov/news/pr.asp?ID=513*		○										

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

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	Climate Change Action Plan (2007)	Plan recommends a number of LBE activities, including: all new buildings should be designed to achieve high energy performance and to be certified as meeting the requirements of the Silver level of the LEED rating system. Existing buildings should be upgraded for energy efficiency over the next 15 years and should be benchmarked within three years. Recommends requiring ENERGY STAR qualification for purchases and recommends purchasing these products in bulk. Establishes a goal of reducing energy consumption per square foot by 20% by 2020 in existing buildings and by 40% by 2020 in new buildings. Also establishes a goal of using 25% renewable energy in existing state government buildings by 2025. *http://www.mtclimatechange.us/ewebeditpro/items/O127F14042.pdf*	○	○		○	○	○	○					○
	Section 90-4-605, MCA	Statute (House Bill 12) directs the Department of Environmental quality to identify state buildings that have a potential for energy savings, based on age, energy use, function, and condition of the building. The department shall select certain facilities for in-depth energy analyses to identify the technical and financial feasibility of making energy conservation improvements to the facilities. If the estimated savings are determined to be greater than the bond payment costs for a particular project, the department shall notify the department of administration. Upon receipt of the notification, the department of administration shall implement a design and construction project using bond proceeds for the costs of the project. *http://data.opi.state.mt.us/bills/2001/billhtml/HB0012.htm*		●										
	Section 90-4-1011, MCA	Statute encourages the use of alternative fuels and fuel blends, recommending that state and local governments should be encouraged to set an example with their vehicle fleets in the use of alternative fuels and fuel blends. *http://data.opi.mt.gov/bills/2003/mca/90/4/90-4-1011.htm*										○		
	HJR 26 (enrolled 2003)	Bill establishes the Montana Hydrogen Futures Project as a key economic development focus of the state. The Project goal is that by 2020, 50% of all vehicles and equipment in Montana and 100% of all state-run vehicles will be powered by alternative fuels. *http://data.opi.state.mt.us/bills/2003/BillPDF/HJ0026.pdf#search=%22house%20joint%20resolution%2026%20montana%22*										●		
NE	Executive Order 2005-03	Executive order directs the Transportation Services Bureau and the Nebraska Department of Roads to immediately take all reasonable actions necessary to investigate ways in which to strengthen the infrastructure for increasing the availability of E85 and B2 for the State's flexible-fuel fleet and to allow for the procurement of 2% blends of biodiesel (B2) fuel for the State's diesel-powered vehicle fleet. Additionally, all state employees utilizing the State's fleet of vehicles shall use E85 and 2% blends of biodiesel (B2) fuel when operating flexible-fuel vehicles and diesel-powered vehicles, whenever practical, in the course of their state employment. *http://www.nlc.state.ne.us/docs/pilot/pubs/eofiles/05-03.pdf*										●		

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

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NV	NAC 486A.160	Statute requires that fleets containing 10 or more vehicles that are owned, leased, or operated by the state are mandated to acquire AFVs or EPA-certified ultra-low emission vehicles. Beginning in FY 2000 and each year thereafter, 90% of new vehicles obtained by covered fleets must be either AFVs or certified low-emission vehicles (LEVs). *http://ndep.nv.gov/nac/486a.pdf#search=%22nevada%20administrative%20code%20486A.160%22*										●		
	NRS 701 title 58	Statute creates the Office of Energy within the Office of the Governor. The Director of the Office of Energy shall prepare a state energy reduction plan which requires state agencies, departments and other entities in the Executive Branch to reduce grid-based energy purchases for state-owned buildings by 20% by 2015 (Session Law 76, 22nd Special Session, 2005). The Director is also required to adopt guidelines establishing Green Building Standards for all occupied public buildings and to adopt a Green Building Rating System, such as LEED. Creates a task force to advise the Office of Energy on Renewable Energy and Energy Conservation. *http://leg.state.nv.us/nrs/nrs-701.html*	●	●		●								
NH	Executive Order 2004-07	Executive order directs Department of Administrative Services to develop an energy information system to track and report state energy usage. Additionally, each department is required to: inventory facilities for energy use; train staff in ENERGY STAR benchmarking program; develop procedures for annual tracking and reporting of energy use. Order establishes a steering committee to develop recommendations for: conducting energy audits of facilities scoring between 40% and 60% on ENERGY STAR's rating scale; developing ENERGY STAR products procurement guidelines; developing energy-efficient guidelines for designing and commissioning new buildings; establishing a policy to purchase the most fuel-efficient and low-emission vehicles; and encouraging ride-sharing. *http://www.sos.nh.gov/EXECUTIVE%20ORDERS/Benson2004-7.pdf*		●	○		○	○			○		○	
	Executive Order 2005-4	Executive order requires state to reduce energy use in its facilities by 10% in accordance with the ENERGY STAR Challenge. Requires all agencies to work with the State Energy Manager to ensure that existing energy efficiency polices are fulfilled. The Department of Administrative Services shall implement an energy information system to measure progress, including a rating system for agencies to rate and track progress. Every agency is required to purchase ENERGY STAR equipment. New construction or renovation must exceed state energy code by 20%. Every agency shall implement a Clean Fleets Program with the following components: minimum rating of 27.5 mpg, new purchases must be LEVs, and alternative transportation methods such as carpooling. *http://www.nh.gov/governor/orders/documents/Executive_order_2005-4.pdf*	●	●	●		●	●			●		●	●

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

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	New Hampshire State Energy Plan	Plan recommends that the state consider purchasing a fixed percentage of its power from renewable generation. Recommends that the state consider incorporating "performance contracting" into new building construction. Recommends that the state commit to purchasing office equipment that is ENERGY STAR rated. Recommends that the state should transition the entire state fleet to biodiesel or hybrid vehicles. *http://www.nh.gov/oep/programs/energy/StateEnergyPlan.htm*	○				○	○			○	○		
NJ	Governor's Mandate	Former governor McGreevey's office delivered a mandate for a minimum of 10% green power purchases for all state agencies. As a result, an aggregation of New Jersey state agencies currently use renewable energy for ~12% of their electricity. *http://www.state.nj.us/dep/dsr/bscit/GreenPower.pdf*							●					
	Executive Order 94 (1999)	Executive order directs state agencies to exercise leadership in the acquisition and use of ATVs and AFVs. The State shall exceed the EPAct AFV acquisition requirements for State government fleets by 5% for each model year. In Model Years 1999 and 2000, those additional vehicles acquired to fulfill this enhanced commitment shall meet or exceed California Air Resources Board LEV standards in effect for those model years. In Model Year 2001, and thereafter, those additional vehicles acquired to fulfill this enhanced commitment shall meet or exceed CARB ultra low-emission vehicle standards in effect for those model years. *http://www.state.nj.us/infobank/circular/eow94.htm*										●		
	Executive Order 24 (2002)	Executive order requires all newly constructed schools in the state to be designed according to LEED standards. *http://www.state.nj.us/infobank/circular/eom24.htm*	●			●								
	Executive Order 11 (2006)	Executive order creates the position of Director of Energy Savings in the Department of the Treasury. Director will be responsible for improving the energy efficiency of all procurement programs for state facilities. Additionally, all state agencies shall select ENERGY STAR energy-efficient products when acquiring new energy-using products or replacing existing equipment. The Director of the Division of Purchase and Property in the Department of Treasury shall issue standards and guidelines to implement this requirement. For products that do not have ENERGY STAR labels, State agencies shall follow guidelines established by the New Jersey Clean Energy Program. Each State agency shall purchase recycled products, provided the recycled products are competitive. *http://www.state.nj.us/infobank/circular/eojsc11.htm*					●	●						●
	Executive Order 54 (2007)	Within six months from the date of this Order, the Director of Energy Savings in the Department of Treasury shall develop specific targets and implementation strategies for reducing usage by State agencies through improved energy efficiency at State facilities and by reducing the State's vehicle fleet's fuel consumption. *http://www.state.nj.us/governor/news/news/approved/20070213a.html*		○							○			

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	State Revised Statutes Title 52, Chapter 34	Senate Bill 341 (2006) requires the state to purchase only products bearing the ENERGY STAR label when buying products for state government use. *http://www.njleg.state.nj.us/2006/Bills/S0500/341_T1.HTM*					●	●						
	State Revised Statutes Title 52	Assembly Bill 3983 (2007) requires all state agencies with purchasing authority to replace all incandescent light bulbs used in state-owned buildings with compact fluorescent light bulbs within three years. *http://www.njleg.state.nj.us/2006/Bills/PL07/156_.PDF*					●							
NM	Executive Order 2004-19	Executive order creates the Clean Energy Development Council to develop policy recommendations that will enhance the opportunities for successful clean energy growth in New Mexico. The council shall recommend to the governor the creation of task forces to work with existing clean energy programs and work on specific initiatives and issues, including reducing energy use in public buildings. *http://www.governor.state.nm.us/orders/2004/EO_2004_019.pdf*		○										
	Executive Order 05-33	Order creates the a Change Action Council to review and provide recommendations regarding climate change policy and the New Mexico Climate Change Advisory Group to present proposals to the Council to reduce the state's total GHG emissions to 2000 levels by 2012, 10% below 2000 levels by 2020, and 75% below by 2050. In addition, this order directs the General Services Department to develop recommendations to reduce GHG emissions in state government capital projects. The department will further propose changes to procurement policies for new state vehicles to have hybrid electric engines or utilize alternative fuels. *http://www.governor.state.nm.us/orders/2005/EO_2005_033.pdf*									○	○		●
	Executive Order 2005-49	Executive order directs all state agencies, public schools, and institutions of higher education to take immediate action toward obtaining 15% of total transportation fuel requirements from renewable fuels by 2010. Directs all state agencies and schools to comply with requirements of the Alternative Fuel Acquisition Act of 1978, which requires that 75% of all vehicles acquired by the state be capable of operating on alternative fuels or be hybrids. Also requires agencies to develop procedures to allocate and/or assign vehicle usage based on fuel economy, to investigate carpooling, and to procure vehicles that have the highest fuel economy. *http://www.governor.state.nm.us/orders/2005/EO_2005_049.pdf*									●	●	●	

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement			Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
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	Executive Order 2006-001	Executive order requires the adoption of LEED-Silver standards in new public buildings in excess of 15,000 square feet and/or using over 50 kW peak electrical demand. Such buildings must achieve a minimum delivered energy performance standard of 50% of the average consumption for that building type. New construction and renovation of existing buildings between 5,000 and 15,000 square feet will achieve a minimum delivered energy performance standard of 50% of the average consumption for that building type. Renovations of existing buildings in excess of 15,000 square feet and/or using over 50 kW peak electric demand must meet LEED-Silver standards and achieve a minimum delivered energy performance standard of 50% of the average for that building type. *http://www.governor.state.nm.us/orders/2006/EO_2006_001.pdf*	●	●		●								
	Executive Order 2006-69	Executive order establishes Climate Change Action Implementation Team responsible for developing a GHG emissions registry and reporting mechanism and energy management programs for state agencies. The order requires the Department of General Services to establish policies for green power purchasing, modify state procurement processes, ensure low greenhouse gas emissions from state vehicles, and require mandatory recycling. Requires the Department of the Environment to submit a proposal to implement a state clean car standard consistent with clean car standards adopted by other states no later than January 1, 2008. *http://www.governor.state.nm.us/press/2006/dec/122806_01.pdf*							○		○			○
	Executive Order 2007-053	Order directs all executive branch agencies to achieve a 20% reduction below 2005 levels in energy usage in state buildings by 2015, based on the average energy usage per square foot of building space. Executive branch agencies are also directed to achieve a 20% usage reduction below 2005 levels in the state fleet and transportation-related activities by 2015, based on the average transportation-related energy usage per sate employee. Order establishes a statewide goal of reducing energy consumption per capita by 20% from 2005 levels by 2020 (10% by 2012). The General Services Department and Energy, Mineral, and Natural Resources Department are directed to develop a plan to meet these goals. Order creates the position of Lead by Example Coordinator to direct LBE activities. Order requires creation of a database to track state government energy efficiency improvements. *http://www.governor.state.nm.us/orders/2007/EO_2007_053.pdf*		●									●	
	13-1B NMSA 1978	The Alternative Fuel Acquisition Act of 1992 requires that 75% of state government and educational institution fleet vehicles acquired in FY 2003 and after be bi-fuel or dedicated AFVs or gas-electric hybrid vehicles. *http://www.conwaygreene.com/nmsu/lpext.dll?f=templates&fn=main-h.htm&2.0*									●	●			

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	Session Law (2005) Chapter 176	Session law (House Bill 32) directs the Department of Energy, Minerals, and Natural Resources to develop a state plan for the installation, no later than the end of fiscal year 2010, of energy efficiency measures in state buildings and school district buildings. The plan shall include the maximum amount of on-site renewable energy measures. The statute creates an energy efficiency and renewable energy bonding fund to pay for energy efficiency upgrades. *http://legis.state.nm.us/Sessions/05%20Regular/bills/house/HB0032.pdf*		●					●	●				
NY	Executive Order 111	Executive order directs the state to implement energy efficiency measures in state and school district buildings by 2010. Requires most state agencies to acquire an increasing percentage of hybrids/AFVs. By 2005, at least 50% of new light-duty vehicles acquired by each agency and affected entity must be AFVs; by 2010, 100% of all new light-duty vehicles must be AFVs, with exceptions for designated police and emergency vehicles. Directed state agencies to increase purchase of electricity from renewable sources to 10% of all electricity purchases by 2005, increasing to 20% by 2010. The order calls for this goal to be achieved using on-site generation of renewable power, a mix of on-site generation and open-market procurement, or purchase of all renewable-power requirements on the market. *http://www.nyserda.org/programs/exorder111orig.asp*	●	●	●	●	●	●	●		●	●		
	Executive Order 142	Executive order directs state agencies to ensure that all vehicles capable of operating on E85 fuel shall do so whenever feasible. All agencies shall prepare plans to ensure that flex-fueled vehicles already in the state fleet use ethanol fuels whenever feasible. State agencies and public authorities shall purchase, allocate, distribute, and use B100 for state fleets at a 2% rate in 2007, graduating to 10% in 2012. By 2005, at least 50% of new light-duty vehicles acquired shall be AFVs. By 2010, 100% of all new light-duty vehicles shall be AFVs. (These last two requirements are modifications of Executive Order 111.) State agencies and public authorities shall purchase, allocate, distribute, and use B100 for heating in state agencies at a 0.5% rate in 2007, graduating to 5% in 2012. *http://www.ogs.state.ny.us/purchase/spg/pdfdocs/EO142_EEP.pdf*		●					●		●	●		
	State Law 5-108-a	Law directs NYSERDA to establish minimum efficiency standards for specific energy-using products and appliances purchased by or for the state or any of its agencies. These standards are promulgated in 21 New York Conservation Rules and Regulations Part 506. *http://public.leginfo.state.ny.us/menugetf.cgi?COMMONQUERY=LAWS*					●							

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	Governor's 15x15 Initiative	A new green building initiative of Governor Spitzer's "15 x 15" plan to reduce energy use in state government by 15% by 2015 was announced on August 28, 2007. Following the plan, New York State's Dormitory Authority--responsible for roughly one billion dollars of libraries, classrooms, and other public buildings each year--will be required to meet energy-efficiency standards of the U.S. Green Buildings Council (US GBC). *http://www.ny.gov/governor/press/0419071.html*	○	○										
NC	Executive Order 156	Executive order directs state agencies to seek opportunities to reduce environmental impacts associated with capital improvements and to implement initiatives that result in energy-efficient operations in facilities. Order establishes a goal for at least 75% of all new light duty cars and trucks purchased after January 1, 2004, be alternative-fueled or low emission vehicles. Agencies shall implement measures to reduce vehicle miles driven by state employees. Agencies shall give consideration to environmentally preferable products. Electronic equipment purchased by state agencies shall be ENERGY STAR qualified. State agencies shall give priority to the purchase of fleet vehicles that use less-polluting fuels and have the highest available mpg rating. *http://www.p2pays.org/ref/03/02221.pdf*	●	●			●	●			○	●	●	●
	GS 143-64. 10-15	Statute directs the Department of Administration to develop procedures to ensure that State purchasing practices improve energy and water efficiency. The department shall adopt and implement Building Energy Design Guidelines that include energy use goals and standards, economic assumptions for life-cycle cost analysis, and other criteria on building systems and technologies. The department shall modify the design criteria for construction and renovation of facilities to require that a life-cycle cost analysis be conducted. The department shall identify energy conservation M&O procedures that are designed to reduce energy consumption and that require no significant expenditure of funds. State agencies shall implement these recommendations. *http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_143/Article_3B.html*	○	○			○							○
	GS 143-215. 107C	Along with Executive Order 156, this law codifies EPAct requirements, establishing a requirement that on and after January 1, 2004, at least 75% of new or replacement light-duty cars and trucks purchased by the state will be AFVs or low-emission vehicles. *http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_143/GS_143-215.107C.html*										●		

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	Session Law 2005-276 Section 19.5	Law requires that all state agencies, universities, and community colleges that have state-owned vehicle fleets must develop and implement plans to improve the state's use of alternative fuels, synthetic lubricants, and efficient vehicles. The plans are directed to achieve a 20% reduction or displacement of the current petroleum products consumed by January 1, 2010. Before implementation of any plan, all affected agencies shall report their plan to the Department of Administration. The Department of Administration will compile a report on the plans submitted and report to the Joint Legislative Commission on Governmental Operations. Agencies must implement their plans by January 1, 2006. *http://www.ncleg.net/Sessions/2005/Bills/Senate/PDF/S622v9.pdf*									●	●		
	Session Law 2007-546	New buildings and major renovations of 20,000 square feet must be designed to exceed the energy requirements of ASHRAE 90.1-2004 standard (by 30% for new buildings, 20% for major renovations). New buildings must consume 20% less potable water than state code requires, and consume 50% less outdoor water than conventional facilities. Existing buildings must replace all conventional exit signs with LED ones, replace all incandescent light bulbs with CFLs, install low-flow water fixtures and take other measures to reduce indoor water consumption by 20% relative to a 2002-2003 baseline. New equipment must meet ENERGY STAR qualification. Existing buildings must reduce energy consumption per square foot by 20% by 2010 and 30% by 2015 based on the 2003-2004 year. *http://www.ncleg.net/Sessions/2007/Bills/Senate/HTML/S668v6.html*	●	●			●	●						●
	SB2051 (2006)	The Department of Administration shall develop a plan for a 20% reduction in petroleum products consumed in State-owned vehicle fleets by January 1, 2010. In an effort to improve energy and water conservation by State agencies, the Joint Legislative Oversight Committee on Capital Improvements shall study: reducing energy and water use in existing facilities by 20% by January 1, 2012; the construction and design of new facilities and facility renovations with the goal of reducing energy and water use by 20% by January 1, 2012; and the costs and benefits of constructing green, LEED-certified buildings, building commissioning, and other design and construction techniques when constructing new State-owned facilities, facility additions, and facility renovations. *http://www.ncga.state.nc.us/Sessions/2005/Bills/Senate/HTML/S2051v6.html*	○	○		○						○		
	North Carolina Energy Plan	Plan contains a chapter on Energy Use in the Public Sector that includes a number of recommended policies and programs, including goals for energy reducing energy use in existing state buildings to save 20% by 2008 (a reduction of 4% per year or more for the next 5 years), and goals for establishing minimum percentage requirements for renewable energy use. *http://www.energync.net/sep/docs/sep_12-04.pdf#search=%22%22energy%20plan%22%20%2B%22state%20facilities%22%22*		○					○					

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Title	Description	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
OH	Executive Order 2005-18	The Ohio Department of Transportation's (ODOT) fleet is required to use at least one million gallons of biodiesel and 30,000 gallons of ethanol blends in fleet vehicles each year. Additionally, new ODOT light-duty vehicle purchases must be flexible-fuel vehicles capable of operating on E85. *http://www.eere.energy.gov/afdc/progs/view_ind.cgi?afdc/6026/0*										●		
	Executive Order 2007-02S	Agencies are directed to implement procedures for: establishing energy efficiency and conservation standards; designing a common life-cycle costing method for facilities; and increasing the purchase of energy-efficient products. The Department of Administrative Services is directed to develop a tool for measuring energy consumption which can be used to calculate a "carbon footprint." Agencies are directed to achieve a reduction of 5% in building energy use within the first year of the biennium and 15% within four years. Agencies are directed acquire alterative-fuel vehicles. DAS is directed to prepare plans to establish pumps for E85 fuel, and to develop and implement a plan to raise biodiesel fuel consumption to at least 25% of state diesel purchases by 2008. *http://governor2.ohio.gov/Portals/0/Executive%20Order%202007-02S.pdf*		●			●					●		●
	Ohio Revised Code Sections 122, 125, 4511 and 5735	Statute (House Bill 245) requires that beginning July 1, 2006, all new motor vehicles acquired for state fleet be capable of using alternative fuels and sets minimum E85 and biodiesel use requirements for those vehicles. The bill requires the Department of Administrative Services to quarterly compile all data relating to the purchase by each state department and agency of alternative fuels. Subject to rules adopted by the Director of DAS, the motor vehicles must use at least 60,000 gallons of E85 blend fuel per calendar year by January 1, 2007, with an increase of 5,000 gallons per calendar year each calendar year thereafter, and at least one million gallons of biodiesel per calendar year by that date, with annual increases of 100,000 gallons per calendar year. *http://www.legislature.state.oh.us/bills.cfm?ID=126_HB_245*										●		
	Ohio Revised Code Section 123, 125, and 3345	Statute [House Bill 251 (2005)] requires the efficient use of energy in all state facilities based on standards developed by the Ohio School Facilities Commission. Requires the Department of Administrative Services to give preference in procuring products and services to those that meet the energy efficiency guidelines set by the EPA and Department of Energy. Requires each state institution of higher education that receives capital appropriations for a specific project to use energy-efficient designs in the project. Bill prescribes a state fleet average fuel economy. *http://www.legislature.state.oh.us/BillText126/126_HB_251_PH_Y.pdf*	●	●			●				●	●		

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

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OR	Executive Order 03-03	Executive order requires the Oregon Sustainability Board to develop "Sustainability Guidance" for state agencies. State agencies are required to designate a manager as the agency's sustainability coordinator. This coordinator will be responsible for developing a plan to implement the guidance strategies developed by the board. *http://sustainableoregon.net/execOrder/sustain_eo.cfm*												
	Executive Order 06-02	Executive order requires the Sustainability Board to develop a "sustainable practices toolbox" for state and local governments. Calls on the board to promote sustainable economic investment and development, especially in renewables. The board is required to assist agencies in various sustainable initiatives, including sustainable procurement programs, tracking GHGs, tracking fleet emissions, and renewable fuel use. The state Department of Energy is required to implement strategies to assist state agencies in meeting the governor's goal of 20% energy savings in state government within 10 years. *http://sustainableoregon.net/sust_act/2006_exec_order.cfm*	○	●			○		○		○	○		○
	OAR 330-130	Statute establishes the SEED program. Requires all renovation and construction projects for state facilities to exceed Oregon's energy conservation building codes by at least 20%. Agencies are required to achieve a 10% energy reduction. The state's Department of Energy administers the program and provides technical expertise on each project, helping agencies identify and design the most cost-effective energy conservation measures. *http://arcweb.sos.state.or.us/rules/OARs_300/OAR_330/330_130.html*	●	●										
	ORS 276.900	Statute requires that facilities constructed or purchased by state agencies be designed, constructed, renovated, and operated to serve as models of energy efficiency. Facilities constructed or renovated after June 30, 2001 shall exceed the energy conservation provisions of the state building code by 20% or more. *http://www.leg.state.or.us/ors/276.html*	●	●										
	ORS 279C.005 to ORS 279C.670	New or renovated public buildings must include solar technologies. Investments in solar energy (electric or thermal) must amount to at least 1.5% of the total contract price for the building. Passive solar can be used if it results in an overall energy consumption reduction of at least 20%. *http://www.dsireusa.org/library/includes/incentivesearch.cfm?Incentive_Code=OR23R&Search=TableType&type=Constr&CurrentPageID=7&EE=0&RE=1*	●							●				
	ORS 283.327 and 267.030	Statutes require that the state agencies and transit districts purchase AFVs to the maximum extent possible, except when it is not economically or logistically possible to purchase or refuel an AFV. *http://www.leg.state.or.us/ors/vol7.html*										●		

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	Oregon Renewable Energy Action Plan	Plan provides goals and suggested actions for LBE activities. Recommends that 100% of the diesel used by the state fleet be B20 by 2025 and that 10% of the gasoline used by the state fleet be E85 by 2010 and 25% by 2025. By the end of 2006, 10% of the state government's total electricity needs should be met by renewable energy sources; 10% of the diesels used by the state fleet should be B20; 75% of the gasoline used by the state fleet should be E10. Recommends the use of on-site renewable energy for state facilities. In a 2006 press release, the governor modified this plan so that new renewable electricity would account for 100 % of state government's electrical needs. *http://www.oregon.gov/ENERGY/RENEW/docs/FinalREAP.pdf*	○	○					○	○	○	○		
PA	Executive Order 1998-1	Executive order creates the Governor's Green Government Council to facilitate the incorporation of energy-efficient and sustainable practices across state government. The council is required to review individual agency Green Plans, which are to outline each agency's goals for incorporating sustainable practices and reducing net emissions to zero. *http://www.gggc.state.pa.us/gggc/lib/gggc/documents/1998-1.pdf*												
	Executive Order 2002-08	Executive order creates the Interagency Task Force on Energy to coordinate state agency action and to identify opportunities for state agencies to lead by example. Requires state agencies to submit annual energy plans to outline goals and review accomplishments pertaining to the efficient use of energy resources. *http://www.oa.state.pa.us/oac/cwp/view.asp?A=351&Q=175752*												
	Executive Order 2004-12	Executive order requires state agencies to develop no-cost or low-cost energy conservation measures for all Commonwealth-owned and leased buildings. Agencies are directed to continue to explore the use of ESCO Projects, ENERGY STAR products, Green Building Practices, and other similar energy conservation measures and implement such programs where appropriate. *http://www.oa.state.pa.us/oac/cwp/view.asp?A=351&Q=196122*	○	●			●	●						
	Governor's Renewable Energy Policy	Since 2001, Pennsylvania has been purchasing green power to provide for its state government energy demands. Beginning with an initial purchase that constituted 5% of total energy demand, Governor Rendell has since twice doubled the size of the renewable energy contract with Community Energy, Inc. State agencies now obtain 20% of the their energy needs from renewable sources. *http://www.dgs.state.pa.us/dgs/lib/dgs/green_energy_purchase.doc*							●					

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	Facilities Strategic Energy Plan	Department of General Services Strategic Energy Plan outlines strategies for improving the energy efficiency of state facilities. General goals include increasing procurement of green power, benchmarking the energy consumed by state facilities on the basis of an "energy utilization index," communicating the usage history of significant energy-consuming buildings to stakeholders, encouraging conservation efforts from all employees as well as managers, using life-cycle cost analysis, conducting training sessions for facility managers, developing pollution prevention energy efficiency programs, and designing new buildings in a manner consistent with LEED standards. *http://www.dgs.state.pa.us/dgs/lib/dgs/dgs_strategic_energy_plan.pdf*	○	○		○			○					○
	Green Transportation Plan	The governor's Green Transportation Plan creates an alternative-fuel pilot project with a goal of purchasing 30 hybrid vehicles for the state fleet by 2006, to be increased to 50 by 2008, and 75 by 2010. By 2011, at least 25% of all new passenger vehicles purchased for the fleet will be hybrid. *http://www.dgs.state.pa.us/dgs/lib/dgs/news/homepage/08_22_05R-Hybrid_Pilot2.doc*									○	○		
RI	Executive Order 05-13	Executive order requires that state fleet purchases of vehicles must comply with the EPAct by ensuring that a minimum of 75% of the vehicles purchased shall be alterative fueled and the remaining 25% of all new vehicles purchased be hybrid electric vehicles. All new light-duty trucks in the state fleet will achieve a minimum of 19 mpg city for the fleet and be certified as at least a low-emission vehicle. All new passenger vehicles will achieve a minimum of 23 mpg for the state fleet. *http://www.ri.gov/GOVERNOR/view.php?id=614*									●	●	●	
	Executive Order 05-14	Executive order requires that any new or renovated public building must meet the standards developed by LEED. The design, construction, operation and maintenance of any new, substantially expanded, or renovated public building shall also evaluate all feasible energy-efficiency measures on the basis of their total life-cycle costs of installation, operation, and maintenance. *http://www.ri.gov/GOVERNOR/view.php?id=614*	●	●		●								
	Executive Order 06-02	Executive order creates the position of Chief Energy Advisor to the governor. Directs the State Energy Office to conduct an energy audit of state facilities and operations as well as an energy education campaign aimed at reducing energy costs. *http://www.dsireusa.org/documents/Incentives/RI13R.pdf*												
	Governor's Energy Goal	In January 2006, Rhode Island's governor established a goal for the state government to buy 15% of its electricity from renewable-energy resources by 2016. In September 2006, the goal was accelerated to 20% by 2011. The Office of the Governor anticipates that qualifying electricity will be generated by wind turbines and hydropower facilities. *http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=RI13R&state=RI&CurrentPageID=1&RE=1&EE=1*							●					

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	Governor's Energy Agenda	Agenda designates a senior energy advisor to undertake an audit of state energy use in order to identify inefficiencies and to develop and implement strategies to reduce energy consumption in state government. *http://www.governor.ri.gov/documents/energy-agenda-background.pdf*												
SC	South Carolina Codes Title 48.52.1	H3034 (passed in 2007) requires new state-funded projects of 10,000 square feet or more to be designed to meet LEED-Silver certification. As an alternative option to the LEED requirement, projects may be designed to achieve two globes on the Green Globes Rating System. If obtaining certification from Green Globes, project must earn at least 20% of the available points for energy performance; if using LEED-Silver, project must earn at least 40% of the available points for energy performance. All major projects obtaining LEED-Silver certification must receive regular third-party commissioning. State Budget and Control Board must report aggregate energy cost savings annually. *http://www.scstatehouse.net/sess117_2007-2008/bills/3034.doc*	●					○						○
	South Carolina Codes Title 48.52.6	The South Carolina Energy Efficiency Act requires the development of a comprehensive energy plan, which shall incorporate individual agency plans. The statute requires the State Energy Office to develop energy efficient code standards for state-owned and leased buildings, including public school buildings. These standards must provide for life-cycle cost-effectiveness. State agencies are required to purchase energy-efficient products certified by the State Energy Office. Energy savings are to be divided between the agencies, the general fund, and debt retirement of capital expenditures on energy efficiency. *http://www.scstatehouse.net/code/t48c052.htm*	●	●			●							
TN	Public Law Chapter 33 (2007)	Senate Bill 266 (2007) authorizes the governor, utilizing the resources of certain state departments and agencies, to develop a comprehensive state energy conservation plan. *http://www.legislature.state.tn.us/bills/currentga/asp/WebBillInfo/BillCompanionInfo.aspx?BillNumber=SB0266*												
	Public Law Chapter 401 (2007)	Senate Bill 146 requires the comptroller of the treasury to conduct a performance audit of those agencies and departments responsible for conservation of energy, the study and production of alternative sources of energy, and energy security by January 8, 2008, and every five years thereafter. *http://www.legislature.state.tn.us/bills/currentga/asp/WebBillInfo/BillCompanionInfo.aspx?BillNumber=SB0146*												
	Public Law Chapter 532 (2007)	S123/H1146, signed June 27, 2007, requires that at least 30% of the motor vehicles purchased for the state fleet each fiscal year be energy-efficient. The requirement applies to vehicles designed for carrying six or fewer adult passengers. *http://www.legislature.state.tn.us/bills/currentga/asp/WebBillInfo/BillCompanionInfo.aspx?BillNumber=SB0123*									●			

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	Public Law Chapter 489 (2007)	H723/S109, signed June 21, 2007, requires state agencies, universities, and community colleges to develop and initiate implementation of plans to reduce or displace motor vehicle fleet use of petroleum products by 20% by January 1, 2008. *http://www.legislature.state.tn.us/bills/currentga/asp/WebBillInfo/BillCcompanionInfo.aspx?BillNumber=HB0723*									○	○		
TX	Executive Order RP 49	Executive order requires that each state agency develop a plan for conserving energy and to set a percentage goal for reducing its electric, gas, and natural gas usage. Each state agency shall submit the energy conservation plan to the Office of the Governor and the Legislative Budget Board no later than December 1, 2005. *http://www.governor.state.tx.us/divisions/press/exorders/rp49*		○										
	TX Code § 2166	Statute requires that for all new construction and renovation to existing buildings in which repair involves installing or replacing all or part of an energy system, energy source, or energy-consuming equipment, a written evaluation of energy alternatives for the project shall be prepared. If the use of alternative energy devices for a particular function is economically feasible, then the use of alternative energy devices must be included in the construction plans. "Alternative energy" refers to renewable energy sources, including solar energy, biomass energy, geothermal energy, and wind energy. "Alternative energy devices" include alternative energy collectors or alternative energy storage mechanisms that collect, store, or distribute alternative energy. *http://www.dsireusa.org/documents/Incentives/TX06R.htm*							○	○				
	TX Code § 2158.004	Statute requires that agencies with more than 15 vehicles purchase or lease only AFVs and hybrids. *http://tlo2.tlc.state.tx.us/statutes/gv.toc.htm*									●	●		
	19 TX Administrative Code 34.1.C	Statute requires that before beginning construction of a new state building or a major renovation project, a state agency or an institution of higher education shall submit to the State Energy Conservation Office (SECO) a copy of the certification by the design architect or engineer that verifies to the agency or institution that the construction or renovation complies with the standards that are established under this chapter. *http://info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=34&pt=1&ch=19&rl=34*	●	●										
	TX Code § 447.004	Statute (Senate Bill 982) requires the State Energy Conservation Office to establish and publish mandatory energy and water conservation design standards for each new state building or major renovation project, including a new building or major renovation project of a state-supported institution of higher education. A state agency may not begin construction of a new state building or a major renovation project before the design architect or engineer for the construction or renovation has confirmed that the building meets the design standards. *http://tlo2.tlc.state.tx.us/statutes/docs/GV/content/pdf/gv.004.00.000447.00.pdf*	●	●										

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	TX Code Sections 44 and 2158	HB 3693 (2007) an omnibus energy efficiency bill, which established efficiency provisions applicable to school districts and to certain institutions of higher education and executive branch state agencies, requiring them to establish a goal of reducing their annual electricity consumption by 5% for each of six state fiscal years beginning September 1, 2007. Also directs state agencies to purchase energy-efficient products designated as ENERGY STAR-qualified and to install energy-efficient light bulbs.		●			●	●						●
UT	Executive Order 2006-0004	Executive order directs state employees to sign up for and heed PowerForward email alerts and to adopt energy conservation principles in state facilities by implementing conservation practices, such as adjusting building temperatures, reducing power usage, and replacing light fixtures. Order requires state facilities managers to adopt practical conservation practices and procedures. Order directs the Department of Environmental Quality to prepare for the Governor's review a comprehensive annual report regarding the functioning of and responses to PowerForward within each State agency, and regarding each agency's efforts to achieve the State's 2015 energy efficiency goals. *http://www.rules.utah.gov/execdocs/2006/ExecDoc113478.htm*		●										
	Session Law 2006-Chapter 278	Statute (House Bill 80) requires the Department of Facilities Construction and Management to administer the State Building Energy Efficiency Program. The Program will be responsible for developing guidelines for energy efficiency in state buildings and assisting state agencies in using the guidelines. Additionally, the Division is charged with developing incentives to promote energy conservation and to provide annual energy savings reports to the governor and legislature. The State Building Board is required to work with the Division to establish design criteria, standards, and procedures for planning new state buildings and renovating existing state buildings. Bill also declares that it is the state's policy to procure energy-efficient products wherever possible. *http://www.le.state.ut.us/~2006/bills/hbillenr/hb0080.pdf*	○	○			●							
	Utah Policy o Advance Energy Efficiency in the State (2006)	Policy calls for the creation of programs for energy-efficient products procurement, energy design standards setting, and high-performance building rating. The policy encourages energy-efficient practices, such as installing the most efficient lighting systems and recommissioning. The policy calls for the use of hybrids and AFVs, and encourages the use of public transportation through the "eco-pass" program. Policy establishes a goal that state government will develop programs to install on-site renewable energy sources to reduce energy consumption by 2% by 2015 compared to 2005 levels. Policy also supports the adoption of an accelerated timetable for achieving the Western Governors' Association of increasing energy efficiency by 20% from 2020 to 2015. *http://energy.utah.gov/energy/governors_priorities/energy.html#*	○	○			○		○	○	○	○	○	

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	Utah Code Section 63A.9.401 -402	House Bill 110 requires agencies that use state fleet vehicles to design programs that will reduce fleet costs by increasing energy efficiency through decreasing the volume of fuel used, increasing fleet mpg, and implementing improved maintenance of vehicles, among other approaches. Each agency submitted a fleet cost efficiency plan by November 1, 2007, that includes a plan of action to increase energy efficiency. *http://le.utah.gov/~2007/bills/hbillenr/hb0110.pdf*									●		●	
	Utah Energy Efficiency Strategy: Policy Options	This strategy was developed for the Governor's Office by the Southwest Energy Efficiency Project and Utah Clean Energy. The strategy presents options for achieving the Governor's goal of improving energy efficiency in the state by 20% by 2015. The strategy includes three policy options for public sector entities: energy savings requirements for state agencies; energy efficiency activities in local governments and K-12 schools, including expansion of the state's revolving loan fund; and energy efficiency education in K-12 schools. *http://www.swenergy.org/pubs/UT_Energy_Efficiency_Strategy.pdf*		○			○	○						
VT	Executive Order 14-03	Executive order establishes a Climate Neutral Working Group to coordinate efforts to meet state GHG emission reduction goals. Additionally, all agencies are directed to: purchase only those products that meet ENERGY STAR or comparable standards; purchase vehicles that have the highest available fuel efficiency and produce fewer emissions; and develop programs that encourage state employees to use alternative means of transportation. Order requires Department of Buildings and General Services to investigate opportunities to purchase renewable energy for state facilities. *http://www.vermont.gov/tools/whatsnew2/index.php?topic=ExecutiveOrders&id=249&v=Article*					●	●	○		●		○	●
	Executive Order 02-04	Executive order directs the Vermont Clean State Council to manage wastes by state government through actions such as giving preference to pollution prevention, source reduction, and recycling strategies in advance of those representing treatment and disposal. Calls for the rededication and expansion of a Clean State Program for state agencies. *http://www.vermont.gov/tools/whatsnew2/index.php?topic=ExecutiveOrders&id=634&v=Article*												●
	Title 49, Chapter 29 Government Code	This statute guides the State Office of Purchasing. The purpose of the law is to "maximize the state's use of waste and recycled materials and products, particularly where the added cost of using waste materials is less than the cost avoided by not having that waste in the waste stream." The statute allows for purchases of recycled material by state government agencies to be of a cost up to 10% higher than comparable non-recycled products. *http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=29&Chapter=049&Section=00903*												●

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	Vermont State Agency Energy Plan for State Government	Plan pursues the goal that state building energy efficiency will be improved to the greatest extent possible. Ideally, state buildings will receive the ENERGY STAR and will reduce energy consumption by 20%. Plan recommends that state agencies purchase ENERGY STAR compliant equipment when practical and consider fuel efficiency and alternative fuels when purchasing fleet vehicles. According to Section 2291b of Title 3 V.S.A., state agencies are required to develop implementation plans outlining compliance with the State Agency Energy Plan for State Government. *http://www.bgs.state.vt.us/pdf/VTStateEnergyPlan.pdf#search=%22vermont%20energy%20plan%22*	●	●	○		○	○	○		○	○	○	○
VA	Executive Order 54 (2003)	Directs state agencies to reduce energy consumption by at least 7% by 2004 and 10% by 2006, relative to 2002 levels. Directs the Department of mines, Minerals, and Energy to provide agencies with technical assistance. Directs agencies to implement energy management plans. *http://www.governor.virginia.gov/initiatives/ExecutiveOrders/pdf/EO_48.pdf*		●										
	Executive Order 48 (2007)	Establishes a goal for state agencies to reduce annual energy costs by 20% by 2010, relative to 2006 levels. Agencies that reduced energy costs by 10% from 2003 to 2006 are required to reduce costs by an additional 15% by 2010, relative to 2006 levels. State-owned facilities over 5,000 sq. ft. and renovations of greater than 50% shall be designed consistent with the LEED and ENERGY STAR rating systems. When leasing facilities, agencies must seek spaces within a quarter mile of public transit and give preference to LEED or ENERGY STAR certified buildings. If photovoltaics or green roofs are cost-effective over a 15-year period, agencies are directed to incorporate said technologies into new designs or major renovations. The Department of General Services shall include in its policies requirements for the purchase of fuel-efficient LEVs, and all agencies shall maximize use of biodiesel and ethanol in fleets. Agencies shall take necessary actions to minimize VMT. Agencies shall purchase ENERGY STAR appliances an *http://www.governor.virginia.gov/initiatives/ExecutiveOrders/pdf/EO_48.pdf*	●	●	●	●	●	●		●	●	●	●	●
	House Bill 1195 (in committee)	Bill requires achievement of LEED-Silver standards for all state-funded construction projects. *http://www.legislature.state.tn.us/bills/currentga/asp/WebBillInfo/BillCompanionInfo.aspx?BillNumber=HB0723*	*			*								
	VA Energy Plan (2001; 2007)	Plan presents recommended strategies for achieving specific goals for state government to reduce energy use. Conservation strategies include: requiring the use of ENERGY STAR as an energy use management tool; requiring that all new construction and major renovation to existing buildings meet or exceed ASHRAE standards; requiring that ENERGY STAR equipment be made available through state contract; encouraging the use of alternative means of transportation; promoting the use of photovoltaics and biomass energy resources. *http://www.mme.state.va.us/de/energyframe.html*	○	○	○		○	○	○		○		○	○

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Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Title	Description	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
WA	Executive Order 02-03	Executive order calls for each state agency to establish sustainability objectives and prepare a biennial sustainability plan to modify practices regarding resource consumption; vehicle use; purchase of goods and services; and facility construction, operation, and maintenance. *http://www.governor.wa.gov/execorders/eoarchive/eo_02-03.htm*												
	Executive Order 05-01	Executive order requires state construction projects over 25,000 sq. ft. to be designed according to LEED-Silver standards. Requires a reduction in agency energy use by 10% by September 1, 2009 using a FY 2003 baseline, using measures such as renewable on-site resources. Directs state agencies to achieve a 20% reduction in petroleum use in the operation of state vehicles by September 1, 2005. Directs General Administration to incorporate hybrid vehicles into procurement policies. By September 1, 2009, state agencies shall replace standard diesel with a 20% biodiesel blend. Agencies are ordered to reduce the use of paper materials by 30%, to recycle 100% of used office paper, and to increase the percentage of environmentally preferable paper to at least 50% by 2009. *http://www.governor.wa.gov/execorders/eoarchive/eo_05-01.pdf*	●	●		●			●	○	●	●	●	●
	Executive Order 07-02	Executive order establishes the Washington Climate Change Challenge. This challenge establishes a number of statewide targets for reducing GHG emissions. The order reasserts the state's intention to reduce energy use by state agencies by achieving the goals established in Executive Order 05-01. Additionally, the order directs state agencies to work with local governments to maximize coordination and effectiveness of local and state initiatives. *http://www.governor.wa.gov/execorders/eo_07-02.pdf*												
	RCW 39.35C.020	Statute (House Bill 2247) requires energy audits at state facilities no later than October 1, 2001. If the audits produce opportunities to save energy, improvements will be accomplished using performance contracting by June 30, 2004. *http://www.ga.wa.gov/eas/epc/espc.htm*		○										
	RCW 39.35D	Statute requires that all major facility projects of public agencies receiving any funding in a state capital budget must be designed, constructed, and certified to at least the LEED-Silver standard and must include building commissioning as a component of the design process. Public agencies must monitor and document ongoing operating savings resulting from the projects designed under these standards, and report said savings to the Department of Administration. The department is to provide the governor and legislature with a biennial consolidated report. The department is required to develop and issue guidelines for administering this law for public agencies. *http://apps.leg.wa.gov/RCW/default.aspx?cite=39.35D.030*	●			●								
	RCW 43.19.637	Statute requires that at least 30% of all new vehicles purchased through a state contract must be clean-fuel vehicles; this percentage shall increase at the rate of 5% each year. *http://apps.leg.wa.gov/RCW/default.aspx?cite=43.19.637*									●	●		

TABLE A.1 STATE EXECUTIVE ORDERS, LEGISLATION, POLICIES, AND PLANS INITIATING LBE PROGRAMS (THROUGH APRIL 2008) *(cont.)*

Approach			Energy Efficiency in Buildings				Equipment Procurement		Clean Energy Supply		Transportation and Vehicle Procurement Activities			Other LBE Activities
State	Title	Description	New Buildings	Existing Buildings	ENERGY STAR Label or Tools	LEED Standards	Energy-Efficient Product Procurement	ENERGY STAR Qualification	Renewable Energy Use	Clean Energy Generation	Fleet Efficiency	Renewable Fuels	Other	Water Efficiency, Recycling, etc.
	SB 6518 (not enacted)	Bill would encourage each state agency to reduce energy consumption by 15% from 2005, using all practicable, cost-effective means available, including energy efficiency programs and the use of on-site renewable resources. *http://www.leg.wa.gov/pub/billinfo/2005-06/Pdf/Bills/Senate%20Bills/6518-S.pdf*		*					*	*				
WV	WVC 5A-2A-2	Statute gives the Secretary of Administration the authority to implement EPAct requirements that state, county, and municipal government fleets purchase AFVs on the following schedule: 20% of new vehicles acquisitions in FY 1995, increasing to 50% in FY 1997, and 75% from FY 1998 thereafter. *http://www.legis.state.wv.us/WVCODE/05a/masterfrmFrm.htm*										●		
WI	Executive Order 141	Executive order requires state agencies to improve fleet efficiency through the reduction of petroleum-based gasoline in state-owned vehicles by 20% by 2010 and by 50% by 2015, and the reduction of petroleum-based diesel fuel by those vehicles 10% by 2010 and 25% by 2015. Order encourages state employees to strive to use renewable fuels when operating flex fuel and diesel powered vehicles. *http://www.wisgov.state.wi.us/journal_media_detail.asp?locid=19&prid=1781*									●	○	●	
	Executive Order 145	Order directs the Department of Administration to set energy efficiency goals for state facilities. The goals should reduce overall actual energy usage by at least 10% by FY08 from a FY05 baseline and 20% by 2010. The Department is further directed to: establish programs for energy analysis of state-owned buildings; ensure that new state facilities are constructed to be 30% more efficient than code; establish sustainable building operation guidelines based on LEED; ensure that new construction incorporates an integrated design process; and pursue demonstration projects at state facilities regarding use of photovoltaics and other renewable technologies. Agencies are required to work with the Department to develop sustainability and energy efficiency goals. *http://www.wisgov.state.wi.us/journal_media_detail.asp?locid=19&prid=1907*	●	●		●	○		○	○				○
	Wisconsin Act 141	Act (Senate Bill 459) requires the Department of Administration to set goals for the use of renewable energy by the six state agencies that consume the great majority of electricity purchased by the state. The individual agency goals shall be designed to accomplish the overall goal that, by the end of 2007, 10% of the electricity purchased by the state be derived from renewable resources and, by the end of 2011, 20% be derived from renewable resources. Act directs the Department to establish energy efficiency standards for equipment installed in state buildings. *http://www.legis.state.wi.us/2005/data/lc_act/act141-sb459.pdf*					○		●					

APPENDIX B

State and Local Clean Energy LBE Programs: Examples, Tools, and Information Resources

This appendix presents a series of tables that provide examples of clean energy LBE activities that state and local governments have implemented, as well as resources for each of the six activities described in Chapter 3, *Identifying Options: Potential LBE Activities and Measures*.

APPENDIX B CONTENTS

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES

State or Title	Description	URL
Examples of State and Local Programs		
California	Title 24, Part 6 of the California Code of Regulations, contains the state's **Energy Efficiency Standards for Residential and Non-residential Buildings**.	*http://www.energy.ca.gov/title24/2005standards/index.html*
Illinois	The state has adopted an Energy Conservation Code for State Buildings based on the ASHRAE 90.1 Standard for all state-funded construction projects.	*http://www.commerce.state.il.us/dceo/Bureaus/Energy_Recycling/IECC.htm*
Maine	Through the Maine **State Building Program**, the Bureau of General Services has developed a "Maine Benchmark" to assist state agencies in meeting the requirement that public buildings be 20% more energy efficient than code, as directed by **Title 5 MRSA 1764-A**.	*http://www.efficiencymaine.com/other_programs_sbp.htm*
Michigan	The Michigan Energy Office **State Facility Energy Efficiency** program assists state agencies in reducing energy consumption by 10% by 2009, as directed by **Executive Directive 2005-4**.	*http://www.michigan.gov/cis/0,1607,7-154-25676_25689_33337---,00.html*
Minnesota	The **Energy Conservation Information for Minnesota State Employees** Web site provides strategies for reducing energy consumption in state-owned buildings by 10% by the end of 2006, as directed by **Executive Order 05-16**.	*http://www.savingenergy.state.mn.us/index.htm*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Missouri	The State has adopted **State Building Minimum Energy Efficiency Standards** for new and existing state buildings based on the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards.	*http://www.sos.mo.gov/adrules/csr/current/10csr/10c140-7.pdf*
New Hampshire	The state **Building Energy Conservation Initiative** analyses state buildings for energy efficiency investment opportunities, such as lighting upgrades; HVAC upgrades; domestic hot water systems; energy management controls; water conservation measures; and building envelope improvements.	*http://www.nh.gov/oep/programs/energy/beci.htm*
New York	The state **New Construction Program** provides assistance to state agencies to incorporate energy efficiency measures into the design, construction, and operation of new state buildings.	*http://www.nyserda.org/programs/New_Construction/default.asp?i=PON%20815%27)*
North Carolina	The **Utility Savings Initiative** provides assistance to each state agency and public university in an effort to reduce energy consumption by at least 20%. The program concentrates on four key areas: utility accounting, operations and maintenance, performance contracting, and awareness and training.	*http://www.energync.net/programs/usi.html*
Oregon	The **State Energy Efficiency Design** program assists state agencies in meeting the state's requirement that all renovation and construction projects exceed Oregon's energy conservation building codes by at least 20%. The Oregon Department of Energy provides technical consulting services to help agencies meet standards outlined in the *SEED Guidelines*.	*http://www.oregon.gov/ENERGY/CONS/SEED/SEEDhome.shtml#work*
	The **Energy Savings Performance Contracting** program under the state Department of Energy provides public facilities with assistance in using performance contracts to audit and improve energy use.	*http://www.oregon.gov/ENERGY/CONS/school/perfcontract.shtml* *http://www.oregon.gov/ENERGY/CONS/school/docs/ESPCGuide.pdf (Guide to Performance Contracting)*
Utah	The state **Energy Efficiency Strategy** included 23 policy options, including three LBE activities. This report provides information on how the state screened and selected these policy options.	*http://www.swenergy.org/pubs/UT_Energy_Efficiency_Strategy.pdf*
	Under its *Local Climate Action Plan*, Salt Lake City has significantly reduced its energy costs by adopting aggressive energy efficiency measures.	*http://www.slcgreen.com/CAP/default.htm*
Vermont	The *Guidelines for Energy Efficiency Commercial Construction* establish minimum energy use and application criteria to complement the Vermont Fire Prevention and Building Code, existing energy requirements in the state, and regional efforts to coordinate and simplify commercial energy codes among neighboring states.	*http://publicservice.vermont.gov/energy-efficiency/ee_commstandards.html*
Wisconsin	The **Wisconsin Energy Initiative** was initiated in 1992 to comprehensively address energy savings opportunities, with a goal of reducing energy use in state buildings by 15%. The state Department of Administration (DOA) hired an ESCO to conduct audits of energy use in state facilities and to implement improvements.	*http://www.doa.state.wi.us/press_releases_detail.asp?prid=123&divid=4*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Resources for Energy Efficiency in Buildings		
ASHRAE Standard 90.1—Energy Standard for Buildings Except Low-Rise Residential Buildings	This standard is one of a series developed by ASHRAE relating to HVAC systems. ASHRAE standards are often referenced in building codes.	*http://www.constructionbook.com/ashrae-standard-901-2007-energy-standard-for-buildings-except-low-rise-residential-buildings-ip-edition-ansi-approved-iesna-co-sponsored-1041-2336/ashrae-standards/*
Benchmarking Fact Sheet	This **Green California** fact sheet describes opportunities for building managers to improve a building's performance through frequent assessment and rating.	*http://www.documents.dgs.ca.gov/green/eeproj/BenchmarkingFactSheet.doc*
Best Practices Guide	This South Carolina Energy Office document provides guidance to facility directors of each state agency with useful strategies for reducing energy consumptions.	*http://www.energy.sc.gov/publications/Energy%20Plan%20Guide%203-07.pdf*
Blueprint for Madison's Sustainable Design and Energy Future	The Madison Mayor's Energy Task Force has developed a *Blueprint for Madison's Sustainable Design and Energy Future* to recommend strategies for the city to lead by example in energy efficiency and renewable energy.	*http://www.cityofmadison.com/sustainable_design/*
Building Investment Decision Support	This document provides an overview of the qualitative and quantitative benefits of high-performance buildings.	*http://www.aia.org/SiteObjects/files/BIDS_color.pdf*
California Handbook for Energy Efficiency in State Facilities	The **Green California Online Handbook** outlines a program for implementing and funding energy efficiency projects in state facilities.	*http://www.green.ca.gov/EnergyEffProj/default.htm*
Community Jobs in the Green Economy	The Apollo Alliance developed this report to outline the community economic benefits of investing in energy efficiency and renewable energy.	*http://www.urbanhabitat.org/files/Community-Jobs-in-the-Green-Economy-web.pdf*
Connecticut *Report on Energy Efficiency Opportunities at State Facilities*	The Connecticut Department of Public Utility Control produced an *Energy Efficiency Opportunities at State Facilities* report for Governor Jodi Rell that highlights energy efficiency opportunities in state buildings.	*http://www.neep.org/newsletter/1Q2005/Report_to_Gov_Rell_05.pdf*
Energy-Aware Planning Guide	This guide, developed by the California Energy Commission with the assistance of representatives from 49 local governments, identifies energy-related planning opportunities in land use, transportation, buildings, water use, and waste management.	*http://www.energy.ca.gov/energy_aware_guide/P700-93-001.PDF*
Energy Conservation Measures	The New Hampshire Office of Energy and Planning has compiled a list of energy conservation measures as a framework around which ESCOs are required to plan upgrades.	*http://www.nh.gov/oep/programs/energy/EnergyConservationMeasureDescriptions.htm*
Energy and Cost Savings through Tele-communication and Tele-conferencing	The state of Nebraska conducted this study to assess available information on cost and energy saving opportunities through telecommunications and teleconferencing. The report also highlights the features of other state programs.	*http://www.nlc.state.ne.us/epubs/E5700/B044-1994.pdf*
Energy and Environment: Best Practices	This report by the U.S. Conference of Mayors provides examples of clean energy activities undertaken by local governments across the nation. Topics include public facilities, fleets, and energy sources.	*http://www.usmayors.org/climateprotection/AtlantaEESummitCDROMVersion.pdf*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Energy Conservation Standards for New Federal Buildings	In 2006, DOE issued regulations requiring all new federal buildings to be designed in accordance with new energy efficiency standards based on ASHRAE 90.1 Standard.	*http://energycode.pnl.gov/pdf/71FR-70275-FedCom.pdf*
Energy Design Resources Web Site	The Energy Design Resources Web site provides a guide to energy-efficient design practices, including building commissioning, integrated energy design, and energy-efficient technologies.	*http://www.energydesignresources.com/*
Energy Efficiency Policy Toolkit	This document, produced by the Regulatory Assistance Project, summarizes clean energy regulatory policies for policymakers. It covers four primary subjects: energy efficiency, renewable energy, distributed resources, and rate design.	*http://www.arkansas.gov/psc/EEInfo/EEPToolkit-Pt1.pdf*
Energy Efficiency: The Smart Way to Reduce Global Warming Pollution in the Northeast	This report by the National Association of State PIRGs discusses the benefits of energy efficiency in the Northeast, and outlines the potential impacts of energy-efficient policy.	*http://www.rggi.org/docs/rggi_energy_8_24_05.pdf*
Energy Performance Contracting Success Story	This case study from the Colorado Energy Office provides an overview of the performance contracting activities of one Colorado state agency.	*http://www.colorado.gov/energy/in/uploaded_pdf/CDHSCaseStudy.pdf*
ENERGY STAR Labeling	The ENERGY STAR certification program is based on EPA's national energy performance rating system. State and local facilities that achieve a rating of 75 or higher (based on a performance rating scale of 1 to 100) and are professionally verified to meet current indoor environment standards are eligible to apply for the ENERGY STAR label.	*http://www.energystar.gov/index.cfm?c = evaluate_performance.bus_portfoliomanager_intro*
ENERGY STAR Portfolio Manager	The ENERGY STAR Portfolio Manager software program allows building managers to benchmark the energy performance of their buildings against that of similar buildings across the nation.	*http://www.energystar.gov/index.cfm?c = evaluate_performance.bus_portfoliomanager*
ENERGY STAR Upgrade Manual for Buildings	The ENERGY STAR *Upgrade Manual for Buildings* is a guide for planning and implementing profitable upgrades that will improve energy performance. The guide also provides information that can assist in the development of a comprehensive energy management plan.	*http://www.energystar.gov/index.cfm?c = business.bus_upgrade_manual*
Energy Use Policy and Energy Design Guidelines	The Wisconsin Department of Administration's Division of State Facilities has developed *Energy Use Policy and Energy Design Guidelines* for state buildings.	*http://www.doa.wi.gov/category.asp?linkcatid=785&linkid=135&locid=4*
EnviroCalc	**EnviroCalc** is a Vermont Department of Buildings and General Services spreadsheet-based tool designed to estimate the environmental benefits of purchasing recycled-content and energy-efficient products. This tool combines a wide range of available methodologies and models for assessing the environmental impacts of purchasing.	*http://bgs.vermont.gov/purchasing/epp*
Federal Energy Management Program	FEMP has issued a ruling requiring federal government buildings to achieve at least 30% energy savings over prevailing ASHRAE standards for the private sector.	*http://www.ornl.gov/sci/femp/*
Financing Energy Efficiency Projects	This ENERGY STAR article describes how energy cost savings can be used to finance energy-efficiency investments.	*http://www.energystar.gov/ia/business/government/Financial_Energy_Efficiency_Projects.pdf*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Green Office Guide	The *Green Office Guide* was developed by the City of Portland, Oregon, Office of Sustainable Development as a guide to resource-saving strategies for companies and agencies to implement within the office.	*http://www.rmi.org/images/other/GDS/GDS-GrnOfficeGuide.pdf*
Greening the Building and the Bottom Line	This Rocky Mountain Institute report provides case studies of businesses that have experienced tangible productivity benefits as a result of improving energy efficiency in their facilities.	*http://www.rmi.org/images/other/GDS/D94-27_GBBL.pdf*
A Guide to Energy-Efficient Lighting Upgrades in State Facilities	Developed by the Virginia Department of Mines, Minerals, and Energy, this document provides state agencies with energy-efficient lighting measures. It demonstrates energy-efficient lighting as a cost-effective measure that can produce significant cost savings.	*http://www.mme.state.va.us/de/chap8b.html*
Guide to Reducing Energy Use in Office Equipment	This guide, developed by the City of San Francisco and the Lawrence Berkeley National Laboratory, describes how to develop and implement programs for reducing electricity use in offices by focusing on "plug load" and proper use of office equipment.	*http://eetd.lbl.gov/bea/sf/GuideR6.doc*
High Performance Building Renovation Guidelines	The *Philadelphia High Performance Building Renovation Guidelines* provide guidance on major government renovation projects. Each guideline includes an overview of project materials, implementation strategies, and benefits.	*http://www.phila.gov/pdfs/PhiladelphiaGreenGuidelines.pdf*
Jobs from Renewable Energy and Energy Efficiency	This fact sheet provides statistics on the economic and jobs impacts of investing in renewable energy and energy efficiency in the U.S.	*http://www.eesi.org/briefings/2007/Energy%20&%20Climate/11-8-07_green_jobs/EEREJobsFactSheet_11-8-07.pdf*
LEED for Existing Buildings (LEED-EB)	The U.S. Green Building Council's **LEED-EB** standard maximizes operational efficiency while minimizing environmental impacts. It provides a performance-based benchmark for building owners and operators to measure operations, improvements, and maintenance on a consistent scale.	*http://www.usgbc.org/DisplayPage.aspx?CMSPageID = 221*
Model Energy Audit Agreement	The Florida Department of Management Services has developed this model for state agencies to use when contracting with private energy auditing firms. The agreement includes requirements for collecting facility information, analyzing existing systems, establishing baselines, recommending energy conservation measures, and reporting results.	*http://dms.myflorida.com/content/download/26976/126434/version/1/file/Audit+agreement+(DMS+-+Progress+Energy).doc*
Nevada Energy Conservation Plan for State Government	This guidance document is intended to assist agencies in the development of individual energy conservation plans. It provides immediate, short-term, and long-term measures that can be incorporated into agency plans.	*http://energy.state.nv.us/conservation%20plan%20for%20state%20government.pdf*
New Building Design	This ENERGY STAR Web site provides an number of information resources and tools to assist in designing energy-efficient buildings.	*http://www.energystar.gov/index.cfm?c=new_bldg_design.new_bldg_design*
New Energy for States: Energy Saving Policies for Governors and Legislators	The Apollo Alliance produced this best practices guidebook to provide state policy makers with information and examples of how energy conservation practices can be incorporated into state policy.	*http://www.apolloalliance.org/downloads/resources_apollostate_report.pdf*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
New York *"Green and Clean" State Buildings and Vehicles Guidelines*	*Executive Order No. 111 "Green and Clean" State Buildings and Vehicles Guidelines* were developed by NYSERDA to assist state agencies in implementing energy efficiency measures in state buildings.	*http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf*
North Carolina Measures to Conserve Energy	The State Energy Office has compiled a collection of web-based conservation resources for residential consumers, schools, government buildings, and industry; these tools range from no- and low-cost to significant capital improvement incentives such as performance contracting.	*http://www.energync.net/efficiency*
Office Building Energy Use Profile	The National Action Plan for Energy Efficiency has developed a profile of office buildings in the U.S. that provides information on average energy consumption, cost, and end-use figures.	*http://www.epa.gov/cleanenergy/documents/sector-meeting/4bi_officebuilding.pdf*
Performance Contracting	This Virginia Department of Mines, Minerals, and Energy Web site provides guidance for state agencies on how to use energy performance contracting to improve energy efficiency in state facilities.	*http://www.dmme.virginia.gov/DE/StateAgencyProgs/performancecontracting.shtml*
Potential for Energy Efficiency, Demand Response, and Onsite Renewable Energy in Texas	This ACEEE report provides a number of policy recommendations for the state of Texas to increase the use of clean energy. One of the recommendations is for a program to implement energy efficiency measures in public buildings at the state and local government level.	*http://www.aceee.org/pubs/e073.htm*
Rebuild America Technical Assistance Services	The DOE **Rebuild America Technical Assistance Services** provide targeted tools and analysis that can facilitate major energy efficiency or renewable energy improvements in public local and state governments.	*http://www.eere.energy.gov/buildings/program_areas/rebuild_ta_guidance.html*
Reduce Energy Use in State Facilities Through Conservation Measures	This Flex Your Power guidance document provides strategies and examples of California efforts to improve energy conservation in state facilities.	*http://www.fypower.org/pdf/BPG_State1_Con&Eff.pdf*
State Building Operators and Managers Energy Conservation Action Plan	The State of Minnesota has compiled a list of 37 energy conservation measures for immediate implementation, as well as nine items for long-term future implementation, that are expected to significantly improve energy efficiency in state government buildings.	*http://www.savingenergy.state.mn.us/managers_plan.htm*
State Energy Codes Database	DOE created a **State Energy Codes Database** that details the status and nature of each state's commercial and residential energy codes.	*http://www.energycodes.gov/implement/state_codes/index.stm*
Resources for Building Commissioning		
California Commissioning Guide: Existing Buildings	This **Green California** guide provides an overview of the commissioning process for facility managers and discusses the benefits and costs of commissioning existing buildings.	*http://www.documents.dgs.ca.gov/green/commissionguideexisting.pdf*
Cost-Effectiveness of Commercial Buildings Commissioning	This LBNL document provides a quantitative review of energy and non-energy impacts in existing buildings and new construction in the United States.	*http://eetd.lbl.gov/EMills/PUBS/Cx-Costs-Benefits.html*
Federal Energy Management Program *Operations and Maintenance Best Practice Guide*	This FEMP guidance document highlights O&M programs for reducing energy costs by 5% to 20% and provides federal energy managers with information and actions aimed at achieving these results.	*http://www1.eere.energy.gov/femp/pdfs/omguide_complete.pdf*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Practical Guide for Commissioning Existing Buildings	Produced by the Oak Ridge National Laboratory, the *Practical Guide for Commissioning Existing Buildings* guides building managers through commissioning processes.	*http://eber.ed.ornl.gov/commercialproducts/retrocx.htm*
Resource Guide to Building Energy Management	The **Iowa Energy Bank Building Energy Management Program** uses energy cost savings to assist in the financing of improvements to public and nonprofit facilities.	*http://www.iowadnr.com/energy/efficiency/schools.html*
Retro-Commissioning Buildings in New York State	This NYSERDA Web site, **Retro-Commissioning Buildings in New York State**, describes New York's retro-commissioning approach and provides numerous case studies and resources.	*http://www.nyserda.org/programs/Commissioning/default.asp*
Retro-Commissioning Fact Sheet	This **Green California** fact sheet was completed as part of the California online handbook for energy efficiency in state facilities. It presents quantified estimates of the benefits and costs of retro-commissioning.	*http://www.documents.dgs.ca.gov/green/eeproj/retrocommfactsheet.doc*
Retro-Commissioning Handbook for Facility Managers	The *Retro-commissioning Handbook for Facility Managers* was developed for the Oregon Office of Energy to provide building owners and managers with basic information about retro-commissioning.	*http://www.oregon.gov/ENERGY/CONS/BUS/comm/docs/retrocx.pdf*
	The Oregon *Retro-Commissioning Handbook* has an accompanying **Commissioning Toolkit** that helps guide facility managers through the commissioning process.	*http://egov.oregon.gov/ENERGY/CONS/BUS/comm/Cx_Guide.shtml*
Resources for Energy Efficiency in K-12 Schools		
American School and University Energy Resources	The American School and University Web site provides numerous energy-related resources for school administrators and facility operators.	*http://asumag.com/energy/*
Benchmarking Energy Use in Schools	This report by the Oak Ridge National Laboratory discusses methods for benchmarking energy performance in schools.	*http://eber.ed.ornl.gov/commercialproducts/98%20Schools%20Energy%20Benchmarking.pdf*
Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance	This report was produced for the California Board on Energy Efficiency to assess the benefits of daylighting on student performance in schools located in California, Colorado, and Washington.	*http://www.coe.uga.edu/sdpl/research/daylightingstudy.pdf*
Dwindling Support: Annual School O&M Cost Study	This American School and University report addresses the trend of decreasing school maintenance and operation budgets across the country.	*http://asumag.com/images/archive/04as21.pdf*
Energy Design Guidelines for High Performance Schools	The DOE has published eight reports that provide guidance for designing high performance schools in eight unique climate regions.	*http://www.eere.energy.gov/buildings/info/publications.html#energysmartschools*
Energy Efficiency and Indoor Air Quality in Schools	This ENERGY STAR report describes the relationship between energy efficiency upgrades, such as HVAC retrofits, and indoor air quality in schools.	*http://www.energystar.gov/ia/business/k12_schools/Ee&iaq.pdf*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Energy Resources for Schools	This EnergyIdeas Clearinghouse fact sheet provides information on energy efficiency in K-12 schools.	*http://www.energyideas.org/documents/factsheets/EIC_schools.pdf*
EnergySmart Schools "How-to" Guides	The DOE EnergySmart Schools program has developed "how-to" guides for planning, designing financing, and operating and maintaining energy-efficient schools.	*http://www.eere.energy.gov/buildings/energysmartschools/howto.html*
Energy Solutions for School Buildings	This DOE Office of Energy Efficiency and Renewable Energy Web site provides a wealth of information and examples showing opportunities for energy efficiency in school building design, construction, and operation.	*http://www.eere.energy.gov/buildings/info/schools/index.html*
ENERGY STAR Building Upgrade Manual	The ENERGY STAR Building Upgrade Manual provides information on implementing a staged upgrade approach to improving energy efficiency in buildings.	*http://www.energystar.gov/index.cfm?c=business.bus_upgrade_manual*
ENERGY STAR Operations and Maintenance Reports	ENERGY STAR has collected a number of resources on energy-efficient operations and maintenance practices.	*http://www.energystar.gov/index.cfm?c=business.bus_om_reports*
Energy-Efficient Education – Cutting Utility Costs in Schools	This Texas State Energy Conservation Office guidance document provides ten strategies for reducing energy costs in public schools.	*http://www.window.state.tx.us/tspr/energy/*
Green Schools: Attributes for Health and Learning	This report by the National Research Council of the National Academies offers recommendations for green school guidelines based on health and productivity benefits associated with green schools.	*http://www.masstech.org/renewableenergy/green_schools/NRCreport10_2_06.pdf*
Green Schools Program	The Alliance to Save Energy has used this program to reduce energy use in participating schools by 5% to 15%.	*http://www.ase.org/section/program/greenschl*
Greenhouse Gas Reductions Manual for Schools	The New Jersey Sustainable Schools Network has developed this guidebook for New Jersey schools to help them reduce their GHG emissions.	*http://www.globallearningnj.org/GHGmanual.doc*
Greening America's Schools: Costs and Benefits	This Capital E report discusses the cost-effectiveness of designing new school buildings with energy-efficient and sustainable features.	*http://www.cap-e.com/ewebeditpro/items/O59F11233.pdf*
Greening Schools	This Illinois state initiative seeks to inform school district administrators and teachers of ways to incorporate green practices and lessons into school design and operations.	*http://www.greeningschools.org/*
Hawaii High Performance Schools Guidelines	These technical guidelines were developed by the state Department of Business, Economic Development, and Tourism.	*http://www.archenergy.com/services/sda//hi%20high%20performance%20school%20guidelines.pdf*
High Performance School Characteristics	This American Society of Heating, Refrigeration, and Air Conditioning Engineers' report addresses the features, benefits, and costs associated with designing high performance schools.	*http://www.chps.net/info/ASHRAE%20Journal%20May%202006.pdf*
Indoor Air Quality Tools for Schools Program	This EPA program provides information to school district officials, teachers, and parents on ways to monitor and maintain good indoor air quality in schools.	*http://www.epa.gov/iaq/schools/index.html*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Maine High Performance Schools	The state of Maine has developed a program to provide energy-efficient design and implementation assistance to public schools. The program offers various workshops and seminars, as well as project financing opportunities.	*http://www.efficiencymaine.com/other_programs_hps.htm*
Managing the Costs of Green Buildings	This report for the California Sustainable Buildings Task Force describes the costs of incorporating energy and environmental features in several types of buildings, including K-12 schools, and addresses opportunities and strategies for managing these costs .	*http://www.ciwmb.ca.gov/greenbuilding/Design/ManagingCost.pdf*
Massachusetts Green Schools Initiative	Administered by the Massachusetts Technology Collaborative and the Massachusetts School Building Authority, this program provides school districts with information and resources to help them build high performance schools.	*http://www.masstech.org/renewableenergy/green_schools.htm*
Menu of ENERGY STAR Offerings for K-12 Education	This table provides school officials with guidance on how ENERGY STAR can assist with energy efficiency upgrades.	*http://www.energystar.gov/index.cfm?c=k12_schools.bus_schoolsk12*
National Best Practices Manual for Building High Performance Schools	This report presents design strategies covering ten different disciplines, such as building envelope, lighting and electrical systems, ventilation, maintenance, and water conservation.	*http://www.epa.gov/iaq/schools/high_performance.html*
National Clearinghouse for Educational Facilities	NCEF maintains a collection of resources relevant to improving energy performance in schools.	*http://www.edfacilities.org/rl/high_performance.cfm*
National Energy Foundation	This non-profit organization promotes the development, dissemination, and implementation of energy-related educational materials.	*http://www.nef1.org/*
National Review of Green Schools: Costs, Benefits, and Implications for Massachusetts	This report was produced by Capital E for the Massachusetts Technology Collaborative. It describes the financial costs and benefits of green schools compared to conventional schools, and presents the cost-effectiveness of greening schools in Massachusetts.	*http://www.cap-e.com/ewebeditpro/items/O59F7707.pdf*
National Science Teachers Association	This organization offers guidance to educators and administrators on how to incorporate energy-related learning into classroom studies.	*http://www.nsta.org/*
School Energy Efficiency Program	This Resource Solutions Group program – funded by the California Public Utilities Commission - offers no-cost technical and financial assistance to California school districts for energy efficiency upgrades.	*http://www.schoolsenergyefficiency.com/*
School Operations and Maintenance: Best Practices for Controlling Energy Costs	Prepared for DOE, this guidebook is designed to provide school district staff with technical information and information on barriers to implementing energy efficient O&M practices.	*http://www.ase.org/uploaded_files/greenschools/School%20Energy%20Guidebook_9-04.pdf*
Tips for Implementing a School-Wide Energy Efficiency Program	The Alliance to Save Energy has developed a list of 10 action items for implementing energy efficiency measures in K-12 schools.	*http://www.ase.org/content/article/detail/637*
Vermont High Performance Schools	The Vermont High Performance Schools partnership coordinates stakeholders from state agencies, industry groups, and trade organizations.	*http://www.neep.org/HPSE/vt.php*

TABLE B.1 ENERGY EFFICIENCY IN BUILDINGS STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Washington Sustainable School Protocol Pilot Program	This protocol is a variant of the California CHPS standard that requires high performance in public schools throughout the state.	*http://www.k12.wa.us/SchFacilities/SustainableSchools.aspx*
Information Resources on Commissioning K-12 Schools		
Commissioning for Schools	This Hawaii Department of Business, Economic Development, and Tourism fact sheet provides information on the estimated costs of commissioning a broad range of school building components.	*http://www.hawaii.gov/dbedt/info/energy/publications/schools/commissioning.pdf*
The Cost-Effectiveness of Commercial Buildings Commissioning	This Lawrence Berkeley National Laboratory report assesses the cost and benefits of commissioning several types of buildings, including schools.	*http://eetd.lbl.gov/emills/PUBS/PDF/Cx-Costs-Benefits.pdf*
Lessons Learned from Commissioning 15 Schools	This report identifies a number of commissioning issues and challenges encountered by California schools undergoing building commissioning processes.	*http://resources.cacx.org/library/holdings/202.pdf*
Information Resources on CHPS Initiatives		
CHPS *Best Practices Manual*	The Collaborative for High Performance Schools has developed guidance for planning, designing, constructing, and operating high performance schools.	*http://www.chps.net/manual/index.htm*
CHPS web site	Collaborative for High Performance Schools Web site. The Collaborative for High Performance Schools is a program that has been used in several states that oversees a green building rating program designed exclusively for K-12 schools.	*http://www.chps.net/*
Massachusetts Collaborative for High Performance Schools	The Massachusetts Technology Collaborative adapted the California CHPS model, building on the model's strongest features and adding more stringent requirements in certain aspects.	*http://www.masstech.org/renewableenergy/green_schools/gs_publications.html*
New York Collaborative for High Performance Schools	The New York CHPS is based on the Massachusetts CHPS, but is tailored to meet New York state building energy codes.	*http://www.emsc.nysed.gov/facplan/documents/NY-CHPS_Sep2007finalNYSERDA.doc*
Northeast Energy Efficiency Partnerships	The Northeast Energy Efficiency Partnerships have developed a protocol for designing high performance schools in the Northeast.	*http://www.neep.org/HPSE/NECHPS/Northeastchpsmay2007edits.pdf*

TABLE B.2 ENERGY MANAGEMENT IN GREEN BUILDINGS

State or Title	Description	URL
Examples of State Programs		
California	The state **Green Building Action Plan**, and resultant **Green Building Program**, were designed in response to **Executive Order S-20-04**.	*http://www.green.ca.gov/GreenBuildings/default.htm* Green Building Action Plan: *http://www.documents.dgs.ca.gov/green/GreenBuildingActionPlan.pdf*
Massachusetts	Executive Office for Administration and Finance Bulletin 12 outlines the "**Massachusetts LEED Plus**" standard. Agencies are required to follow this new design and construction standard for projects 20,000 square feet or larger.	*http://www.mass.gov/Eeoaf/docs/administrativebulletin12.doc*
Minnesota	The state **Green Building Program** began with the publication of a sustainable design guide.	*http://www.pca.state.mn.us/oea/greenbuilding/design.cfm*
New Jersey	The **SmartStart Buildings Initiative** was created to provide energy-efficient alternatives to conventional buildings.	*http://www.njsmartstartbuildings.com/*
New York	NYSERDA's **Green Building Services** provide assistance for state agencies to ensure compliance with **Executive Order 111**.	*http://www.nyserda.org/Programs/Green_Buildings/Default.asp*
Pennsylvania	The Pennsylvania Governor's Green Government Council **Green Building Program** provides guidelines and resources for designing and constructing high performance state facilities.	*http://www.gggc.state.pa.us/gggc/cwp/view.asp?a=515&q=156866*
Wisconsin	The Wisconsin *Sustainable Facilities Policy*, created in response to **Executive Order 145**, sets forth sustainable "guidelines and minimum standards" to be incorporated in all state facilities.	*ftp://doaftp04.doa.state.wi.us/master_spec/Sustainable%20Facilities%20Guidelines/Sustainable%20Facilities%20Guidelines.pdf*
Resources for Designing State Green Buildings		
A Blueprint for Sustainable State Facilities	The California Sustainable Building Task Force produced *A Blueprint for Sustainable State Facilities* that provides guidance for interagency collaboration in the development of California's green building program.	*http://www.ciwmb.ca.gov/GreenBuilding/Blueprint/2001/Blueprint.pdf*
Analysis of State Green Building Programs	This report, prepared for the Massachusetts Executive Office of Environmental Affairs and Sustainable Design Roundtable, assesses features of progressive green building programs in four states.	*http://www.mass.gov/Eoeea/docs/eea/lbe/report_iec.pdf*
California Online Guidebook for Energy Efficiency in State Facilities	The **Green California Online Guidebook** outlines a program for the streamlined implementation of green principles in state buildings.	*http://www.green.ca.gov/EnergyEffProj/default.htm*
California Commissioning Guide: New Buildings	This **Green California** guide provides an overview of the commissioning process for facility managers and discusses the benefits and costs of commissioning new buildings.	*http://www.documents.dgs.ca.gov/green/commissionguidenew.pdf*
Commissioning Toolkit for Small Buildings	This resource was developed as part of the **Green California Online Handbook** for energy efficiency in state facilities. It includes a sample commissioning plan and a list of suggested performance tests.	*http://www.green.ca.gov/CxToolkit/default.htm*

TABLE B.2 ENERGY MANAGEMENT IN GREEN BUILDINGS *(cont.)*

State or Title	Description	URL
Costing Green: A Comprehensive Cost Database and budgeting Methodology	This report, produced by Davis Langdon, uses actual building construction cost data to compare the cost of green buildings with conventional buildings. The paper also presents a green building budgeting methodology.	*http://www.davislangdon.com/USA/Projects/CostingGreen/*
Daylighting Standard	The Wisconsin Department of Administration Division of State Facilities has developed a daylighting design standard for new state facilities.	*http://www.doa.state.wi.us/dsf/masterspec_view_new.asp?catid=21*
Energy Design Resources: *Guide to Energy Efficiency Design Practices*	This Energy Design Resources Web site provides energy efficiency tools and information for designing and building high performance buildings.	*http://www.energydesignresources.com/*
Examining the Potential for Energy Efficiency to Help Address the Natural Gas Crisis in the Midwest	This ACEEE report describes the economic benefits of energy efficiency activities related to natural gas prices in the Midwest. The study examines how energy efficiency can be used to stabilize the natural gas market in the region.	*http://www.aceee.org/pubs/u051full.pdf*
Green Building Costs and Financial Benefits	This report by Capital E provides an overview of green building opportunities, costs, and benefits particular to the state of Massachusetts.	*http://www.cap-e.com/ewebeditpro/items/O59F3481.pdf*
Green Building Initiative	The Green Building Initiative's **Green Globes**™ system allows building managers to assess, rate, and track the progress of environmentally friendly building designs. This Web-based system is integrated with EPA's ENERGY STAR Target Finder tool.	*http://www.thegbi.org/home.asp*
Green Building Toolkit	The American Institute of Architects has developed a toolkit to provide information on green building. The toolkit includes sample policy language that local governments have sued to implement green building policies.	*http://www.aia.org/static/state_local_resources/adv_sustainability/*
Green Buildings: Breaking New Ground With Sustainable Design	This presentation by the Pennsylvania **Governor's Green Government Council** examines the cost-effectiveness of green buildings.	*http://www.gggc.state.pa.us/gggc/lib/gggc/documents/green_for_le$$01.pdf*
Greening Federal Facilities	DOE's *Greening Federal Facilities* provides strategies for energy efficiency, water conservation, and resource conservation.	*http://www1.eere.energy.gov/femp/pdfs/29267.pdf*
Greening Georgia Facilities	This report presents the analysis by the Georgia Environmental Facilities Authority of the impacts of various green building programs and policies on the state.	*http://www.gefa.org/Index.aspx?page=192#a2*
Guideline for High Performance Building	The University of Buffalo's *Guideline for High Performance Building* uses LEED criteria, but arranges the credits to match the chronology of the pre-design, design, and construction process.	*http://wings.buffalo.edu/ubgreen/leos/hbhpguidelines.pdf*
Guiding Principles **for Federal Leadership in High Performance and Sustainable Buildings**	These *Guiding Principles* were established as a collaborative effort between multiple federal agencies. The memorandum of understanding establishes standards for integrated design, energy performance, water conservation, and indoor environmental quality.	*http://www.energystar.gov/ia/business/Guiding_Principles.pdf*
High Performance Building Design in Minnesota	The Weidt Group performed a study of the costs and benefits of 41 high performance buildings in Minnesota for the state Office of Environmental Assistance. This report documents the study's findings.	*http://www.pca.state.mn.us/oea/publications/highperformance-weidt.pdf*

TABLE B.2 ENERGY MANAGEMENT IN GREEN BUILDINGS *(cont.)*

State or Title	Description	URL
High Performance Building Guidelines	The New York City Department of Design and Construction *High Performance Building Guidelines* include a chapter on technical strategies for achieving optimal energy efficiency.	*http://www.nyc.gov/html/ddc/downloads/pdf/guidelines.pdf*
High Performance Building Renovation Guidelines	The *Philadelphia High Performance Building Renovation Guidelines* provide guidance on major government renovation projects. Each guideline includes an overview of project materials, implementation strategies, and benefits.	*http://www.phila.gov/pdfs/PhiladelphiaGreenGuidelines.pdf*
High Performance Buildings	This presentation by the Weidt Group describes in visual detail the integrated aspect of high performance buildings design.	*http://www.swenergy.org/workshops/2006/Leaf.pdf*
High Performance Green Building Guidelines	The Pennsylvania Governor's Green Government Council *High Performance Green Building Guidelines* are intended to familiarize decision-makers with both theoretical and practical concepts and provide recommendations.	*http://www.gggc.state.pa.us/gggc/cwp/view.asp?a = 3&q = 151854*
High Performance Green Buildings	This EPA State Clean Energy-Environment Technical Forum paper addresses public sector opportunities for green buildings and their associated energy and environmental benefits.	*http://www.keystone.org/html/documents.html*
High Performance Guidelines for Public Buildings	The North Carolina High Performance Buildings Guidelines were developed by the Triangle J Council of Governments as part of the statewide high performance buildings pilot project. The Guidelines cover all aspects of design and construction including quality management, site planning, water management, energy and atmosphere, materials and resources, indoor environment and innovation.	*http://www.energync.net/programs/docs/buildings/hpg.doc*
Impacts on Energy Efficiency and Renewable Energy on Natural Gas Markets	This ACEEE report assesses the positive impacts of energy efficiency and renewable energy activities on the national prices for natural gas.	*http://www.aceee.org/pubs/e052full.pdf*
Integrated Building Design	Energy Design Resources has published this design brief explaining the process and benefits of integrated building design.	*http://www.energydesignresources.com/resource/13/*
Jobs from Renewable Energy and Energy Efficiency	This fact sheet provides statistics on the economic and jobs impacts of investing in renewable energy and energy efficiency in the U.S.	*http://www.eesi.org/briefings/2007/Energy%20&%20Climate/11-8-07_green_jobs/EEREJobsFactSheet_11-8-07.pdf*
Leading by Example: A Green Building Action Plan	This action plan was completed by the Massachusetts Sustainable Design Roundtable as a guide to developing the state's **Green Building in State Construction Program**. The plan presents five recommendations for state action to develop the program.	*http://www.mass.gov/Eoeea/docs/eea/lbe/susdesign_report.pdf*
LEED Initiatives in Governments and Schools	This U.S. Green Building Council Web site provides a list of LEED requirements in governments and schools, including a number of state government initiatives.	*https://www.usgbc.org/ShowFile.aspx?DocumentID=691*
Los Alamos National Library (LANL) Sustainable Design Guide	This LANL guide presents a specific planning and design process for creating and meeting sustainability goals, including energy reduction, indoor environmental quality, water quality, and site preservation. The recommendations are based largely on research conducted at the LANL.	*http://www.eere.energy.gov/buildings/highperformance/pdfs/sustainable_guide/32763_sustainable_guide.pdf*

TABLE B.2 ENERGY MANAGEMENT IN GREEN BUILDINGS *(cont.)*

State or Title	Description	URL
Michigan *Major Project Design Manual for State Agencies*	The manual, produced by the Michigan Department of Management and Budget, outlines the requirements for planning major capital outlay design and construction projects for agencies and consultants and lists other requirements for State of Michigan buildings.	*http://www.michigan.gov/documents/dmb/DMB494January2007final_187868_7.pdf*
Municipal Green Building Compliance Guide	The *San Francisco Municipal Green Building Compliance Guide* provides guidance for the design and construction of new government buildings in San Francisco.	*http://sfenvironment.org/downloads/library/gbcomplianceguide.pdf*
Professional Engineer's Guide to the ENERGY STAR Label for Buildings	This ENERGY STAR document provides design modules to help engineers better understand the requirements of their role in ensuring optimal performance in new construction. The document is structured in modules.	*http://www.energystar.gov/ia/business/evaluate_performance/pm_pe_guide.pdf*
Sustainable Design Guide	This Minnesota guide, developed with assistance from the state Office of Environmental Assistance, provides guidance for incorporating regional values into LEED standards.	*http://www.sustainabledesignguide.umn.edu*
Sustainable Facilities Policy	The Wisconsin *Sustainable Facilities Policy*, created in response to **Executive Order 145**, sets forth sustainable guidelines and minimum standards to be incorporated in all state facilities.	*http://www.doa.state.wi.us/docs_view2.asp?docid=5396*
Top 6 Benefits of High Performance Buildings	This fact sheet highlights the findings of a study that quantified the benefits of 41 high performance buildings in Minnesota.	*http://www.pca.state.mn.us/oea/publications/highperformance-brochure.pdf*
Towards a Climate-Friendly Built Environment	This Pew Center on Global Climate Change report outlines current trends in building-related GHG emissions, barriers to improvement, needs for research and development, and viable policy options for governments.	*http://www.pewclimate.org/docUploads/Buildings%5FFINAL%2Epdf*
2030 Challenge	Architecture 2030 has issued the 2030 Challenge asking the global building communities to adopt specific fossil fuel reduction targets. This Web site includes case studies and relevant resources.	*http://www.architecture2030.org/open_letter/index.html*
Washington High-Performance Building Submittal Template	The Washington Department of Administration developed this template to assist planners in complying with standards for designing and constructing high-performance state government buildings. The template includes a worksheet detailing elements of high performance design.	*http://www.ga.wa.gov/EAS/green/GASubmittalForms.xls*
"Whole-Building" Design Guide	The *"Whole-Building" Design Guide* is a Web-based portal providing access to information on a wide range of building-related guidance.	*http://www.wbdg.org/index.php*
Resources on the Costs of Green Buildings		
Costs and Financial Benefits of Green Buildings	This comprehensive report to the California Sustainable Building Task Force by Capital E and LBNL reviews existing research on the financial implications of green buildings.	*http://www.usgbc.org/Docs/News/News477.pdf*
Green Building Costs and Financial Benefits	This report provides a summary of the report to the California Sustainable Building Task Force by Capital E and LBNL. This report applies the findings of the original within the context of the state of Massachusetts.	*http://www.cap-e.com/ewebeditpro/items/O59F3481.pdf*
U.S. General Services Administration (GSA) *LEED Cost Study*	The GSA produced a *LEED Cost Study* to estimate the costs of developing green federal facilities using the rating system.	*http://www.resourcesaver.org/file/toolmanager/CustomO16C45F60590.pdf*

TABLE B.2 ENERGY MANAGEMENT IN GREEN BUILDINGS *(cont.)*

State or Title	Description	URL
Resources for Designing High Performance Schools		
Best Practices Manual	The *Best Practices Manual* produced by the **California Collaborative for High Performance Schools** includes a list of energy and performance criteria.	*http://www.chps.net/manual/documents.htm*
Building Healthy, High Performance Schools	This Environmental Law Institute report describes the components, challenges, and keys to high performance school building programs in three states.	*http://www.elistore.org/reports_detail.asp?ID = 10925*
Energy Design Resources: Resources for Schools	This Energy Design Resources Web site contains a number of design briefs, online tools, and case studies on high performance schools.	*http://www.energydesignresources.com/category/schools/*
High-Performance Schools Guidelines	The New York Collaborative *High-Performance Schools Guidelines* includes a score sheet for benchmarking schools.	*http://www.emsc.nysed.gov/facplan/*
Maine High Performance Schools Program	This **Efficiency Maine** program provides local school officials and their design teams with information regarding energy-efficient technologies and funding mechanisms available through the state high performance schools program.	*http://www.efficiencymaine.com/other_programs_hps.htm*
New Jersey High Performance Schools Information Center	Created in response to an executive order that requires all schools to incorporate LEED standards, this information clearinghouse provides resources on planning, design, construction, and operation of high performance educational facilities in New Jersey.	*http://www.hpsnj.org/*
High Performance Design Tools		
ENERGY STAR Target Finder	ENERGY STAR offers a **Target Finder** tool for determining appropriate energy targets for new buildings.	*http://www.energystar.gov/index.cfm?c = new_bldg_design.bus_target_finder*
ENERGY-10	**ENERGY-10** is a conceptual design tool for conducting "whole-building" analysis and evaluating energy and cost savings achieved by applying energy-efficient strategies.	*http://www.nrel.gov/buildings/energy10.html*
Leadership in Energy and Environmental Design	The U.S. Green Building Council's **LEED** system is a widely-accepted measurement for rating the performance of buildings.	*http://www.leedbuilding.org/*
Resources for Case Studies		
Green Building Technology Database	The state of North Carolina **Green Building Technology Database** collects information on green buildings in the state. The database allows searches by 140 techniques and sorts by location, building type, and site condition.	*http://www.ncgreenbuilding.org/site/ncg/*
High Performance Building Database	The DOE **High Performance Building Database** collects data on high performance buildings.	*http://www.eere.energy.gov/buildings/database/*
High Performance Federal Building Database	The DOE **High Performance Federal Building Database** showcases examples of high performance federal government buildings.	*http://www.eere.energy.gov/femp/highperformance/*

TABLE B.3. ENERGY-EFFICIENT PRODUCT PROCUREMENT STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES

State or Title	Description	URL
Examples of State and Local Programs		
Arizona	The Arizona State Procurement Office has developed a policy to guide state agencies in purchasing energy-efficient products, as required by **Arizona Revised Statute 34-451**.	*http://www.azleg.state.az.us/FormatDocument.asp?inDoc=/ars/34/00451.htm*
California	The Department of General Services issued a *Memo on Procurement of Energy-Efficient Products* directing state agencies to purchase only those products that meet recommended standards. Department guidelines for major construction projects require that equipment, appliances, and roofing systems purchased for these projects be ENERGY STAR compliant.	*http://www.documents.dgs.ca.gov/osp/sam/mmemos/mm01_14.pdf*
Connecticut	The Environmental Purchasing Program requires the state to buy products that may contain recycled content, minimize waste, conserve energy or water, and reduce the amount of toxins disposed of or consumed.	*http://www.das.state.ct.us/purchase/Epp/Index.htm*
Massachusetts	The state's **Environmentally Preferable Products (EPP) Procurement Program** features ENERGY STAR-labeled appliances, air conditioners, and office equipment. and provides resources to assist states and other organizations in developing procurement programs.	*http://www.mass.gov/?pageID = osdtopic&L = 3&sid = Aosd&L0 = Home&L1 = Buy+from+a+Contract&L2 = Environmentally+Preferable+Products+(EPP)+Procurement+Program*
	Green Spending: An Update on Massachusetts' Environmental Purchasing Program Incorporating ENERGY STAR Office Equipment provides information on Massachusetts' experiences, including associated benefits and challenges, with incorporating ENERGY STAR products into an existing environmentally preferable products purchasing program.	*http://www.cee1.org/gov/purch/mass-case.pdf*
Minnesota	The **Environmentally Preferable Purchasing program** assists state agencies in meeting the energy-efficient product procurement requirements of Executive Order 04-08. The program includes a quarterly newsletter and procurement workshops.	*http://www.pca.state.mn.us/oea/epp/index.cfm*
New York	NYSERDA has developed energy-efficient product procurement standards for a number of products, as required by **Article 5, Section 5-108a** of the New York State Laws.	*http://www.nyserda.org/programs/equipstds.asp*
	New York City WasteLe$$ program provides assistance for municipal agencies in complying with the energy-efficient product purchasing requirements laid out in NYC **Local Law 30 of 2003**.	*http://www.nyc.gov/html/nycwasteless/html/at_agencies/energy_efficiency.shtml*
North Carolina	**Executive Order 156** requires state agencies to purchase ENERGY STAR qualified electronic equipment. The state **Environmentally Preferable Procurement** program provides agencies with model templates for developing procurement policies.	*http://www.p2pays.org/epp/stagencies.asp*
Vermont	To assist state agencies in meeting the energy-efficient product procurement requirements of **Executive Order 14-03**, the state **Environmentally Preferable Program** provides numerous resources, including a tool for calculating the environmental benefits of using ENERGY STAR products.	*http://www.bgs.state.vt.us/PCA/epp/envirocalc_guide.doc*

TABLE B.3. ENERGY-EFFICIENT PRODUCT PROCUREMENT STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Resources on Energy-Efficient Product Procurement		
Consortium for Energy Efficiency (CEE) State and Local Government Purchasing Initiative	The CEE initiative was launched to assist government officials in procuring energy-efficient products. The CEE has produced four purchasing guidebooks designed to inform policymakers and purchasing officials.	*http://www.cee1.org/gov/purch/guides.php3*
Energy-Efficient Procurement Resources	Washington State University has compiled this collection of energy-efficient procurement information resources.	*http://www.energy.wsu.edu/documents/engineering/Proc_Resources.pdf*
Energy-Efficient Purchasing by State and Local Governments	This CEE paper reviews state and local purchasing programs and discusses how such programs are initiated. The paper also examines the strategic role of governments in fostering the development of energy-efficient product markets.	*http://www.cee1.org/gov/purch/2004_purchasing.pdf*
Energy-Efficient Traffic Signals	This Consortium for Energy Efficiency fact sheet provides information on the benefits of converting traffic signals to energy-efficient LEDs.	*http://www.cee1.org/resrc/facts/led-fx.pdf*
ENERGY STAR Purchasing and Procurement	This ENERGY STAR Web site provides savings calculators for energy-efficient products and equipment.	*http://www.energystar.gov/index.cfm?c = bulk_purchasing.bus_purchasing*
FEMP Purchasing Energy Efficiency Requirements	FEMP issues energy efficiency specifications for more than 50 types of products commonly purchased by federal government agencies.	*http://www1.eere.energy.gov/femp/procurement/index.html*
Flex Your Power Best Practices	Flex Your Power, a California PUC initiative, has developed multiple local government guidance documents on various topics. Many of these guides address issues of relevance to energy-efficient product procurement.	*http://fypower.org/res/tools/res_search_results.html?skip = 220&keywords = &topic = all&res_facts = on&region = all*
Guide to Energy-Efficient Heating and Cooling	This ENERGY STAR resource provides comprehensive checklists for improving HVAC system energy efficiency.	*http://www.energystar.gov/ia/products/heat_cool/GUIDE_2COLOR.pdf*
Helping Agencies Buy Energy-Efficient Products	DOE has developed this paper to provide information to federal purchasers on the benefits of purchasing energy-efficient products and how to obtain assistance in developing energy-efficient product procurement programs.	*http://www1.eere.energy.gov/femp/pdfs/eeproducts_fs.pdf*
Institutional Purchasing: Save Money, Time and the Environment	This ENERGY STAR document provides an overview of the benefits of purchasing energy-efficiency products at the institutional level.	*http://www.energystar.gov/ia/partners/reps/pt_reps_purch_procu/files/general_purchasing_new_10-4.pdf*
Jobs from Renewable Energy and Energy Efficiency	This fact sheet provides statistics on the economic and jobs impacts of investing in renewable energy and energy efficiency in the U.S.	*http://www.eesi.org/briefings/2007/Energy%20&%20Climate/11-8-07_green_jobs/EEREJobsFactSheet_11-8-07.pdf*
NYSERDA *Minimum Efficiency Standards*	Following legislative mandate, NYSERDA established minimum efficiency standards for specific energy-using products and appliances purchased by or for New York State or any of its agencies.	*http://www.nyserda.org/programs/equipStandardRegulations.pdf*

TABLE B.3. ENERGY-EFFICIENT PRODUCT PROCUREMENT STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Online Guide to Energy-Efficient Commercial Equipment	This American Council for an Energy Efficient Economy (ACEEE) guide provides building owners and managers with information on purchasing office equipment. The guide provides detailed information on applications that favor one type of equipment over another.	*http://aceee.org/ogeece/ch1_index.htm*
Online Guide to Energy-Efficient Office Equipment	This ACEEE guide provides an overview of the costs and benefits of purchasing different energy-efficient office products.	*http://www.aceee.org/ogeece/ch5_office.htm*
Potential Energy, Cost, and CO_2 Savings from Energy-Efficient Government Purchasing	This LBNL report estimates the potential energy, cost, and CO2 savings from government purchasing of energy-efficient products. The report presents detailed FEMP analyses of 21 products.	*http://www1.eere.energy.gov/femp/pdfs/government_purchasing.pdf*
Procuring Energy-Efficient Products	This document was produced by the Consortium for Energy Efficiency as a guidebook for state and local government purchasing agencies.	*http://www.cee1.org/gov/purch/gb1-rev2.pdf*
Purchasing Specifications for Energy-Efficient Products	FEMP's *Purchasing Specifications for Energy-Efficient Products* helps government purchasers identify types of highly efficient products. A list of all ENERGY STAR-qualified or FEMP-designated products is available for download.	*http://www.eere.energy.gov/femp/procurement/*
State and Local Government Purchasing Initiative	Though no longer active, this Consortium for Energy Efficiency project provides information on state and local government purchasing, including guidebooks and case studies.	*http://www.cee1.org/gov/purch/purch-main.php3*
Strength in Numbers: An Introduction to Cooperative Procurements	This National Association of State Procurement Officials resource provides an overview of the benefits of and strategies for entering into cooperative procurement agreements.	*http://www.naspo.org/documents/CooperativePurchasingBrief.pdf*
Resources on Environmentally Preferable Product Procurement		
Assessment of Massachusetts' EPP Procurement Program	This Office of Environmental Affairs report provides a history of the state EPP procurement program, describes the program's basics, and includes quantitative and qualitative program benefits.	*http://www.mass.gov/Aosd/docs/EPP/EPP%20Program%20Assessment%20Final%20Report%20Dec02.doc*
California *Environmentally Preferable Purchasing Best Practices Manual*	The **Green California** *Environmentally Preferable Purchasing Best Practices Manual* provides state purchasing officials with information on environmentally friendly products and services.	*http://www.green.ca.gov/EPP/Introduction/default.htm*
Environmentally Preferable Purchasing	This New American Dream Web site serves as a clearinghouse of resources on environmentally preferable purchasing. It includes case studies and model policies as well as guidance on developing comprehensive purchasing programs.	*http://www.newdream.org/work/rpn.php*
Environmentally Preferable Purchasing Database	This EPA database provides information on EPPs and services sorted by category.	*http://yosemite1.epa.gov/oppt/eppstand2.nsf*
EPA Environmentally Preferable Purchasing	This EPA program encourages and assists agencies in purchasing products and services that have a reduced impact on the environment.	*http://www.epa.gov/opptintr/epp/pubs/about/about.htm*

TABLE B.3. ENERGY-EFFICIENT PRODUCT PROCUREMENT STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Final Guidance on Environmentally Preferable Purchasing	This EPA guidance was developed in response to federal Executive Order 13101, which requires federal agencies to implement EPP purchasing policies.	*http://www.epa.gov/epp/pubs/guidance/finalguidance.htm#GuidingPrinciple1*
Green Procurement Initiative	The California Energy Commission has compiled a list of state, county, and local purchasing programs.	*http://www.cec.org/files/PDF/ECONOMY/Green-Procurement_Initiatives_en.pdf*
Green Purchasing: A Guide for Local Governments and Communities	This document, developed by the New Jersey Department of Environmental Protection, provides guidance to New Jersey communities in establishing and implementing green purchasing activities.	*http://www.state.nj.us/dep//opsc/docs/green_purchasing_guide_local_governments.pdf*
Green Spending: A Case Study of Massachusetts' Environmental Purchasing Program	This EPA report provides background information on the state's purchasing program and outlines its achievements. It also includes a discussion of program challenges that might inhibit the success of the program.	*http://www.epa.gov/epp/pubs/case/mass.pdf*
Guide to Greening Government Through Powerful Purchasing Decisions	The National Association of Counties has developed an **Environmental Purchasing Starter Kit** to assist local governments. The kit was produced with the assistance of EPA.	*http://www.naco.org/Content/ContentGroups/Programs_and_Projects/Environmental1/Energy/Introduction.pdf*
Hennepin County, Minnesota Lead by Example Initiative Guidelines	The Board of Commissioners in Hennepin County has authorized the creation of a Lead by Example Incentive Fund that will award a combined $100,000 to county departments that invest in EPPs. The Board has developed a set of guidelines to assist department staff in meeting the program's requirements.	*http://www.hennepin.us/portal/site/HCInternet/menuitem.3f94db53874f9b6f68ce1e10b1466498/?vgnextoid=43ac9bb82e9fc010VgnVCM1000000f094689RCRD*
Implementation Guidelines for Model Policy	These guidelines for implementing a model procurement policy were developed by Alameda County. The county's model policy has been adopted by several California local governments.	*http://www.ciwmb.ca.gov/epp/LawPolicy/AlaPolImp.doc*
Introduction to Cooperative Procurement	The National Association of State Procurement Officials has developed a primer on the benefits and strategies of cooperative procurement.	*http://www.naspo.org/content.cfm/id/About_Coop*
King County Environmental Purchasing Policy	King County, Washington, provides county personnel with information and technical assistance to help them identify and evaluate economical and effective EPP. This Web site includes environmental purchasing bulletins that focus on different purchasing opportunities.	*http://www.metrokc.gov/procure/green/index.htm*
Massachusetts *Recycled and EPP and Services Guide*	The Massachusetts *Recycled and EPP and Services Guide* provides information on how to use state contracts, tips on writing green specifications, definitions, and model "buy recycled" policies. The *Product, Contract, and Vendor Information* section provides up-to-date details on existing state contracts for EPPs, including contract terms, vendor contact information, and pricing, when available.	Recycled and EPP and Services Guide: *http://www.mass.gov/?pageID=osdterminal&L=4&L0=Home&L1=Buy+from+a+Contract&L2=Environmentally+Preferable+Products+(EPP)+Procurement+Program&L3=Download+Publications%2C+Reports+and+Tools&sid=Aosd&b=terminalcontent&f=EPP_osd_es_epp_download_publications_guides&csid=Aosd*

TABLE B.3. ENERGY-EFFICIENT PRODUCT PROCUREMENT STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Massachusetts *Recycled and EPP and Services Guide* **(cont.)**		Product, Contract, and Vendor Information: *http://www.mass.gov/?pageID=osdsubtopic&L=3&L0=Home&L1=Buy+from+a+Contract&L2=Environmentally+Preferable+Products+(EPP)+Procurement+Program&sid=Aosd*
Minnesota *Environmentally Preferable Purchasing Guide*	The Minnesota *Environmentally Preferable Purchasing Guide* is a reference tool for Minnesota government and school purchasers. It provides strategies to reduce energy consumption and protect natural resources by identifying environmentally preferable alternatives in 16 green building product areas and building services.	*http://greenguardian.com/EPPG/*
National Association of State Procurement Officials	This organization works with state procurement officials to facilitate information exchange and to aid purchasers in obtaining cost-effective products through cooperative procurement.	*http://www.naspo.org/*
National Institute of Governmental Purchasing	This non-profit organization provides assistance and information to public purchasers on a range of issues.	*http://www.nigp.org/genlinfo/AboutUs.htm*
Responsible Purchasing Network	The Responsible Purchasing Network is a project initiated by purchasing stakeholders. The Network has compiled multiple responsible purchasing guides on fleets, electronics, office equipment, and paints.	*http://www.responsiblepurchasing.org/*
Information Resources for End-of-Life Management of Electronic Products		
Electronics Waste Management in the United States	This EPA report presents a national analysis of current trends in disposal and management of electronic products.	*http://www.epa.gov/epaoswer/hazwaste/recycle/ecycling/manage.htm*
End-of-Life Management	The Federal Electronics Challenge has developed a Web site to provide federal facilities with information on purchasing green electronics products. The Challenge maintains a collection of resources on end-of-life management.	*http://www.federalelectronicschallenge.net/resources/eolmngt.htm*
Guidelines for the Procurement, Use, and End-of-Life Management of Electronic Equipment	This report was developed for the California Integrated Waste Management Board to provide state agencies with tools to implement cost-saving procurement practices that have minimal energy and environmental impacts.	*http://www.ciwmb.ca.gov/Electronics/Procurement/PUEOL/FinalGuide.pdf*
Model Policies for Energy-Efficient and EPP Procurement		
Environmental Purchasing Policies 101	The Center for a New American Dream has developed this guidance document to provide purchasers with a collection of best practices relating to environmentally preferable purchasing. This document includes a sample EPP purchasing policy.	*http://www.cec.org/files/pdf//NAGPI%20Policy%20Paper2e.pdf*
Model Environmentally Preferable Products Policy	The King County Environmental Purchasing Program has established this model policy for cities and other organizations.	*www.kingcounty.gov/operations/procurement/Services/Environmental_Purchasing/~/media/operations/.../EP_Policy_Model.ashx*

TABLE B.3. ENERGY-EFFICIENT PRODUCT PROCUREMENT STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
New American Dream Collection of Green Purchasing Polices	The New American Dream has collected a list of annotated examples of green purchasing policies.	*http://www.newdream.org*
Tools and Certification for Energy-Efficient and EPP Procurement		
ENERGY STAR Purchasing and Procurement	ENERGY STAR provides certification for energy-efficient products. In general, ENERGY STAR-qualified products use up to 50% less energy than conventional products of the same utility.	*http://www.energystar.gov/index.cfm?c = bulk_purchasing.bus_purchasing*
ENERGY STAR Purchasing and Procurement Briefings	ENERGY STAR provides monthly Webcasts that identify the resources available, including the product calculators.	*http://www.energystar.gov/index.cfm?c = business.bus_internet_presentations_actionplans*
EPEAT	EPEAT is a system to help purchasers compare and select computer equipment based on a product's environmental attributes. EPEAT certification is intended to meet ENERGY STAR qualification standards for energy efficiency.	*http://www.epeat.net/*
Green Purchasing Training	The Office of the Federal Environmental Executive provides opportunities for free online training and frequent classroom training to procurement officials interested in green purchasing.	*http://ofee.gov/gp/training.asp*
Green Seal	Green Seal is a non-profit organization that establishes standards for EPPs and administers its own certification program. The organization produces Choose Green Reports that provide information on a range of EPPs.	*http://www.greenseal.org/*

TABLE B.4 GREEN POWER PURCHASES STATE EXAMPLES, TOOLS, AND RESOURCES

State or Title	Description	URL
Examples of State Programs		
Connecticut	The State of Connecticut has locked in electric supply for state facilities through June 30, 2012. The supply contracts include 19% (not including RPS) to be green power from Class I renewable sources. This equates to 112 million kWh of green power annually. When RPS requirements are factored in, as of 2012 28% of the electricity used by Connecticut State Government will come from Class I renewable resources.	*http://www.ctclimatechange.com/documents/DetailedUpdatesonRAs2006Progress.pdf* CTClean Energy Options: *http://www.ctcleanenergyoptions.com/index.htm*
Iowa	The Department of Natural Resources provides implementation guidance for **Executive Order 41**, which includes a requirement that state agencies obtain 10% of energy from renewable sources.	*http://www.iowadnr.com/energy/eo41.html*
Maine	More than 800 individual state accounts were aggregated to facilitate green power purchasing. As of November 2005, approximately 30% of the state government's electricity was generated by renewable-energy resources -- mostly hydropower and biomass.	*http://www.maineenergyinfo.com/docs/Maine%20Renewable%20Energy.pdf*
New Jersey	Over 180 accounts have been aggregated to purchase approximately 12% of the state's energy from renewable sources.	*http://www.state.nj.us/dep/dsr/bscit/GreenPower.pdf*
New York	NYSERDA's **Power Naturally** program assists state agencies in meeting the renewable energy requirements established by **Executive Order 111**.	*http://www.powernaturally.org/*
Oregon	The *Renewable Energy Action Plan* requires that 25% of all state government electricity needs be met by new renewable energy sources by 2010 and 100% by 2025.	*http://www.oregon.gov/ENERGY/RENEW/docs/FinalREAP.pdf*
Wisconsin	The Governor's Task Force of Energy Efficiency and Renewables has drafted a report on the cost of using renewable energy use in state government buildings.	*http://energytaskforce.wi.gov/docview.asp?docid=32*
Resources on Green Power Purchases		
A Check List for Local Government Green Power RFPs	The Local Government Commission has developed this checklist to guide local governments through the competitive process of selecting green power providers.	*http://www.lgc.org/freepub/energy/factsheets/fact3.html*
Assessing the Economic Development Impacts of Wind Power	This report provides examples that document the economic development implications of investing in wind power.	*http://www.nationalwind.org/publications/economic/econ_final_report.pdf*
Clean Energy Funds: An Overview of State Support for Renewable Energy	This LBNL report provides examples of states that have used system benefits charges to promote renewable energy throughout state and local organizations and communities.	*http://eetd.lbl.gov/ea/ems/reports/47705.pdf*
Customer Aggregation: An Opportunity for Green Power	This NREL report assists state and local governments in negotiating lower green power prices with utilities.	*http://www.eere.energy.gov/greenpower/resources/pdfs/lb29408.pdf*
DSIRE	The Database of State Incentives for Renewable Energy provides information on state and local government renewable energy and energy efficiency incentives.	*http://www.dsireusa.org/*

TABLE B.4 GREEN POWER PURCHASES STATE EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Emerging Markets for Renewable Energy Certificates: Opportunities and Challenges	This LBNL report describes the current market for RECs. It provides an overview of how RECs are marketed and identifies key challenges to broader expansion of REC markets.	*http://www.eere.energy.gov/greenpower/resources/pdfs/37388.pdf*
Environmental Resources Trust	The Environmental Resources Trust certifies RECs through its EcoPower certification program.	*http://www.ert.net/*
EPA *Clean Energy-Environment Guide to Action*	Chapter 5.5, Fostering Green Power Markets, of the EPA *Clean Energy-Environment Guide to Action* provides states with a framework for developing suitable environments in which green power markets can become effective and productive.	*http://www.epa.gov/solar/documents/gta/guide_action_chap5_s1.pdf*
EPA Communications Guide for Green Power Partners	The EPA Green Power Partnership has developed this communications and outreach guide to assist partners in promoting their organizations' green power purchases.	*http://www.epa.gov/greenpower/pubs/index.htm*
EPA Green Power Partnership	EPA's Green Power Partnership is a voluntary partnership between EPA and organizations that are interested in buying green power. Through this program, EPA supports organizations that are buying, or planning to buy, green power.	*http://www.epa.gov/greenpower/*
FEMP Renewable Energy	The DOE FEMP program provides information on federal government initiatives for using renewable energy, including on-site generation.	*http://www1.eere.energy.gov/femp/renewable_energy/index.html*
Green Power Marketing in the United States, A Status Report	This NREL report provides an overview of current trends in green power prices and the state of renewable energy technologies.	*http://erendev.nrel.gov/greenpower/resources/pdfs/40904.pdf*
Green-e	**Green-e** is a voluntary certification and verification program for wholesale, retail, and commercial electricity products, tradable renewable certificates, and utility green pricing programs in the United States. Green-e certifies about 100 retail and wholesale green power marketers across the country.	*http://www.green-e.org/*
Guide to Purchasing Green Power	This EPA Green Power Partnership guide provides information on planning and implementing green power purchases.	*http://www1.eere.energy.gov/femp/pdfs/purchase_green_power.pdf*
Power Quality Problems and Renewable Energy Solutions	This Massachusetts Technology Collaborative report looks at the relative benefits of renewable energy compared to conventional energy generation with regard to power reliability, power quality, and power availability.	*http://www.mtpc.org/Project%20Deliverables/PP_General_Power_Quality_Study.pdf*
Jobs from Renewable Energy and Energy Efficiency	This fact sheet provides information on existing and projected energy efficiency- and renewable energy-related jobs in the U.S. by sector.	*http://www.eesi.org/briefings/2007/Energy%20&%20Climate/11-8-07_green_jobs/EERE JobsFactSheet_11-8-07.pdf*
Power Scorecard	The **Power Scorecard** is a Web-based information tool created by a coalition of environmental groups, which enables consumers to compare the environmental impacts of green power and conventional power products.	*http://www.powerscorecard.org/*

TABLE B.4 GREEN POWER PURCHASES STATE EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate	This University of California – Berkeley report shows the economic benefits of investing in renewable energy in terms of jobs created.	*http://rael.berkeley.edu/files/2004/Kammen-Renewable-Jobs-2004.pdf*
Regulator's Handbook on Renewable Energy Programs & Tariffs	This report by the Center for Resource Solutions provides an overview of state renewable energy programs. The report includes case studies on different states' methods of implementing renewable energy programs.	*http://www.resource-solutions.org/policy/TariffHandbook/Handbook_on_Renewable_Energy_Programs_&_Tariffs.pdf*
Renewable Energy Certificates: An Attractive Means for Corporate Customers to Purchase Renewable Energy	This World Resources International report provides an overview of RECs, including funding opportunities for procuring RECs and steps for selecting appropriate options.	*http://pdf.wri.org/gpmdg_corporate_5.pdf*
Renewable Energy Certificates and Generation Attributes	This Regulatory Assistance Project report provides an overview of the concept behind marketing renewable energy attributes.	*http://www.raponline.org/Pubs/IssueLtr/RenewableEnergyCertificates.pdf*
Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century	This report was developed by the American Solar Energy Society to describe the existing and projected breakdown of renewable energy and energy efficiency-related employment in the United States.	*http://www.ases.org/ASES-JobsReport-Final.pdf*
Switching to Green	This World Resources Institute report provides guidance to offices and retail companies on procuring green power. The report gives an overview of steps to consider when deciding to switch to green power.	*http://pdf.wri.org/switching_to_green.pdf*
Tackling Climate Change in the U.S.: Potential Carbon Emissions Reductions from Energy Efficiency and Renewable Energy	This report by the American Solar Energy Society addresses the potential contributions of different energy-efficient and renewable technologies toward GHG emissions reductions. It provides an overview of the status and potential of each renewable energy resource type.	*http://maine.sierraclub.org/Maine%20Cool%20Tackling%20Climate%20Change%20in%20the%20US.pdf*
Tradable Renewable Certificates Handbook	This handbook provides information on basics and benefits of RECs and provides an overview of the regulator's role in facilitating REC transactions.	*http://www.resource-solutions.org/policy/TRChandbook/TRC_Handbook.htm*
Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewable Portfolio Standards	This LBNL report provides an overview of the treatment of renewable energy attributes in states that enforce renewable portfolio standards. The report identified implementation issues that arise when RECs are used for RPS compliance.	*http://eetd.lbl.gov/ea/ems/reports/62574.pdf*
Trends in Utility Green Pricing	This NREL report presents data on trends in green pricing for renewable energy products and provides an overview of utility green pricing program implementation since 1999.	*http://www.nrel.gov/docs/fy07osti/40777.pdf*

TABLE B.4 GREEN POWER PURCHASES STATE EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Using Wind Power to Hedge Volatile Electricity Prices for Commercial and Industrial Customers in New York	This report, prepared for the New York State Energy Research and Development Authority, provides a financial analysis of the comparative benefits of relying on wind power as compared to conventional fossil fuels.	*http://www.powernaturally.org/About/documents/WindHedgeExSumm.pdf*
Resources for Estimating the Benefits of Green Power Purchases		
CACP Software	The National Association of Clean Air Agencies' CACP is a Windows-based software tool designed to help state and local governments develop harmonized strategies to reduce both GHG and air pollution emissions. It allows users to create a cross-sector emissions inventory at the entire community level or at the government operations level.	*http://www.cacpsoftware.org/*
eGRID	EPA's eGRID is a comprehensive source of data on the environmental characteristics of domestic electric power generation. It compiles data from 24 federal sources on emissions and resource mixes for virtually every power plant and company that generates electricity in the United States. It also provides user search options, including aspects of individual power plants, generating companies, states, and regions of the power grid.	*http://www.epa.gov/cleanenergy/egrid/index.htm*
EPA Green Power Locator	This tool enables users to locate green power options available in each state.	*http://www.epa.gov/greenpower/pubs/gplocator.htm*
EPA Power Profiler Tool	This EPA tool provides emission factors for any utility, to help calculate the pollution benefits of energy consumption reduction.	*http://www.epa.gov/cleanenergy/powerprofiler.htm*
GHG Equivalencies Calculator	Local governments can use this calculator to translate GHG emissions reductions into more tangible quantities (e.g., vehicle miles reduced or trees planted).	*http://www.usctcgateway.net/tool/*
Green-e	Green-e is a voluntary certification and verification program for wholesale, retail, and commercial electricity products, RECs, and utility green pricing programs.	*http://www.green-e.org/*
Power Scorecard	The Power Scorecard is a Web-based information tool created by a coalition of environmental groups. It enables consumers to compare the environmental impacts of green power and conventional power products.	*http://www.powerscorecard.org/*

TABLE B.5 CLEAN ENERGY SUPPLY STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES

State or Title	Description	URL
Examples of State and Local Programs		
Arizona	The *Arizona Working Group on Renewable Energy and Energy Efficiency* has advised the governor to require state facilities to produce 5% of their own energy needs through renewable sources by 2012.	*http://www.azsolarcenter.com/policy/documents/pdfs/GovREEE_ReportFinal.pdf*
California	The *Green Building Action Plan* calls for all state-owned buildings to reduce the volume of energy purchased from the grid by 20% by 2015 from 2003 levels by pursuing energy efficiency measures and on-site renewable technologies.	*http://www.documents.dgs.ca.gov/green/GreenBuildingActionPlan.pdf*
	The City of San Francisco passed a resolution calling for the installation of solar panels and wind turbines on city-owned property in the city.	*http://www.californiasolarcenter.org/sfbond2001.html*
Connecticut	The Connecticut Clean Energy Fund's **On-Site Renewable DG Program** assists public and private entities with installing renewable energy generating equipment on site.	*http://www.ctcleanenergy.com/YourBusinessorInstitution/OnSiteRenewableDG/tabid/95/Default.aspx*
Iowa	In FY 2005, the *SIFIC* began implementing a comprehensive energy efficiency upgrade project that included installation of a biomass boiler capable of burning wood waste. The boiler will be integrated into a CHP system.	*http://www.iowadnr.com/energy/ebank/sfp.html*
Utah	The governor's **Energy Policy** calls for the state to establish programs to evaluate the potential for installing on-site renewable energy sources in state buildings to reduce energy consumption by 2% by 2015 compared to 2005 levels.	*http://energy.utah.gov/energy/governors_priorities/utah_policy_to_advance_energy_efficiency_in_the_state.html*
Wisconsin	The state Renewable Energy Task Force has proposed renewable energy targets that include a recommended strategy of incorporating on-site generation at state facilities.	*http://energytaskforce.wi.gov/docview.asp?docid=35*
Resources on Renewable Energy Generation		
Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2006	This DOE report provides statistics on national wind power capacity, turbine size and cost, wind power prices, and policy efforts driving wind power development.	*http://www1.eere.energy.gov/windandhydro/pdfs/41435.pdf*
APS Energy	APS Energy has partnered with multiple local governments to install solar energy systems at municipal facilities. This APS Energy Web site provides information on a sample of these projects.	*http://www.aps.com/my_community/Solar/Solar_22.html*
American Wind Energy Association	The American Wind Energy Association has a number of helpful resources available to consumers interested in on-site renewable energy, including fact sheets and cost estimates.	*http://www.awea.org/pubs/*
Clean Power Estimator	This tool provides quick cost-benefit analysis for PV, solar thermal, wind, and energy efficiency technologies for residential and commercial buildings in specified geographic regions.	*http://www.consumerenergycenter.org/renewables/estimator/index.html*
Community Jobs in the Green Economy	This Apollo Alliance and Urban Habitat report describes the potential for job creation from investing in energy efficiency and renewable energy.	*http://www.urbanhabitat.org/node/931*

TABLE B.5 CLEAN ENERGY SUPPLY STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Database of State Incentives for Renewable Energy	This database is a comprehensive source of information on state, local, and selected federal incentives that promote renewable energy and energy efficiency.	*http://www.dsireusa.org*
EPA Power Profiler Tool	This EPA tool provides emission factors for any given utility, to help calculate the pollution benefits of energy consumption reduction.	*http://www.epa.gov/cleanenergy/powerprofiler.htm*
FEMP Renewable Energy	The DOE FEMP program provides information on federal government initiatives for using renewable energy, including on-site generation.	*http://www1.eere.energy.gov/femp/renewable_energy/index.html*
Find Solar	**Find Solar** is a collaborative project involving DOE and the American Solar Energy Society that enables a user to calculate the costs, savings, and GHG emissions reductions of converting a portion of a building's energy use to solar generation.	*http://www.findsolar.com/index.php?page = rightforme*
Fuel Cell Technology	This Web site, developed as a component of the Whole Building Design Guide, provides information on fuel cell technologies and applications.	*http://www.wbdg.org/resources/fuelcell.php*
Fuel Cells	This EPA fact sheet presents the benefits and costs behind fuel cell technology as a form of energy generation. It also addresses the barriers to large-scale fuel cell technology adoption.	*http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/SHSU5BULTK/$File/fuelcells.pdf*
Geothermal Heat Pumps	This DOE Web site provides information on the basics of geothermal exchange. The site includes fact sheets on the logistics of using geothermal heat pumps in different building types.	*http://www1.eere.energy.gov/geothermal/heatpumps.html*
Geothermal Resources Maps	DOE has collected information on the location of geologic resources that could make geothermal applications potentially feasible.	*http://www1.eere.energy.gov/geothermal/maps.html*
Government Facilities Case Studies	The Geo-thermal Heat Pump Consortium has collected fact sheets on municipal government examples of geothermal applications.	*http://www.geoexchange.org/geothermal/publications/cat_view/37-case-studies/60-government-facilities.html?limit=10&limitstart=0&order=name&dir=DESC*
Green Power from Landfill Gas	This EPA fact sheet provides information and statistics on how landfills can be used to produce electricity in a manner that is protective of natural resources.	*http://www.epa.gov/lmop/docs/LMOPGreenPower.pdf*
Guide to Photovoltaic System Design and Installation	This California Energy Commission guidebook provides information on issues to consider when designing and installing PV solar power systems.	*http://www.abcsolar.com/pdf/2001-09-04_500-01-020.pdf*
Guide to Purchasing Green Power	This EPA guide provides information on purchasing green power. Chapter 7 addresses on-site renewable energy projects.	*www.eere.energy.gov/femp/pdfs/purchase_green_power.pdf*
High Performance Technologies: Solar Thermal & Photovoltaic Systems	This DOE report provides information on building zero-energy homes using solar thermal and PV technologies. Local governments can find information on site planning and orientation of solar thermal and PV applications.	*http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/41085.pdf*
Jobs from Renewable Energy and Energy Efficiency	*Jobs from Renewable Energy and Energy Efficiency*. This fact sheet provides information on existing and projected energy efficiency- and renewable energy-related jobs in the U.S. by sector.	*http://www.eesi.org/briefings/2007/Energy & Climate/11-8-07_green_jobs/EEREJobsFactSheet_11-8-07.pdf*

TABLE B.5 CLEAN ENERGY SUPPLY STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Money from the Sun: An Investor's Guide to Solar-Electric Profits	This article describes the long term benefits of investing in solar energy systems.	*http://www.scottsdaleaz.gov/Assets/documents/greenbuilding/SolarEconomics.pdf*
Potential for Energy Efficiency, Demand Response, and On-site Renewable Energy to Meet Texas's Growing Electricity Needs	This ACEEE report provides policy recommendations to meet growing energy demand in Texas. Recommendations include development of the public buildings program and providing incentives for onsite renewable energy.	*http://aceee.org/pubs/E073.htm*
Power Quality Problems and Renewable Energy Solutions	This Massachusetts Technology Collaborative report looks at the relative benefits of renewable energy compared to conventional energy generation with regard to power reliability, power quality, and power availability.	*http://www.mtpc.org/Project%20Deliverables/PP_General_Power_Quality_Study.pdf*
ProForm	This tool, developed by LBNL, calculates the financial indicators and reduced GHG emissions of renewable energy projects.	*http://poet.lbl.gov/Proform/*
Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate	This University of California – Berkeley report shows the economic benefits of investing in renewable energy in terms of jobs created.	*http://rael.berkeley.edu/files/2004/Kammen-Renewable-Jobs-2004.pdf*
PV Watts	This NREL performance calculator estimates the energy and cost savings from grid-connected PV systems from various locations around the country. The calculator allows the user to adjust various data assumptions to accommodate for regional and system specifics.	*http://rredc.nrel.gov/solar/calculators/PVWATTS/*
Renewable Energy and Distributed Generation Guidebook	This Massachusetts Division of Energy Resources report provides an overview of implementation issues associated with siting and generating distributed energy and connecting to the grid.	*http://www.mass.gov/Eoca/docs/doer/pub_info/guidebook.pdf*
Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century	This report was developed by the American Solar Energy Society to describe the existing and projected breakdown of renewable energy and energy efficiency-related employment in the United States.	*http://www.ases.org/ASES-JobsReport-Final.pdf*
Renewable Energy Basics	NREL provides basic information on seven forms of renewable energy applications.	*http://www.nrel.gov/learning/re_basics.html*
RETScreen	This tool was developed by the Canada national Natural Resources department to evaluate the energy production and savings, emissions reductions, and financial viability of different types of energy efficiency and renewable energy investments, including on-site renewable energy generation.	*http://www.retscreen.net/ang/d_o_view.php*
Single, Paired, and Aggregated Anaerobic Digester Options	This study presents an overview of the feasibility of installing anaerobic digesters to turn dairy farm waste into usable biofuels.	*http://www.manuremanagement.cornell.edu/Docs/Perry%20Feas%20Study%20fact%20sheet%20FINAL%205-31-05.pdf*
Solar Energy Technologies Program	DOE's **Solar Energy Technologies Program** leads the effort to research, develop, and implement technologies toward improving solar energy. Through such programs as the **Million Solar Roofs Initiative** and the **Solar America Initiative**, the federal government partners with state and local governments to deploy the program's resources.	*http://www1.eere.energy.gov/solar/about.html*

TABLE B.5 CLEAN ENERGY SUPPLY STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Solar Water Heaters for Swimming Pools	This fact sheet provides information on the technical aspects and benefits of installing solar water heaters on swimming pools.	*http://www.infinitepower.org/newfact/new96-825-No11.pdf*
Supplemental Environmental Projects Toolkit	EPA's toolkit helps state governments pursue clean energy projects through enforcement settlements. The toolkit provides information on the SEP process, including a step-by-step regulatory roadmap for pursuing SEPs.	*http://www.epa.gov/cleanenergy/documents/sep_toolkit.pdf*
Wind Energy Economics	The Iowa Energy Center has developed this resource to provide information on the cost-effectiveness of wind turbines.	*http://www.energy.iastate.edu/renewable/wind/wem/wem-13_econ.html*
Resources on Distributed Generation		
The Benefits of Distributed Resources to Local Governments	This NREL report addresses how local government can benefit from increased deployment of DG technologies. The benefits addressed within the report include environmental improvement, economic development, system reliability, price stability, and disaster relief support.	*http://www.clean-power.com/research/distributedgeneration/DGandLocalGoverments.pdf*
Calculating Reliability Benefits	This EPA CHP Partnership Web site provides information on how to calculate the reliability benefits of installing CHP systems as opposed to non-CHP back-up power generators.	*http://www.epa.gov/chp/basic/benefits.html*
California *Distributed Energy Resources Guide*	The CEC has developed an online guide to techno-economic characteristics of several clean energy generation technologies.	*http://www.energy.ca.gov/distgen/equipment/equipment.html*
Catalog of CHP Technologies	This EPA CHP Partnership manual provides an overview of multiple CHP systems. It also provides information on the benefits and costs of CHP applications.	*http://www.epa.gov/chp/basic/catalog.html*
CHP Calculation Methodology for LEED-NC v2.2 EA Credit 1	This document provides guidance on accounting for CHP systems when using the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system for new construction.	*https://www.usgbc.org/ShowFile.aspx?DocumentID=1354*
CHP Emissions Calculator	This EPA tool can be used to compare the anticipated CO2, SOx, and NOx emissions from a CHP system to the emissions from a conventional system.	*http://www.epa.gov/chp/basic/calculator.html*
CHP Guide #1: Q&A on Combined Heat and Power for Multi-family Housing	This Department of Housing and Urban Development guide provides information to affordable housing administrators on the benefits of CHP systems.	*http://www.hud.gov/offices/cpd/library/energy/pdf/chpguide1.pdf*
CHP on Campus Online Guidebook	The International District Energy Association has developed this guidebook to demonstrate the feasibility of siting	*http://www.districtenergy.org/guidebook/CHP.Webdoc.Homepage.htm*
Combined Heat and Power: An Emerging Technology	This ENERGY STAR article describes the energy, environmental, and economic benefits of using CHP technology.	*http://www.energystar.gov/index.cfm?c=healthcare.ashe_nov_dec_2005*
Combined Heat and Power: Capturing Wasted Energy	This ACEEE report provides a basic primer on CHP technology and an overview of the benefits of CHP.	*http://www.aceee.org/pubs/ie983.htm*

TABLE B.5 CLEAN ENERGY SUPPLY STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
Combined Heat and Power Resource Guide	This guide was prepared by the Midwest CHP Application Center to provide answers to FAQs pertaining to CHP and to provide basic 'rules of thumb' about CHP applications.	*http://www.chpcentermw.org/pdfs/Resource_Guide_10312005_Final_Rev5.pdf*
Customer-Owned Utilities and Distributed Energy: Potentials and Benefits	This DOE report provides an overview of the potential for distributed energy technologies, including CHP for customer-owned utilities, including municipally-owned utilities.	*http://www.ornl.gov/~webworks/cppr/y2007/rpt/124344.pdf*
Distributed Energy Case Study Database	DOE maintains this database of distributed energy projects, including CHP. Users can narrow database searches based on market sector, power size range, prime mover, thermal energy use, and fuel type.	*http://www.eere.energy.gov/de/casestudies/*
Distributed Energy Information Resources	This DOE Distributed Energy Program Web site provides numerous resources on distributed generation and CHP applications, technologies, and market studies.	*http://www.eere.energy.gov/de/publications.html*
Distributed Generation Strategic Plan	This CEC guidance document includes a section on opportunities for state agency involvement in promoting DG development.	*http://www.energy.ca.gov/reports/2002-06-12_700-02-002.PDF*
EPA Combined Heat and Power Partnership	This EPA program works closely with energy users, the CHP industry, state and local governments, and other stakeholders to support the development and implementation of CHP technology.	*http://www.epa.gov/chp*
Experiences with Combined Heat and Power During the August 14, 2003 Northeast Blackout	This Oak Ridge National Laboratory report addresses the reliability benefits of CHP systems in light of the 2003 blackout, in which many non-CHP back-up generators failed at New York City hospitals.	*http://www.ornl.gov/~webworks/cppr/y2001/pres/121715.pdf*
FEMP DG and CHP Programs	DOE's FEMP program uses this Web site to provide information on DG and CHP technologies to facility managers. The site includes substantial information on various applications of these forms of clean energy generation.	*http://www.ornl.gov/sci/femp/*
Funding Database	The EPA CHP Partnership maintains a database of funding opportunities available for CHP projects.	*http://www.epa.gov/chp/funding/funding.html*
Gas-Fired Distributed Energy Resource Technology Characterizations	This NREL report provides techno-economic characteristics of several clean energy generation technologies.	*http://www.eea-inc.com/dgchp_reports/TechCharNREL.pdf*
Guidance on CHP Systems in LEED Rating Systems	This methodology provides information on how the benefits of CHP systems can be recognized under the energy requirements of the LEED rating system for new construction.	*http://www.usgbc.org/ShowFile.aspx?DocumentID=1384*
High-Density Housing, Mega-Developments: An Assessment of Arizona and Nevada Comparing Central Power to a Distributed Energy Approach	This report assesses the relative contribution potential of distributed energy and CHP technologies for reducing energy costs and minimizing impacts on the environment resulting from energy generation.	*http://www.eea-inc.com/natgas_reports/FinalMegaDevelopmentReport.pdf*
HUD CHP Screening Tool	The Department of Housing and Urban Development has created this tool to help housing administrators determine the feasibility of installing CHP systems at multi-family housing developments.	*http://www.hud.gov/offices/cpd/library/energy/software.cfm*

TABLE B.5 CLEAN ENERGY SUPPLY STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
An Integrated Assessment of the Energy Savings and Emissions-Reduction Potential of Combined Heat and Power	This American Council for an Energy-Efficient Economy paper provides an overview and a prospectus of U.S. deployment of CHP technologies across different sectors, such as buildings and district energy services.	*http://www.aceee.org/industry/Resources/assessment.pdf*
International District Energy Association	The IDEA Web site provides information on district energy systems, which can often be configured to use CHP. IDEA maintains a list of CHP-related district energy resources.	*http://www.districtenergy.org/DE_CHPResearch.htm#IEA%20Report%20Summaries*
Monetizing Environmental Benefits	This EPA CHP Partnership Web site provides guidelines for calculating the monetary value of environmental benefits resulting from CHP systems as compared to SHP systems.	*http://www.epa.gov/chp/funding/monetizing.html*
Municipal Wastewater Treatment Facilities	This EPA CHP Web site provides information on the compatibility of CHP systems with wastewater treatment facilities.	*http://www.epa.gov/CHP/markets/wastewater.html*
Opportunities for CHP at Wastewater Treatment Facilities	This EPA guide describes the benefits of installing CHP systems at wastewater treatment facilities that have anaerobic digesters. It is intended primarily for facility operators and CHP project developers.	*http://www.epa.gov/chp/documents/chp_wwtf_opportunities.pdf*
Procurement Guide: CHP Financing	This EPA CHP Partnership guide provides an overview of financing strategies for CHP applications.	*http://www.epa.gov/combdhpp/documents/pguide_financing_options.pdf*
Public Buildings Manual	The National Association of State Energy Officials published this manual as a guide to state and local governments. The manual addresses financing, benchmarking, retro-commissioning, and CHP applications.	*http://naseo.org/committees/buildings/documents/NASEO_Public_Buildings_Manual.pdf*
The Role of Distributed Generation in Power Quality and Reliability	This NYSERDA report assesses the power quality and supply reliability benefits of distributed generation technologies, including on-site renewable energy generation.	*http://www.eea-inc.com/dgchp_reports/The_Role_of_DG_in_Power_Quality_Final_Report_R1.pdf*
Screening Sheet for CHP Applications	This EPA Web page provides a list of criteria that local governments can use to assess the appropriateness of installing CHP systems at their facilities.	*http://www.epa.gov/chp/project-development/qualifier_form.html*
State Opportunities for Action: Update of States' Combined Heat and Power Activities	This ACEEE report provides detailed information on state legislative policies toward CHP.	*http://www.aceee.org/pubs/ie032full.pdf*
Survey of Emissions Models for Distributed Combined Heat and Power Systems	This ACEEE report surveys different models for quantifying the emission-reducing benefits of CHP technologies. The report describes how each model operates and handles emissions and it also identifies the best qualities of each model so that a more efficient, universally useful tool can be designed.	*http://aceee.org/pubs/ie071.htm*
United States Combined Heat and Power Association (USCHPA)	The USCHPA provides numerous resources for state and local governments, including information for policymakers interested in increasing government involvement in CHP-related state and regional actions.	*http://www.uschpa.org/i4a/pages/index.cfm?pageid=1*
Using Distributed Energy Resources	This DOE fact sheet provides an overview of the benefits of using distributed energy resources, such as on-site energy generating technologies, and describes the process for determining the need for distributed energy resources at a facility.	*http://www1.eere.energy.gov/femp/pdfs/31570.pdf*

TABLE B.6 OTHER ENERGY SAVING OPPORTUNITIES STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES

State or Title	Description	URL
Examples of State and Local Programs		
California	The Sacramento Municipal Utility District developed a **Shade Tree Program** that has resulted in average energy cooling load savings of 153 kWh per year. Its Cool Roof Program has resulted in 20% savings on cooling loads as well.	*http://www.smud.org/en/news/Documents/08archive/09_29_08_tree_benefits_estimator.pdf*
Ohio	The Ohio EPA Office of Pollution Prevention produced a report on *State Examples of Pollution Prevention Regulatory Integration*.	*http://www.epa.state.oh.us/opp/p2regint/othrstat.pdf*
Pennsylvania	The **Municipal Waste Program** regulates the collection, transportation, transfer, processing, composting, beneficial use, and disposal of municipal waste. Pennsylvania has 49 active landfills and five resource recovery (waste-to-energy) facilities that manage over 20 million tons/year of municipal waste.	*http://www.depweb.state.pa.us/landrecwaste/cwp/view.asp?a = 1216&q = 462227*
Texas	The state legislature directed SECO to develop a set of water efficiency standards for state agencies. This document describes the office's water efficiency guidelines for state buildings and equipment.	*http://www.seco.cpa.state.tx.us/waterconservation.pdf*
Vermont	The state **Comprehensive Environmental & Resource Management Program** was developed to identify opportunities for increasing environmental sustainability in government operations.	*http://www.bgs.state.vt.us/pdf/CERMP.pdf*
Resources on Additional Energy-Saving Opportunities		
FEMP Water Efficiency	DOE has produced guidance materials to assist federal agencies in complying with federal government water efficiency improvement requirements. The material includes water management plan guidelines and best management practices.	*http://www1.eere.energy.gov/femp/water/*
GreenCO	**GreenCO** developed a guideline of best management practices on how to reduce water consumption and protect water quality.	*http://www.greenco.org/index.htm?bmps.htm~contentFrame*
Making Business Sense of Energy Efficiency and Pollution Prevention	This ACEEE report exhibits a number of case studies and provides various resources related to pollution prevention.	*http://aceee.org/p2/index.htm*
Pollution Prevention Information Clearinghouse	The **Pollution Prevention Information Clearinghouse** is an EPA information service dedicated to reducing and eliminating industrial pollutants through technology transfer, source reduction, education, and public awareness.	*http://www.epa.gov/opptintr/ppic/index.htm*
Protect and Conserve Water	The Whole Building Design Guide Web site contains links to ten FEMP best management guides for protecting and conserving water.	*http://www.wbdg.org/design/conserve_water.php*
Recycling Measurement	EPA developed a voluntary, standard methodology for measuring recycling rates. Presently, few state or local governments define recycling in the same way, use the same approach for measuring recycling rates, or include the same materials in their rates.	*http://www.epa.gov/epaoswer/non-hw/recycle/recmeas/*
Tree Benefit Estimator	The American Public Power Association-designed **Tree Benefit Estimator** presents a Web-based method for estimating the amount of energy savings, capacity savings, and carbon and CO2 sequestration resulting from trees planted individually in urban and suburban settings.	*http://www.appanet.org/treeben/calculate.asp*

TABLE B.6 OTHER ENERGY SAVING OPPORTUNITIES STATE AND LOCAL EXAMPLES, TOOLS, AND RESOURCES *(cont.)*

State or Title	Description	URL
The Urban Heat Island, Photochemical Smog, and Chicago	This study addresses the heat island effect in the city of Chicago. The study considers unique local features of the problem and provides recommended solutions.	*http://www.epa.gov/heatisland/resources/pdf/the_urban_heat_island.pdf*
Water to Air Model	The Pacific Institute has created two models—one for agricultural districts, the other for urban districts—that quantify the energy and air emissions implications of water management decisions.	*http://www.pacinst.org/resources/water_to_air_models/index.htm*
Watergy	The Alliance to Save Energy's **Watergy** program provides information on reducing energy use associated with water supply and wastewater treatment on both the supply and demand side, and provides a range of case studies highlighting such efforts.	*http://www.watergy.org/*
WaterSense	EPA's **WaterSense** Web site provides generation information on water efficiency opportunities, water-efficient products and services, and links to more information.	*http://www.epa.gov/watersense/*

APPENDIX C

Resources for Implementing LBE Programs

This appendix provides state examples and resources for implementing LBE programs. More information pertaining to implementing LBE programs can be found in Chapter 5, *Developing a Comprehensive LBE Program of the LBE Guide*.

TABLE C.1 RESOURCES FOR IMPLEMENTING LBE PROGRAMS

State or Title	Description	URL
Examples of State Plans for Implementing LBE Programs		
California	Alameda County has developed *Implementation Guidelines* for its model environmental procurement policy. The county's model policy has been adopted by several California local governments.	*http://www.ciwmb.ca.gov/epp/LawPolicy/AlaPolImp.doc*
Colorado	The *State of Colorado Greening Government Planning and Implementation Guide* is designed to help agencies understand the environmental impacts of day-to-day actions. It includes goals for five program areas, recommended specific actions, and a Greening Government Planning Road Map.	*http://www.colorado.gov/greeninggovernment/guide/Guide.pdf*
	Boulder, Colorado has developed a *Historic Building Energy Efficiency Guide* for implementing energy efficiency measures in historic government buildings. Energy efficiency measures can be implemented without compromising historic authenticity and architectural or aesthetic integrity.	*http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=8217&Itemid=22*
Connecticut	The *Leading by Example* report details steps taken and current initiatives by the Connecticut state government to address climate change.	*http://ctclimatechange.com/rbf_rept.html*
Massachusetts	The *Agency Sustainability Planning and Implementation Guide* is intended to help state agencies understand the environmental impacts of their day-to-day operations and implement specific actions as part of the broader State Sustainability Program.	*http://www.ncprojectgreen.com/Documents/AgencySusGuide.pdf*

TABLE C.1 RESOURCES FOR IMPLEMENTING LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Minnesota	The Minnesota Interagency Pollution Prevention Advisory Team developed an *Implementation Guide* that offers direction and resources for implementing the requirements of **Executive Order 04-08**.	*http://www.moea.state.mn.us/lc/ippat/0408-Implementationguide.pdf*
	The Board of Commissioners in Hennepin County has authorized the creation of a Lead by Example Incentive Fund that will award a combined $100,000 to county departments that invest in environmentally preferable products. The Board has developed a set of *Lead by Example Initiative Guidelines* to assist department staff in meeting the program's requirements.	*http://www.co.hennepin.mn.us/images/HCInternet/EPandT/Environment/Green%20Government/LBE2008guidelinesandinstructions.pdf*
Nevada	The **Energy Conservation Plan for State Government** is intended to assist agencies in the development of individual energy conservation plans. It provides immediate, short-term, and long-term measures that can be incorporated into agency plans.	*http://dem.state.nv.us/EnergyPlan/necp2.pdf*
New York	NYSERDA has developed *"Green and Clean" State Buildings and Vehicles Guidelines* to aid state agencies in implementing **Executive Order No. 111**.	*http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf*
North Carolina	The state of North Carolina *Sustainability in State Government* report provides sustainable strategies and case studies for state government agencies. Program areas addressed include: purchasing, operations, transportation, and manufacturing.	*http://www.p2pays.org/ref%5C01/00770.pdf*
Oregon	The State of Oregon developed guidance for implementing **Executive Order 03-03** that provides helpful ideas for developing agency initiatives and coordinating with other agencies.	*http://governor.oregon.gov/Gov/pdf/ExecutiveOrder03-03.pdf*
Pennsylvania	The Pennsylvania Department of General Services has produced the *Facilities Strategic Energy Plan* to provide state facilities with a framework for setting energy policies, making energy efficiency improvements, and encouraging employee participation and innovation.	*http://www.dgs.state.pa.us/dgs/lib/dgs/dgs_strategic_energy_plan.pdf*
Texas	The Texas State Energy Conservation Office has developed this guidance to assist state agencies and institutions of higher learning in completing energy management plans, in accordance with government code Section 447.011.	*http://www.seco.cpa.state.tx.us/zzz_facilities/fac_emp_guide.pdf*
	San Antonio has developed an *Energy Efficiency Plan* that outlines measures the city plans on implementing to reduce energy consumption in local government facilities and operations.	*http://www.sanantonio.gov/swmd/pdf/Cosa%20Energy%20Plan%20Rev%2010-03*
Utah	The Utah Energy Efficiency Strategy recommends 23 potential policies, programs, and initiatives for consideration in meeting the state clean energy goals goal and include three LBE initiatives.	*http://energy.utah.gov/energy/utah_energy_efficiency_strategy.html*
Vermont	The Vermont **State Agency Energy Plan for State Government** provides state agency personnel with specific strategies and for implementing energy consumption-reducing activities in state government operations.	*http://www.bgs.state.vt.us/pdf/VTStateEnergyPlan.pdf*

TABLE C.1 RESOURCES FOR IMPLEMENTING LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Washington	**Revised Code of Washington 39.35D** calls for major facility projects receiving state funding to be LEED Silver certified. The Department of Administration was required to develop guidelines for implementing the policy for public agencies. In addition to these guidelines, the department developed a template to assist designers and officials in the planning and construction phases.	Guidelines: *http://www.ga.wa.gov/EAS/green/LEEDSilverQualityAssurance.doc* Example Submittal Forms: *http://www.ga.wa.gov/EAS/green/GASubmittalForms.xls*
Wisconsin	The State of Wisconsin Energy Use Policy provides guidelines for state agencies on required measures for improving energy efficiency and energy conservation in state facilities. The state Energy Design Guidelines provide guidance on implementing energy efficiency measures in new construction.	*http://www.doa.state.wi.us/docview.asp?docid=6147&locid=4* (Energy Use Policy) *ftp://doaftp04.doa.state.wi.us/master_spec/Energy%20Guidelines/Energy_Design_Guideline.doc (Energy Design Guidelines)*
Resources for Implementing LBE Programs		
Arkansas Energy Efficiency Docket	This link provides a number of resources, including reports, presentations, and meeting minutes that discuss the successes of and barriers to implementing various state energy efficiency programs.	*http://www.raponline.org/Feature.asp?select=96*
California Local Energy Efficiency Program Local Energy Efficiency Program Workbook	The **CALeep Workbook** outlines a five-step process for developing comprehensive energy efficiency programs in local government. The workbook was developed based on information obtained through CALeep program workshops with local authorities.	*http://www.caleep.com/docs/workbook/CALeep%20Workbook%20Final%20050106.pdf*
Energy-Aware Planning Guide	This guide, developed by the California Energy Commission with the assistance of representatives from 49 local governments, identifies energy-related planning opportunities in land use, transportation, buildings, water use, and waste management.	*http://www.energy.ca.gov/energy_aware_guide/index.html*
Energy Efficiency Policy Toolkit	This document summarizes clean energy regulatory policies for policymakers. It covers four primary subjects: energy efficiency, renewable energy, distributed resources, and rate design.	*http://www.arkansas.gov/psc/EEInfo/EEPToolkit-Pt1.pdf*
EPA Clean Energy-Environment *Guide to Action*	The EPA *Guide to Action* provides states with information on implementing clean energy policies. Included in this guide is a chapter outlining LBE activities and strategies for implementation.	*http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-best-practices.html*
Guiding Principles **for Federal Leadership in High Performance and Sustainable Buildings**	These *Guiding Principles* were established as a collaborative effort between multiple federal agencies. This memorandum of understanding establishes sustainable standards for integrated design, energy performance, water conservation, and indoor environmental quality.	*http://www.energystar.gov/ia/business/Guiding_Principles.pdf*
Instructions for Implementing Executive Order 14323	This guidance was developed by the Office of the Federal Environmental Executive to assist federal government agencies in implementing a number of LBE activities at the federal level.	*http://www.ofee.gov/eo/eo13423_instructions.pdf*
National Governors' Association *Securing A Clean Energy Future*	This NGA initiative serves to provide state governments with resources on clean energy opportunities. The Web site provides best practices and state initiatives.	*http://www.nga.org/portal/site/nga/menuitem.751b186f65e10b568a278110501010a0/?vgnextoid=f080dd9ebe318110VgnVCM1000001a01010aRCRD&vgnextchannel=92ebc7df618a2010VgnVCM1000001a01010aRCRD*

TABLE C.1 RESOURCES FOR IMPLEMENTING LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Rebuild Colorado	The Colorado Office of Energy Management and Conservation's **Rebuild Colorado** initiative provides energy management resources and training for facility managers and maintenance staff of state agencies and higher education institutions.	*http://www.colorado.gov/rebuildco/services/energy_management/state/index.html*

APPENDIX D

Resources for Funding LBE Programs

This appendix provides state examples and resources to complement information provided in the *LBE Guide*. More information on funding LBE programs can be found in Section 5.2, *Finance the LBE Program*.

TABLE D.1 RESOURCES FOR FUNDING LBE PROGRAMS

State or Title	Description	URL
State Examples of Funding LBE Programs		
Iowa	The Iowa **Alternate Energy Revolving Loan Program Guidelines** provide state officials with a map of the technical application procedures and loan approval processes involved in the procurement of energy efficiency improvement loans. The program guidance includes an information sheet about the technical application procedure.	*http://www.energy.iastate.edu/AERLP/index.htm*
Maryland	The **State Agency Loan Program** was established in 1991 using funds from the Energy Overcharge Restitution Fund. State agencies pay no interest for the loans. Repayments are made using energy cost savings.	*http://www.dsireusa.org/library/includes/incentivesearch.cfm?Incentive_Code=MD08F&Search=Eligible&sector=State_Sector&currentpageid=2&EE=1&RE=0*
Montana	The Montana **State Buildings Energy Conservation Bond Program** provides financing for energy efficiency upgrades in state-owned buildings. The program uses bond proceeds to fund the projects, and uses energy cost savings to repay the bonds.	*http://deq.mt.gov/Energy/buildings/StateBuildings.asp*
North Dakota	The **North Dakota State Buildings Energy Conservation Program** provides grants to state agencies for energy efficiency upgrades.	*http://www.communityservices.nd.gov/energy/state-buildings-energy-conservation-program/*
Oregon	The Oregon Department of Energy administers a **State Energy Loan Program (SELP)** through which state agencies can obtain low-interest loans for clean energy activities.	*http://www.oregon.gov/ENERGY/LOANS/selphm.shtml*

TABLE D.1 RESOURCES FOR FUNDING LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Texas	The Texas SECO developed a guidebook for engineers as they complete Energy Assessment Reports as part of the project loan application. The **LoanSTAR Guidelines** document identifies policies to be followed in preparing project calculations and outlines the format for presenting energy efficiency projects for review.	*http://www.seco.cpa.state.tx.us/ls_guideline.htm*
General Resources for Funding LBE Programs		
The Borrower's Guide to Financing Solar Energy Systems	This brochure provides an overview of financial assistance opportunities offered by the federal government and private lenders for the installation of on-site renewable energy systems.	*http://www.nrel.gov/docs/fy99osti/26242.pdf*
Choosing the Right Financing for Your Energy Efficiency and Green Projects with ENERGY STAR®	This chapter of *Energy Project Financing- Resources and Strategies for Success* (Thumann, A. and E. Woodroof.. Fairmont Press, Atlanta June 2008– Chapter 3 - by Zobler, N. and Hatcher, K.) provides a brief summary of key accounting principles and describes a variety of financing vehicles and funding sources available for financing state energy efficiency and renewable energy projects.	N.A.
Community Energy Financing	The Smart Communities Network provides information about financing opportunities, including federal and state resources, as well as a collection of relevant literature.	*http://www.smartcommunities.ncat.org/municipal/financing.shtml*
Companies Financing Solar, Wind, and Other Renewable Energy Systems	The California Energy Commission has compiled a list of private financers for on-site renewable energy generation systems.	*http://www.consumerenergycenter.org/*
Database of State Incentives for Renewables (DSIRE)	DSIRE is a DOE-funded comprehensive source of information on state, local, utility, and selected federal incentives that promote renewable energy and energy efficiency. Information about the incentives contained in the DSIRE database is compiled from many different sources, including federal entities, contact with state energy offices, PUCs, and renewable energy organizations.	*http://www.dsireusa.org/*
DOE Financial Opportunities for States	DOE offers several programs to help state governments and organizations finance energy efficiency and renewable energy projects.	*http://www1.eere.energy.gov/financing/states.html*
Easy Access to Energy Improvement Funds in the Public Sector	This ENERGY STAR publication provides information to assist public entities in comparing various energy efficiency improvement funding mechanisms.	*http://www.energystar.gov/ia/business/easyaccess.pdf*
Energy Tax Incentives	The Tax Incentives Assistance Project, a collaborative of non-profit organizations, government agencies, and other stakeholders, provides consumers and businesses with information on incentives available through the federal Energy Policy Act of 2005.	*http://www.energytaxincentives.org/*
EPA Clean Energy-Environment Guide to Action	The EPA Clean Energy-Environment *Guide to Action* provides information on a range of funding and incentive strategies for developing clean energy policies.	*http://www.epa.gov/cleanrgy/stateandlocal/guidetoaction.htm*
Federal Grants	The Federal grants.gov program provides information on financial incentives available from 26 government agencies for a range of investments, including renewable energy generation.	*http://www.grants.gov/*
Financial Incentives Brochure	This brochure provides descriptions of the multiple opportunities for financing energy efficiency improvements in public buildings in Iowa.	*http://www.energy.iastate.edu/news/downloads/FinancialIncent.pdf*

TABLE D.1 RESOURCES FOR FUNDING LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Financing Energy Efficiency in Buildings	This Guide was developed as part of the DOE Rebuild American Guide Series. It provides guidance on selecting financing mechanisms for energy efficiency in buildings, and includes numerous examples that cite cost savings.	*http://eber.ed.ornl.gov/commercialproducts/finance.pdf*
Financing Energy Efficiency Projects	This ENERGY STAR article describes how energy cost savings can be used to finance energy-efficiency investments.	*http://www.energystar.gov/ia/business/government/Financial_Energy_Efficiency_Projects.pdf*
Funding and Savings for Energy Efficiency Programs for Program Years 2000 Through 2004	This paper summarizes energy efficiency programs administered by California utilities. The purpose of the paper is to highlight recent trends regarding energy efficiency funding, savings, and cost-effectiveness of these programs.	*http://www.fypower.org/pdf/CEC%20_Trends2000-04.pdf#search = %22cost%20new%20construction%20dollars%20per%20kwh%22*
Funding Opportunities for Energy Efficiency, Renewable Energy and the Environment	The Center for Economic and Environmental Partnership, Inc. (CEEP) compiled a sample list of solicitations currently offered by foundations and public agencies to support research and implementation of energy efficiency, renewable energy, sustainable development and related environmental activities.	*http://www.naseo.org/funding/November%202006%20CEEP%20Summary.pdf*
Guidelines for Cost-Effective Energy Management Improvement Projects	This guidance document was developed by the Iowa Bureau of Energy Management to assist agency officials in determining whether a proposed energy efficiency project will produce enough savings to offset the costs of purchasing and implementing an efficiency improvement.	*http://www.iowadnr.com/energy/ebank/files/costeffect2002.pdf*
Handbook on Renewable Energy Financing for Rural Colorado	This handbook provides information on state and federal resources for financing renewable energy projects in Colorado. Many of the resources identified may be relevant to local governments outside Colorado.	*http://www.colorado.gov/oemc/publications/handbook_rural_co.pdf*
How to Finance Public Sector Energy Efficiency Projects	This guide addresses the special needs of public sector agencies such as city and county governments, public school districts, hospitals, and special districts, such as water and wastewater treatment districts. It discusses the criteria for evaluating the cost-effectiveness of energy efficiency projects, various funding options, and financing programs specific to public sector agencies.	*http://www.energy.ca.gov/reports/efficiency_handbooks/index.html*
Incentives for Geo-Exchange Systems	This Web site provides information on various federal and state incentives for geothermal energy systems available to local governments.	*http://www.geoexchange.org/*
Innovations in Renewable Energy Financing	This National Renewable Energy Laboratory paper provides information on new strategies for financing renewable energy projects, including REC sales.	*http://www.usaee.org/usaee2007/submissions/OnlineProceedings/Innovations%20in%20Renewable%20Energy%20Financing%20_Cory_%20-%20FINAL.pdf*
Iowa Technical Energy Analysis Guidelines	The Iowa Energy Bank provides technical and financial assistance for energy conservation improvements in public buildings. As part of the loan application process, a technical energy analysis must be performed on a building. **Technical Energy Analysis Guidelines** for this analysis provide a detailed description of the online submission procedure.	*http://www.iowadnr.com/energy/ebank/files/guide2005.pdf*

TABLE D.1 RESOURCES FOR FUNDING LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Life-Cycle Cost Guidelines	This publication by the Iowa Department of Natural Resources is intended to assist engineers and energy managers in using life-cycle costing to conduct technical energy analyses in public facilities.	*http://www.iowadnr.com/energy/ebank/files/lifecycle2002.pdf*
LoanSTAR QuickCalcs Spreadsheets	Using the look-up data tables from the LoanSTAR Guidelines, these simple fill-in-the-blank spreadsheets can be used to determine and analyze projected energy consumption savings based on site- and measure-specific information provided by the user.	*http://www.seco.cpa.state.tx.us/ls_guide_spreads.htm*
Massachusetts Grants and Funding Opportunities	The Massachusetts State Sustainability Program provides a list of various funding opportunities. Included are federal, state, and private financing vehicles.	*http://www.mass.gov/?pageID=eoeeatopic&L=2&L0=Home&L1=Energy%2c+Utilities+%26+Clean+Technologies&sid=Eoeea*
National Association of State Energy Officials (NASEO) Funding Opportunities and Resources	NASEO provides information about federal funding opportunities and other financial resources.	*http://www.naseo.org/resources/funding/default.aspx*
Resource Guide to Building Energy Management	This resource guide provides descriptions of the programs through which Iowa public agencies obtain technical and financial assistance in performing energy efficiency upgrades.	*http://www.iowadnr.com/energy/ebank/files/greenbook.pdf*
Technical Issues Concerning Third Party Financing for Renewable Energy	This Web site was developed by the Sandia National Laboratories to provide information on the relative benefits of different third-party financing models for purchasing renewable energy generation systems.	*http://energy.sandia.gov/technicallissues.htm*
Capital Budgets and Procurement Budgets		
Vermont	Vermont legislation requires the use of life-cycle costing for new construction and major renovations receiving state funding.	*http://www.leg.state.vt.us/statutes/fullsection.cfm?Title = 03&Chapter = 045&Section = 02291)*
Energy Performance Contracts and Lease-Purchase Agreements		
California	The CEC has compiled and regularly updates a directory of ESCOs. Though it is focused on ESCOs doing business in California, many are active in many parts of the country.	*http://energy.ca.gov/2005publications/CEC-400-2005-001/CEC-400-2005-001.PDF*
Colorado	The **Rebuild Colorado** Web site provides information on energy performance contracting, including sample documents and guidelines, and links to resources.	*http://www.state.co.us/oemc/rebuildco/epc.htm*
Iowa	The Iowa Energy Bank, an energy management program using energy cost savings to repay financing for energy management improvements, serves public and nonprofit Iowa facilities (public schools, hospitals, private colleges, private schools, and local governments).	*http://www.iowadnr.com/energy/ebank/index.html*
New Hampshire	The **BECI** program analyzes state buildings for energy and resource conservation opportunities to be funded with performance contracting.	*http://nh.gov/oep/programs/energy/beci.htm*
Virginia	This Virginia Department of Mines, Minerals, and Energy Web site provides information to state agencies on how to use energy performance contracts to finance energy-efficiency improvements.	*http://www.dmme.virginia.gov/DE/StateAgencyProgs/performancecontracting.shtml*

TABLE D.1 RESOURCES FOR FUNDING LBE PROGRAMS *(cont.)*

State or Title	Description	URL
ENERGY STAR *Financing Energy Efficiency Projects*	This article explains how the cost savings resulting from increased energy efficiency can be used to finance the equipment needed for improvements.	*http://www.energystar.gov/ia/business/government/Financial_Energy_Efficiency_Projects.pdf*
ENERGY STAR *Innovative Financing Solutions*	This EPA ENERGY STAR document provides guidance on financing for clean energy efficiency improvement projects.	*http://energystar.gov/ia/business/government/FINAL_Paper.pdf*
ENERGY STAR *Manage Energy Uncertainty*	This article describes how to obtain quick financing for energy efficiency projects.	*http://ww.energystar.gov/ia/business/government/Hatcherarticle.pdf*
ENERGY STAR *Money for Your Energy Upgrades*	This ENERGY STAR presentation provides an introduction to financing energy efficiency upgrades in the public sector.	*http://www.energystar.gov/ia/business/Self_Guide_ES_Finance.pdf*
Public Benefits Funds and Systems Benefits Changes		
Oregon	The State of Oregon offers **Business Energy Tax Credits** to the public sector and nonprofits via a "pass through" provision.	*http://egov.oregon.gov/ENERGY/CONS/BUS/BETC.shtml*
EPA Clean Energy-Environment Guide to Action	The EPA Clean Energy-Environment *Guide to Action* provides sections on using PBFs to fund energy efficiency and clean energy supply programs.	*http://www.epa.gov/cleanrgy/stateandlocal/guidetoaction.htm*
Revolving Loan Funds		
Iowa	The Iowa **Alternate Energy Revolving Loan Program** provides low interest loans to individuals and organizations that want to build alternate energy production facilities in Iowa.	*http://www.energy.iastate.edu/funding/aerlp-index.html*
New York	The **New York Energy $mart**[SM] **Loan Fund** program provides an interest rate reduction off a participating lender's normal loan interest rate for a term up to 10 years on loans for certain energy efficiency improvements and/or renewable technologies.	*http://www.nyserda.org/loanfund/default.asp*
Texas	The Texas **LoanSTAR Program** is a revolving loan mechanism for energy efficiency targeted for public buildings, including state agencies, school districts, and local governments.	*Program Site: http://www.seco.cpa.state.tx.us/ls.htm*
Direct Loans		
Vermont	The Vermont Economic Development Authority **Direct Loan Program** assists borrowers in financing fixed assets. Public and private entities can use these loans to pay for energy efficiency improvements. Borrowing caps are set at 40% of the total project cost, with a maximum loan of $1.3 million.	*http://www.veda.org/interior.php/pid/1/sid/1*
Pension Funds		
Apollo Washington "Policy Menu" Shoots for the Stars	Washington's Union Square draws on state pension funds for financing energy efficiency retrofits.	*http://www.sijournal.com/commentary/1512972.html*

APPENDIX E

Resources for Conducting Communications and Outreach for LBE Programs

This appendix provides state examples and resources to complement information provided in the *LBE Guide*. More information pertaining to conducting communications and outreach for LBE programs can be found in Section 5.3, *Conduct Communications and Outreach: Build and Maintain Support for an LBE Program*.

TABLE E.1 RESOURCES FOR CONDUCTING COMMUNICATIONS AND OUTREACH FOR LBE PROGRAMS

State or Title	Description	URL
Examples of State Vehicles for Conducting Communications and Outreach for LBE Programs		
California	The California Green Action Team (the entity entrusted with implementing Executive Order S-20-04) maintains an online media center for the public that includes links to photos and videos highlighting the team's accomplishments.	*http://www.green.ca.gov/NewsandEvents/MediaCenter.htm*
	The Green Action Team also produces the *Green California News* newsletter. This newsletter enables the Department of General Services to disseminate information on how the state is working to achieve its energy efficiency and resource conservation goals.	*http://www.green.ca.gov/Newsletter/default.htm*
Colorado	The Colorado *Greening Government Planning and Implementation Guide* includes statewide strategies for each of its LBE program areas. These strategies include suggestions on how to disseminate information resources to state agencies and employees.	*http://www.colorado.gov/greeninggovernment/guide/Guide.pdf*
	In May 2006, Colorado held a **Greening of State Government Conference** to inform state employees of the opportunities and benefits of adopting green practices in state government. The two-day conference included a general session and a technical session.	*http://www.colorado.gov/greeninggovernment/events/conference/2006/index.html*
Maine	Maine has developed a Web site for communicating the benefits of clean energy to the public. The Web site includes an outline of past and present LBE activities undertaken by the state under its Clean Government Initiative.	*http://www.maine.gov/oeis/*

TABLE E.1 RESOURCES FOR CONDUCTING COMMUNICATIONS AND OUTREACH FOR LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Massachusetts	The Massachusetts State Sustainability Program produces newsletters as part of its LBE education and outreach initiative. Each issue focuses on a different topic. Past topics have included energy efficiency, environmentally preferable purchasing, waste reduction and recycling, and renewable energy.	*http://www.mass.gov/envir/Sustainable/newsletters.htm*
Minnesota	The Minnesota Departments of Administration and Commerce have produced a Web site for state employees to learn about energy saving opportunities. The site includes goal lists, fact sheets, and newsletters.	*http://www.savingenergy.state.mn.us/index.htm*
	Minnesota Executive Order 04-08 requires state departments to biannually provide state employees with a fact sheet about practices they can adopt at work and at home to reduce air pollution. These fact sheets are disseminated via email.	*http://www.leg.mn/archive/execorders/04-08.pdf*
Vermont	The **State Agency Energy Plan for State Government** provides state agency personnel with specific strategies and for reducing energy consumption in state government operations.	*http://www.bgs.state.vt.us/pdf/VTStateEnergyPlan.pdf*
Resources for Conducting Communications and Outreach for LBE Programs		
CALeep	**CALeep** was established to help California local governments design and implement energy efficiency strategies for their communities. The CALeep Web site and associated **Local Energy Efficiency Program Workbook** provide a set of resources to help local governments implement energy efficiency programs, including ideas for conducting communication and outreach activities.	*http://www.caleep.com* *http://www.caleep.com/docs/workbook/CALeep%20Workbook%20Exec%20Sum%20Final%20050106.pdf*
Communicating the Benefits of Your Actions	This Web site presents EPA guidance on communications activities related to the **Green Power Partnership**. EPA has also developed a **Communications Guide for Green Power Partners**, which provides resources to assist partners in promoting the benefits of their green power purchases and involvement in the Green Power Partnership.	*http://www.epa.gov/greenpower/pubs/comm.htm*
Comparative Assessment of Consumer Awareness for Clean Energy in Connecticut and the United States	This comprehensive study uses two surveys to explore public attitudes and communications challenges regarding awareness of clean energy, knowledge about clean energy, importance of various reasons for choosing clean energy, and demographics.	*http://www.ctcleanenergy.com/communities/files/CCEF_survey_report_May_18_2005_Final.pdf* *http://www.ctcleanenergy.com/communities/files/CCEF_Program%20Goal%203_Objective%20P3B_July%202006.pdf*
Designing and Implementing Marketing and Communications Campaigns for Labeling and Standards Setting Programs	This paper contains step-by-step guidelines for designing successful communications campaigns for energy efficiency programs, as well as case studies from around the world.	*http://mail.mtprog.com/CD_Layout/Day_3_23.06.06/1115-1300/ID185_Egan1_final.pdf*
ENERGY STAR Guidance – *Draft a Communications Plan*	ENERGY STAR provides guidance for drafting communications plans relevant for LBE activities. This Web site includes guidance for communicating with multiple audiences, including employees, stakeholders, and the public.	*http://www.energystar.gov/index.cfm?c = drafting_plan.ck_drafting_plan*

TABLE E.1 RESOURCES FOR CONDUCTING COMMUNICATIONS AND OUTREACH FOR LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Ideas for Communicating to Employees and Senior-Level Managers	ENERGY STAR has compiled lists of strategies for increasing employee and senior-level manager awareness of energy efficiency opportunities and initiatives. These lists are accompanied by examples of implemented strategies.	Communicating to Employees: *http://www.energystar.gov/index.cfm?c = employees.ck_employees_ideas* Communicating to Senior-Level Managers: *http://www.energystar.gov/index.cfm?c = employees.ck_employees_senior_communicate*
Program Analysis and Monitoring and Evaluation Plan for the Connecticut Clean Energy Fund's Public Awareness, Education, and Voluntary Market Demand Initiatives	This **Final Evaluation Report** is an assessment of the Connecticut Clean Energy Fund. It outlines goals for increasing public knowledge and awareness of the benefits and availability of clean energy. The report provides a helpful resource for gauging the effectiveness of a public communications initiative.	*http://www.ctcleanenergy.com/communities/files/CCEF_Program%20Goal%203_ME%20Plan_2005%20Evaluation_April%202006.pdf*
The Resource Conservation Management Guidebook	This **Guidebook** was prepared by the Washington State Department of General Administration and the Oregon Office of Energy to provide agencies with communications strategies and information on justifying, developing, and maintaining a Resource Conservation Management Program.	*http://www.oregon.gov/ENERGY/CONS/RCM/rcmGuide.shtml*

APPENDIX F

Resources on Technical and Financial Assistance to Local Governments

This appendix provides state examples and resources to complement information provided in the *LBE Guide*. More information pertaining to technical and financial assistance to local governments can be found in Section 5.4, *Provide Technical and Financial Assistance to Local Governments*.

TABLE F.1 TECHNICAL AND FINANCIAL ASSISTANCE TO LOCAL GOVERNMENTS

State or Title	Description	URL
State Examples of Providing Technical Assistance to Local Governments		
California	The CEC's **Energy Partnership Program** offers technical assistance to cities, counties, hospitals, and colleges and universities. The program helps these local groups identify energy efficiency improvements in existing buildings and energy-efficient options in new construction. The CEC also helps these groups identify state loans and other financing sources for project installation.	*http://www.energy.ca.gov/efficiency/partnership/index.html*
Missouri	Through its **Energy Revolving Fund**, the Missouri Energy Center offers low-interest loans for energy efficiency improvements in public schools, local government, public hospitals, and public water treatment facilities. The loans are paid back using the energy savings generated from the project.	*http://www.dnr.mo.gov/energy/financial/loan.htm*
New York	NYSERDA's **Local Government Energy-Efficient Product Procurement Program** serves as a state government vehicle for providing technical assistance and resources to local governments.	*http://yosemite.epa.gov/gw/StatePolicyActions.nsf/de6a5ff94d325ab3852570670051143f/68c82ea208bd94fa8525720b0068691c!OpenDocument*
North Carolina	The North Carolina Division of Pollution Prevention and Environmental Assistance administers **Local Government Assistance**, providing technical and financial assistance to local governments.	*http://www.p2pays.org/localgov/*
Oregon	DOE provides assistance to public entities through multiple programs, including the **Building Commissioning Program**, which helps building managers perform evaluations and implement cost-saving strategies.	*http://www.oregon.gov/ENERGY/CONS/GOV/govhme.shtml*

TABLE F.1 TECHNICAL AND FINANCIAL ASSISTANCE TO LOCAL GOVERNMENTS *(cont.)*

State or Title	Description	URL
Pennsylvania	The Pennsylvania Department of Environmental Protection maintains a Web site, **Energy Conservation Help for Local Governments**, designed to assist local governments in improving energy efficiency through developing energy management plans.	*http://www.depweb.state.pa.us/energy/cwp/view.asp?a = 1379&q = 485061*
Texas	The **Schools/Local Government Energy Program** provides a number of integrated services to assist in setting up and maintaining effective energy efficiency programs.	*http://www.seco.cpa.state.tx.us/sch-gov.htm*
West Virginia	The **Building Professionals Energy Training Program** provides building code seminars to educate local government officials about the latest codes and building technologies.	*http://www.energywv.org/community/code.html*
State Examples of Providing Financial Assistance to Local Governments		
California	The CEC's **Energy Efficiency Financing Program** provides low-interest loans for public schools, public hospitals, and local governments to fund energy audits and install energy efficiency measures.	*http://www.energy.ca.gov/efficiency/financing/index.html*
Iowa	The **Iowa Energy Bank** is an energy management program for public and nonprofit entities that provides technical and financial assistance for building energy efficiency upgrades.	*http://www.iowadnr.com/energy/ebank/index.html*
Kansas	The Kansas **Facility Conservation Improvement Program** provides low-interest, tax-exempt energy performance contracting agreements to state and local public agencies.	*http://www.kcc.state.ks.us/energy/fcip/financing.htm*
Maryland	The **Community Energy Loan Program** provides Maryland local governments with financial assistance to reduce operating costs. The program allows energy savings generated by efficiency upgrades to be the major source of loan repayment.	*http://www.energy.state.md.us/incentives/schools/communityenergyloan.asp*
New Jersey	The **New Jersey Clean Energy Program** offers financial incentives and low-interest financing to schools and local governments. The program combines the traditional rebate program with incentives and financing, giving schools and local governments the flexibility to implement cost-effective projects immediately.	*http://www.njcleanenergy.com/*
Tennessee	Through its **Local Government Energy Loan Program**, the Tennessee Department of Economic and Community Development provides low interest loans to municipal and county governments for energy efficiency improvements.	*http://www.state.tn.us/ecd/energy_lgelp.htm*
Resources for Providing Assistance to Local Governments		
Guide to Greening Government Through Powerful Purchasing Decisions	The **National Association of Counties** has developed an Environmental Purchasing Starter Kit to assist local governments. The kit was produced with the assistance of EPA.	*http://www.naco.org/Content/ContentGroups/Programs_and_Projects/Environmental1/Energy/Introduction.pdf*
Pennsylvania Department of Environmental Protection Local Government Handbook	This handbook provides a guide to state opportunities for technical and financial assistance across a variety of topics, including clean energy technologies, to local governments in Pennsylvania.	*http://www.depweb.state.pa.us/energy/cwp/view.asp?a = 1379&q = 485677*
Rebuild America Technical Assistance Services	**Rebuild America Technical Assistance Services** provides targeted tools and analysis that can facilitate major energy efficiency or renewable energy improvements in public local and state governments.	*http://www.osti.gov/bridge/servlets/purl/821287-pxvXpf/native/821287.pdf*

APPENDIX G

State LBE Programs and Contacts

This appendix provides state program names and contacts to complement information provided in the *LBE Guide*. More information can be found in Section 5.5, *Information Sharing: Federal, State, and Local LBE Resources*.

TABLE G.1 STATE LBE PROGRAMS AND CONTACTS

State	Agency	LBE Program/Initiative	State Contact		Web Site
			Name	E-mail	
AL	Department of Economic and Community Affairs	State Building Energy Efficiency Program	Larry Knox	*Larry.knox@adeca.alabama.gov*	*http://www.adeca.alabama.gov/C4/State%20Buildings%20Energy%20Efficie/default.aspx*
AZ	Department of Commerce	Renewable Energy and Green Building Standards in New State Buildings	Jim Arwood	*jima@azcommerce.com*	*http://www.commerce.state.az.us/Energy/Efficiency/*
CA	CEC	Green Buildings Initiative	Elaine Hebert	*ehebert@energy.state.ca.us*	*http://www.energy.ca.gov/greenbuilding/index.html*
CA	CEC	Green California Energy Efficiency Projects at State Facilities	John Sugar	*JSugar@energy.state.ca.us*	*http://www.green.ca.gov/energyeffproj/default.htm*
CA	Interagency Team chaired by the Secretary of the State and Consumer Services Agency	Green Action Team	Al Garcia	*agarcia@energy.state.ca.us*	*http://www.green.ca.gov/default.htm*
CO	Office of Energy Management and Conservation	Colorado Greening Government Program Manager	Angie Fyfe	*Angie.Fyfe@state.co.us*	*http://www.colorado.gov/greeninggovernment/index.html*

TABLE G.1 STATE LBE PROGRAMS AND CONTACTS *(cont.)*

State	Agency	LBE Program/Initiative	State Contact		Web Site
			Name	E-mail	
CT	Governor's Office	The Governor's Steering Committee on Climate Change			http://ctclimatechange.com/GSC.html
CT	Connecticut Clean Energy Fund	Connecticut Clean Energy Fund	Bob Wall	bob.wall@ctcleanenergy.com	http://ctclimatechange.com/StateGovernmentRevision.html
CT	Department of Environmental Protection	Connecticut Climate Change: State Government	Don Cassella	Donald.Cassella@ct.gov	http://ctclimatechange.com/StateGovernmentRevision.html
CT	Office of Policy Management	Connecticut Climate Change: State Government	John Ruckes	John.Ruckes@ct.gov	http://ctclimatechange.com/StateGovernmentRevision.html
FL	Department of Environmental Protection	Greening Florida Government	Shannan Reynolds	Shannan.Reynolds@dep.state.fl.us	http://www.dep.state.fl.us/waste/categories/recycling/greengov/GreenGovMain.htm
GA	Georgia Environmental Facilities Authority, Division of Energy Resources	GEFA/Division of Energy Resources	David Godfrey	dgodfrey@gefa.ga.gov	http://www.gefa.org/index.aspx?page=32
HI	Department of Business, Economic Development, and Tourism	Solar Water Heating Systems for State Facilities	Carilyn Shon	cshon@dbebt.hawaii.gov	http://www.hawaii.gov/dbedt/info/energy/efficiency/state/
HI	Department of Business, Economic Development, and Tourism	Hawaii LBE Initiative	Elizabeth Raman	eraman@dbedt.hawaii.gov	http://www.hawaii.gov/dbedt/info/energy/efficiency/state/ http://hawaii.gov/dbedt/
IA	Department of Natural Resources	Iowa Energy Bank	Lee Vannoy	Lee.vannoy@dnr.state.ia.us	http://www.iowadnr.com/energy/ebank/index.html
IA	State of Iowa Facilities Improvement Corporation	State Facilities Program	Dan Lane	Dan.Lane@dnr.state.ia.us	http://www.iowadnr.com/energy/ebank/sfp.html
IL	Green Government Coordinating Council	Illinois Green Government Coordinating Council		GreenCouncil.ltgov@illinois.gov	http://www.standingupforillinois.org/pdf/GGCC_2005.pdf
IN	Department of Administration	Greening the Government Program	Phil Giddens	pgiddens@idoa.in.gov	http://www.in.gov/idoa/services/greening/
KY	Office of Environmental Protection	Renewable Energy and Energy Efficiency: State and Local Government	Alan Shikoh	Alan.Shikoh@ky.gov	http://www.energy.ky.gov/dre3/efficiency/government.htm
KY	Division of Renewable Energy & Energy Efficiency	State Buildings	John Davies	john.davies@ky.gov	http://www.energy.ky.gov/dre3/
ME	Department of Environmental Protection	Clean Government Initiative	Peter Cooke	Peter.Cooke@maine.gov	http://www.maine.gov/cleangovt/index.htm

TABLE G.1 STATE LBE PROGRAMS AND CONTACTS *(cont.)*

State	Agency	LBE Program/Initiative	State Contact		Web Site
			Name	E-mail	
ME	Public Utilities Commission	State Buildings Program	Denis Bergeron	*Denis.bergeron@maine.gov*	*http://www.efficiencymaine.com/other_programs_sbp.htm*
MD	Department of General Services, Office of Facilities Planning, Design, and Construction	Green Power Purchases	Lionel Hill	*Lionel.Hill@dgs.state.md.us*	*http://www.dgs.maryland.gov/overview/const2.htm*
MA	Executive Office of Environmental Affairs (EOEA), State Sustainability Program	EOEA State Sustainability Program	Eric Friedman	*Eric.friedman@state.ma.us*	*http://www.mass.gov/?pageID=eoeeahomepage&L=1&sid=Eoeea&L0=Home*
MI	Department of Labor and Economic Growth	State Facility Energy Program	Thomas Krupiarz	*takrupi@michigan.gov*	*http://www.michigan.gov/cis/0,1607,7-154-25676_25689_33337---,00.html*
MI	Department of Management and Budget	State Facilities	Keith Paasch	*Paaschk@mi.gov*	*http://www.michigan.gov/dmb/0,1607,7-150-9152---,00.html*
MN	Department of Administration	SmartFleet Committee	Tim Morse, Director, Travel Management Division	*Tim.morse@state.mn.us*	*http://www.state.mn.us/portal/mn/jsp/content.do?programid = 536902294&id = -536885290&agency = Travelmgmt*
MN	Pollution Control Agency	Sustainable Buildings	Bill Sierks	*bill.sierks@pca.state.mn.us*	*http://www.pca.state.mn.us/*
MN	Pollution Control Agency	Green Buildings Program	Erin Barnes-Driscoll	*Erin.Driscoll@pca.state.mn.us*	*http://www.moea.state.mn.us/greenbuilding/*
MT	Department of Environmental Quality	Energy Efficiency in Your Government: Public Buildings and Renewable Energy	Todd Teegarden	*tteegarden@mt.gov*	*http://www.deq.state.mt.us/Energy/EEGovt/index.asp*
NC	State Energy Office	Utility Savings Initiative	Len Hoey	*Leonard.hoey@ncmail.net*	*http://www.energync.net/programs/usi.html*
ND	Department of Commerce	State Buildings Energy Conservation Program	Bill Huether	*bhuether@state.nd.us*	*http://www.communityservices.nd.gov/energy/state-buildings-energy-conservation-program/*
NH	Office of Energy and Planning	Building Energy Conservation Initiative	James Taylor	*James.Taylor@nh.gov*	*http://nh.gov/oep/programs/energy/beci.htm*
NJ	New Jersey Board of Public Utilities	New Jersey's Clean Energy Program			*http://www.njcleanenergy.com/*
NJ	Smart Buildings Initiative	Commercial and Industrial Program			*http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings*
NM	Environment Department	Environment and Energy Coordinator	Sandra Ely	*sandra.ely@state.nm.us*	*http://www.nmenv.state.nm.us/aqb/index.html*

TABLE G.1 STATE LBE PROGRAMS AND CONTACTS *(cont.)*

State	Agency	LBE Program/Initiative	State Contact		Web Site
			Name	E-mail	
NM	General Services Department	LBE Coordinator	Erik Aaboe	*erik.aaboe@state.nm.us*	*http://www.emnrd.state.nm.us/ECMD/index.htm*
NY	NYSERDA	Green and Clean State Buildings and Vehicles	Matt Brown	*bcb@nyserda.org*	*http://www.nyserda.org/programs/state.asp*
OH	Ohio Department of Development	Energy Savings in Government Buildings	Greg Payne	*gpayne@odod.state.oh.us*	*http://development.ohio.gov/cdd/oee/*
OH	Ohio Department of Development	Energy Savings in Government Buildings	Christina Panoska	*christina.panoska@development.ohio.gov*	*http://development.ohio.gov/cdd/oee/*
OR	Department of Energy	State Energy Efficient Design	Ann Hushagen	*Ann.hushagen@state.or.us*	*http://www.oregon.gov/ENERGY/CONS/SEED/SEEDhome.shtml*
OR	Sustainable Oregon	Government and Sustainability	David Van't Hof	*vanthof@state.or.us*	*http://www.oregonsolutions.net*
PA	Department of General Services	Energy Savings in Government Buildings	Bruce Stultz	*bstultz@state.pa.us*	*http://www.dgs.state.pa.us/dgs/lib/dgs/green_bldg/greenbuildingbook.pdf*
PA	Departments of Environmental Protection and General Services	Governor's Green Government Council	Paul Zeigler	*pazeigler@state.pa.us*	*http://www.gggc.state.pa.us/gggc/site/default.asp*
RI	Rhode Island State Energy Office	Revolving Loan Fund for State Agency Energy Conservation Measures	Tim Howe	*TimH@gw.doa.state.ri.us*	*http://www.energy.ri.gov/programs/efficiency.php*
TX	State Energy Conservation Office	Schools and Local Government Program, Schools	Glenda Baldwin	*Glenda.Baldwin@cpa.state.tx.us*	*http://www.seco.cpa.state.tx.us/sch-gov_ed.htm*
TX	State Energy Conservation Office	Schools and Local Government Program, Local Government	Theresa Sifuentes	*Theresa.sifuentes@cpa.state.tx.us*	*http://www.seco.cpa.state.tx.us/sch-gov.htm*
TX	State Energy Conservation Office	State Agencies Program, State Agency Energy Advisory Group	Eddy Trevino	*Eddy.Trevino@cpa.state.tx.us*	*http://www.seco.cpa.state.tx.us/sa_saeag.htm*
TX	State Energy Conservation Office	State Agencies Program, Building Codes and Standards	Felix Lopez	*Felix.lopez@cpa.state.tx.us*	*http://www.seco.cpa.state.tx.us/sa_codes.html*
TX	State Energy Conservation Office	Energy Director	Dub Taylor	*Dub.taylor@cpa.state.tx.us*	
UT	Department of Facilities and Construction	State Building Energy Efficiency Program	Curtis Clark	*curtisclark@utah.gov*	*http://dfcm.utah.gov/const_energy.php*
UT	Governor's Office	Energy Advisor	Dianne Nielsen	*dnielson@utah.gov*	
UT	Department of Natural Resources	Energy Program Coordinator	Glade Sowards	*gladesowards@utah.gov*	*http://naturalresources.utah.gov/divisions/geological-survey.html*

TABLE G.1 STATE LBE PROGRAMS AND CONTACTS *(cont.)*

State	Agency	LBE Program/Initiative	State Contact		Web Site
			Name	E-mail	
UT	Department of Natural Resources	Energy Coordinator	Mary Ann Wright	*maryannwright@utah.gov*	*http://naturalresources.utah.gov/divisions/geological-survey.html*
VA	Office of the Governor	Energy Savings in Government Buildings	Steve Walz	*Stephen.Walz@governor.virginia.gov*	*http://www.dmme.virginia.gov/vaenergyplan.shtml*
WA	Department of Administration	State Sustainable Design Program	Stuart Simpson	*ssimpso@ga.wa.gov*	*http://www.ga.wa.gov/EAS/green/index.html*
WI	Department of Administration	Alternative Fuels Program	Maria Redmond	*Maria.Redmond@wisconsin.gov*	*http://www.doa.state.wi.us/section_detail.asp?linkcatid = 419*
WI	Department of Administration	Division of Energy	Jim Mapp	*jim.mapp@wisconsin.gov*	*http://www.doa.state.wi.us/energy/index.asp*
WI	Department of Administration	Division of State Facilities	Rob Cramer	*Robert.cramer@wisconsin.gov*	*http://www.doa.state.wi.us/dsf/index.asp*
WI	Department of Administration	*Focus on Energy*, Government Buildings Program	1-800-762-7077 (general inquiries)	*Govinfo@focusonenergy.com*	*http://energytaskforce.wi.gov/docview.asp?docid=31*
WI	Department of Administration	*Focus on Energy*, Schools Program	1-800-762-7077 (general inquiries)	*Edinfo@focusonenergy.com*	*http://energytaskforce.wi.gov/docview.asp?docid=31*
WI	Office of Energy Independence	Biofuels and State Fleets	Brian Driscoll	*brian.driscoll@wisconsin.gov*	*http://power.wisconsin.gov/*

APPENDIX H

State LBE Tracking Tools and Resources

States are tracking the effectiveness of their LBE policies and programs, especially in terms of reduced energy consumption and the environmental and economic benefits associated with these reductions. This appendix provides information to help states identify and effectively use a variety of tracking tools. Additional information on tracking LBE projects and programs is provided in Chapter 6, *Track, Evaluate, and Report on Progress*.

APPENDIX H CONTENTS

TABLE H.1 SUMMARY OF LBE TRACKING TOOLS

Tool	Sector	Level of Analysis	Method	Description	Availability	Section No.
Tools for Assessing Building Performance						**H.1**
Portfolio Manager	Buildings	Buildings	Uses building characteristics and monthly energy use history.	Measures and tracks energy use and performance of buildings.	Free	H.1.1
Delta Score Estimator	Buildings	Buildings	Spreadsheet tool.	Estimates the percent energy reduction needed to improve an energy rating to the target rating.	Free	H.1.2
Target Finder	Buildings	Buildings	Uses new building characteristics and intended energy use during the design phase.	Sets aggressive energy performance targets for new buildings.	Free	H.1.3

TABLE H.1 SUMMARY OF LBE TRACKING TOOLS *(cont.)*

Tool	Sector	Level of Analysis	Method	Description	Availability	Section No.
Service and Product Providers (SPPs)	Negotiable	Negotiable	SPPs manage billing information and provide energy tracking services.	Analyses of energy consumption.	User fee	H.1.4
METRIX	Building	Project	Management of billing information.	Tracks energy consumption and potential savings.	User fee	H.1.5
Small Business Calculator	Buildings	Project	Uses building characteristics and energy use history.	Estimates a facility's energy intensity and potential energy and cost savings from energy efficiency upgrades.	Free	H.1.6
ENERGY-10™	Buildings	Whole-building design	Simulates energy consumption.	Assesses energy consumption and potential savings.	User fee	H.1.7
Utility Manager™	Buildings	Project	Manages billing information.	Tracks energy consumption.	User fee	H.1.8
Building Life Cycle Cost (BLCC) Program	Buildings	Buildings	Performs an economic analysis of provided costs of alternative building designs	Uses life-cycle costing to assess the relative cost-effectiveness of alternative building designs	Free	H.1.9
Building Energy Consumption Simulation Models	Buildings	Buildings and Projects	Simulates energy consumption.	Assesses energy consumption and potential savings.	Free	H.1.10
Emission Inventory Tools						**H.2**
CACP	All	Facilities	Emissions factors.	Develops emission inventories and analyzes emission reduction measures.	Free	H.2.1
GHG Protocol Initiative	All	All	GHG protocol.	Spreadsheet and guidelines to conduct emissions inventory.	Free	H.2.2
GHG Equivalencies Calculator	All	Project	Simple data entry form.	Translates GHG reductions into terms that are easier to conceptualize.	Free	H.2.3
ISO 14064 Standards	All	Project, organization	Published standards for accounting and verifying GHG emissions.	Includes tools and guidance for quantifying, verifying, and reporting GHG emission reductions.	User fee	H.2.4
eGRID	All	Electricity	Database information on utilities.	Emissions factors.	Free	H.2.5
CHP Emissions Calculator	CHP	CHP systems	Spreadsheet tool.	Calculates emissions from CHP system and compares to system using separate heat and power.	Free	H.2.6

TABLE H.1 SUMMARY OF LBE TRACKING TOOLS *(cont.)*

Tool	Sector	Level of Analysis	Method	Description	Availability	Section No.
Power Profiler	Region	Electricity	Data entry form by Zip code.	Evaluates air pollution and GHG impacts of electricity choices.	Free	H.2.7
State Inventory Tool (currently under development)	All	All	Default pre-loaded data from federal government on state GHG sources.	Assists states in developing GHG emission inventories.	Free	H.2.8
Emissions Forecasting Tool (currently under development)	All	All	Combines results from State Inventory Tool with federal emissions forecasts.	Assists states in forecasting business-as-usual emissions through 2020.	Free	H.2.9
Landfill Gas Emissions Model	Municipal solid waste landfills	Site	Calculates emissions rates based on landfill content and user-specified methane concentrations.	Enables states to estimate emission rates for GHGs and other pollutants resulting from landfills.	Free	H.2.10
Energy Savings Tools						**H.3**
EPA Energy Savings Calculators	Building	Project	Simple transparent spreadsheet tools.	Calculates energy savings and cost savings.	Free	H.3.1
DOE Energy Savings Calculators	Building	Project	Simple transparent spreadsheet tools.	Calculates energy savings and cost savings.	Free	H.3.2
Community Energy Opportunity Finder	Community	Building	Data entry form for building and community characteristics.	Calculates community benefits from energy efficiency and renewable energy opportunities.	Free	H.3.3
eCalc	Buildings in Texas	Building	Based on Texas buildings code.	Estimates energy savings potential.	Free	H.3.4
F-Chart Software	Renewables	Facilities, Building	Estimation of energy from solar installation.	Estimates energy savings from solar installation.	User fee	H.3.5
Financial and Economic Analysis Tools						**H.4**
Cash Flow Opportunity (CFO) Calculator	Existing Buildings	Facility	Financial decision-making tool.	Quantifies the costs of delaying energy efficiency improvements.	Free	H.4.1
Building Life-Cycle Cost (BLCC) Software	Buildings	Buildings	Analysis of capital investments in buildings.	Evaluates alternative designs that have higher initial costs but lower operating-related costs over the project life than the lowest-initial-cost design.	Free	H.4.2
Measurement and Verification Protocols						**H.5**
Environmental Management Systems	All	All	Management system for reducing environmental impacts and increasing operating efficiencies.	Provides a structured approach for monitoring and verifying energy use and savings.	Free	H.5.1

TABLE H.1 SUMMARY OF LBE TRACKING TOOLS *(cont.)*

Tool	Sector	Level of Analysis	Method	Description	Availability	Section No.
International Performance, Measurement, and Verification Protocol (IPMVP)	Buildings	Projects, Buildings, Facilities	Protocols and procedures for measuring and verifying energy efficiency, water efficiency, and renewable energy projects.	Provides framework for calculating and documenting energy and emissions reductions.	Free	H.5.2
Weather Normalization Information						**H.6**
Energy Cap Weather Software	Weather	All	Database with weather data.	Can be used to normalize LBE tracking results for variations in weather.	Free	H.6.1
National Oceanic and Atmospheric Administration (NOAA)	Weather	All	Databases with historical climate trends.	Can be used to normalize LBE tracking results for variations in weather.	Free	H.6.2
Additional Information Resources						**H.7**
EPA Green Power Partnership	Renewables	All	Database of green electricity providers.	Information on green electricity purchase.	Free	H.7.1
EPA Climate Leaders Program	Industry	All	Partnership to develop comprehensive climate change strategies.	Partners set GHG goals and conduct emission inventories to measure progress.	Free	H.7.2
EPA CHP Partnership	CHP	All	Information on CHP installation.	Estimates CO_2 reduction.	Free	H.7.3
School and University Partnerships	Schools and universities	All	Information on clean energy in K–12 schools and universities.	Uses vary according to resource.	Free	H.7.4
Additional Tools						**H.8**
	A number of additional tools are available for estimating the impacts of LBE activities.				Vary	H.8.1–H.8.8

H.1 TOOLS FOR ASSESSING BUILDING PERFORMANCE

H.1.1 PORTFOLIO MANAGER

EPA's Portfolio Manager is an on-line, interactive, software tool that makes benchmarking energy performance simple and accessible and enables states and other users to assess and track building energy performance.

Portfolio Manager tracks energy and water consumption by managing entire portfolios of buildings in a secure on-line environment. The tool calculates site energy intensity and weather-normalized source energy intensity for any building type; for certain building types it also provides a national energy performance rating. Once a baseline is established, Portfolio Manager can track the energy reduction and progress toward energy goals.

Key Features

Portfolio Manager allows users to:

- Track multiple energy and water meters for each facility
- Customize meter names and key information
- Benchmark facilities relative to their past performance
- View percent improvement in weather-normalized source energy
- Monitor energy and water costs
- Share building data with others

Rating Energy Performance

States can rate their building's energy performance on a scale of 1–100 relative to similar buildings nationwide. EPA's energy performance rating system, based on source energy, accounts for the impact of weather variations as well as key physical and operating characteristics of each building. Buildings rating 75 or greater may qualify for the ENERGY STAR.

The following types of commercial buildings, which represent over 50% of U.S. commercial floor space, are currently eligible to receive a rating:

Offices (general offices, financial centers, bank branches, and courthouses)

- K–12 schools
- Hospitals (acute care and children's)
- Hotels and motels
- Medical offices
- Supermarkets
- Residence halls/dormitories
- Warehouses (refrigerated and non-refrigerated)

EPA is developing rating criteria for additional segments of the commercial building market.

Verifying and Tracking Building Performance

Portfolio Manager can be used to verify building performance and track the progress of improvement projects. Users can generate a Statement of Energy Performance (SEP) for each building, which summarizes important energy performance information and building characteristics that are needed to:

- Apply for the ENERGY STAR
- Satisfy LEED-EB requirements
- Support mortgage, sale, and/or lease transactions
- Document performance in energy service contracts
- Communicate with tenants/owner/customers

Required Data

To assess building energy performance, users enter information about a building's physical characteristics, operating characteristics, and energy consumption, including, for example:

- Address (e.g., Zip code is used for weather normalization)
- Gross floor area
- Weekly operating hours
- Number of occupants
- Number of personal computers
- Monthly energy consumption for all fuel types
- Activity or operation data related to specific buildings

Renewable energy (e.g., solar) that is produced on site counts as energy savings rather than energy use. Hence, this information is not entered as energy consumption data.

For additional information on data requirements by type of building: *http://www.energystar.gov/index.cfm?c = eligibility.bus_portfoliomanager_eligibility*.

Modeling Approach/Calculating an Energy Performance Rating

To assess the performance of a building using the national energy performance rating system, two calculations are made after the user enters the required data. First, the user's actual annual source energy use (in kBTU/yr) is weather-normalized to reflect the building's annual source energy use during a normal (i.e., 30-year average) weather year.

Second, a regression model is run to calculate a predicted source energy use value based on the operating characteristics entered by the user. To calculate this value, the building's weather normalized source energy use is compared to a table of customized source energy use values.

CALCULATING SOURCE ENERGY

Source energy includes site energy plus the energy used to produce the site energy, such as the energy required to generate, transmit, and distribute the site energy to the building. Site energy use of each fuel is converted to its source equivalent using standard site-source energy conversion factors and then summed to yield annual total source energy use for each building.

Site	Source	
Fuel Type	(kBTU)	
Electricity	1	3.013
Natural gas	1	1.024
Fuel oil	1	1
Steam	1	1.38
Hot water	1	1

For additional information: *http://www.energystar.gov/index.cfm?c = evaluate_performance.bus_benchmark_comm_bldgs.*

Based on the building information provided by the user (e.g., size, location, number of occupants, number of personal computers), the rating system estimates how much energy the building would use if it were the best performing building, worst performing building, and every level in between. The system then compares the actual energy data for the building to the estimated values to determine where each building ranks relative to its peers.

All of the calculations are based on source energy. Using source energy is the most equitable way to compare building energy performance and correlates best with environmental impacts and energy costs.

To estimate building ratings, EPA conducts statistical analysis on data gathered by the DOE's Energy Information Administration during its quadrennial Commercial Building Energy Consumption Survey (CBECS). For each type of building for which EPA provides a rating, EPA goes through a rigorous process that involves:

- Ensuring that the quality and quantity of the data will support a rating
- Creating a statistical model that correlates the energy data to the operational characteristics for each building to identify the key drivers of energy use
- Testing the model with real buildings

In addition, each building's actual source energy data is normalized. This enables EPA to assess a building's performance relative to the typical weather in that region, without bias for the specific weather patterns during the rating year.

For additional information on the specific data analysis conducted for each available building type: *http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager_model_tech_desc*.

For additional information about weather normalization: *http://www.energystar.gov/index.cfm?c=business.bus_weather_normalization*.

Other Features

Portfolio Manager provides a variety of additional features, including:

- *Adjusted Percent Energy Reduction,* which measures the percentage change in a facility's energy consumption between its baseline energy period and current energy period. This provides a means to measure facility performance even if the facility cannot generate an energy performance rating.
- *Master Accounts,* which allow the centralized viewing of energy data across a number of portfolios. To allow other organizations to track the performance of a portfolio, building owners and operators can use a master account to share facility information. For example, a government agency can establish a master account to track the performance of all city departments, or an association can track the progress of its members.
- *Create Views,* a customized feature for reporting needs such as energy consumption, average energy intensity, rating of entire portfolio, and energy and dollar savings.
- CO_2 *emissions* tracking feature.
- *Water use* tracking feature.
- *A Group* feature, which allows users to manage data for individual buildings or groups of buildings. Users can group their building by any grouping criteria they choose. The tool includes a facility summary page that provides detailed information for each individual facility entered into Portfolio Manager.

Portfolio Manager Web site: *http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager*.

H.1.2 DELTA SCORE ESTIMATOR

This Excel spreadsheet tool provides a quick way to identify the relationship between the energy performance rating obtained through ENERGY STAR tracking tools and the percentage of energy saved in a building. After a building has been benchmarked and a current energy performance rating established, Delta Score can estimate the percent energy reduction needed to improve the existing rating to the target rating. In addition, it can be used to estimate a new energy performance rating by entering a percent reduction in energy use.

Web site: ***http://www.energystar.gov/index.cfm?c = delta.index.***

H.1.3 TARGET FINDER

Target Finder can be used to set energy performance goals, receive a rating for the intended energy use for new building design projects, and determine if projects are among the top 25% of buildings in the nation, in terms of intended energy performance. To set an energy target, states:

- Enter data on Zip code and building type for the new building that is being designed
- Select an energy performance target for achieving any of the following goals
  - *The "Designed to Earn the ENERGY STAR" rating*. Users can select a rating of 75 higher from the Target Rating section in Target Finder. It will display the EPA energy performance rating target using a 1–100 scale.
  - *The 2030 challenge and AIA goal*. Users select the Energy Reduction Target for 50% less than an average building.
  - *Other design targets*. Users can select a target for building types not available in Target Finder by using the *2003 Commercial* Buildings *Energy Consumption Survey National Averages and Design Targets*. These design targets are not normalized for climate nor adjusted for activities that may affect energy use. All targets are expressed in energy use intensity.

Target Finder displays the following data about the new building's design:

- Energy performance rating (1–100)—ENERGY STAR
- Energy reduction percentage (from an average building)—AIA/2030 Challenge Goal
- Source and site energy use intensity (kBTU/sf/yr)
- Source and site total annual energy use (kBTU)
- Total annual energy cost

Web site: ***http://www.energystar.gov/index.cfm?c = new_bldg_design.bus_target_finder.***

H.1.4 SERVICE AND PRODUCT PROVIDERS

SPPs offer energy management assistance either by selling a utility/energy accounting software product or providing energy accounting and analysis services. EPA has worked with these private companies to determine EPA energy performance ratings for eligible buildings. SPPs organize utility bill information into a database that manages energy expenses. They have developed software to identify opportunities for cost savings and energy efficiency and integrate Portfolio Manager benchmarking to provide the EPA energy performance rating. Some of these software products can also be used for forecasting, budgeting, and scenario analysis.

GEORGIA'S ENERGY ACCOUNTING SYSTEM

GEFA issued an RFP to develop an energy accounting system to track and analyze energy consumption for all state facilities. The goal is to secure a sophisticated, in-house energy accounting system that will permit the state to accurately report on its energy consumption and identify, initiate, and manage facility-specific or enterprise-wide cost saving strategies. The system will allow benchmarking buildings using Portfolio Manager. The system will also feature:

Creating groups of similar facilities (e.g., prisons, office buildings, dorm)

Comparing facilities (within a group and otherwise) according to criteria such as cost per kWh, cost per therm, energy expenditure per square foot, energy expenditure per occupant, and energy use per square foot per degree day

Source: Georgia, 2006.

TEXAS ENERGY MANAGEMENT PROJECT

Texas entered a four-year self-funded energy savings project with an SPP that will use the ENERGY STAR Portfolio Manager tool to help save the state an estimated $180 million in energy and other utility costs. As part of the Texas energy management project implementation, Texas will benchmark and track the performance of state buildings and to evaluate the energy performance of state buildings on the Portfolio Manager scale of 1 to 100, comparing them to similar buildings nationwide. The project will be funded by energy cost savings and will be completed at no cost to Texas. This energy performance project can serve as a model for other public and private entities that seek to improve energy performance and reduce energy costs.

Source: SECO, year.

The companies listed in Table H.1.1 offer EPA's energy performance ratings and links to ENERGY STAR as a part of their commercial energy information services.

TABLE H.1.1. SELECTED SERVICE AND PRODUCT PROVIDERS

Provider Name	Contact	Total Buildings Rated (as of 7/11/06)
Avista Advantage[a]	Ed Schlect 509-329-7602	4,259
Save More Resources[a]	Renee Rodgers 970-255-9786 x224	608
Cadence Network	Mark Duffer 513-763-3106	299
Energard	Kelly Scace 425-881-3451	148
Johnson Controls	Gerrit Reinders 414-524-7331	91
EnergySolve	Jeff Alba 203-245-0034	50
ei[3]	Spencer Cramer scramer@ei3.com	31
UtilityAccounts.com	Travis Vickford 716-852-4279	1

[a] These service providers are 2006 ENERGY STAR Partners of the Year.

Source: ENERGY STAR, 2007.

Web sites: ***http://www.energystar.gov/index.cfm?c=spp_res.pt_spps_automated_benchmarking; http://www.energystar.gov/index.cfm?c=spp_res.pt_spps.***

H.1.5 METRIX 3

METRIX is a desktop utility accounting system that helps users track utility performance, benchmark facilities, measure savings from clean energy projects, set clean energy targets, and measure performance. The software program breaks energy tracking into a tuning period, a project installation period, and a performance period. The tuning period is used to establish the relationships between energy consumption and weather or other factors. This period allows corrections to be made for buildings with seasonal changes in energy use. Energy savings are tracked during the performance period, which begins at the end of a project installation period. The program projects baseline and target scenarios for the performance period and compares actual use with both projections. This program allows users to manually choose weather correction parameters. It can correct for heating degree-days, cooling degree-days, and user-defined production variables on a single meter. Project data can be imported from Market Manager, a building energy analysis program, for setting target energy consumption levels. METRIX also has a variety of options for electronic data input via ASCII or EDI formats.

Web site: ***http://www.abraxasenergy.com/intrometrix4.php.***

H.1.6 SMALL BUSINESS CALCULATOR

The ENERGY STAR Small Business Calculator can be used to estimate a facility's energy intensity and the potential energy and cost savings that can be achieved by implementing energy efficiency upgrades. By entering the size and type of a building and recent energy bill data, a facility manager or small business owner can determine the energy intensity of the facility in terms of energy used per square foot of space. The ENERGY STAR guide, *Putting Energy Into Profits,* provides background information about this tool.

Web sites: Calculator: ***http://www.energystar.gov/index.cfm?c=intensive_calc.mgr.***

Guide: ***http://www.energystar.gov/index.cfm?c=small_business.sb_index.***

H.1.7 ENERGY-10™

ENERGY-10™ software analyzes and illustrates the energy and cost savings that can be achieved by applying up to a dozen sustainable design features. This integrated design tool is ideal for use during the early design phases of moderate-sized (e.g., up to 50,000 sq. ft.) projects. ENERGY-10™ includes a set of integrated design guidelines and software for performing energy and cost calculations based on local climate, building orientation, materials, systems, and the interactions among them. Future program upgrades are expected to address larger structures.

Web site: ***http://www.nrel.gov/buildings/energy10.html.***

H.1.8 UTILITY MANAGER™

This software tool targets both the private sector and public sector markets. The program tracks line items from utility bills and generates reports that enable facility managers to identify billing errors and consumption anomalies, track and compare facilities, mark trends, make accurate projections, and create budgets. The

software can be purchased as part of a package that includes on-site training.

Web site: ***http://www.savemoreresources.com/solutions/inhouse.php.***

H.1.9 BUILDING LIFE CYCLE COST (BLCC) PROGRAM

The BLCC computer software program, developed by the National Institute of Standards and Technology, was designed to conduct economic analyses of alternative building designs by evaluating the relative cost-effectiveness of building systems or components. Analyses include calculations of net savings, savings-to-investment ratio, adjusted internal rate of return, and payback period. The program software is typically used to evaluate the relative benefits of building projects that have higher initial costs - but lower life-cycle costs - than conventional building projects with lower initial costs. The software can be particularly helpful in assessing the benefits and costs of incorporating water conservation technologies and renewable energy systems into a project design.

Web site: ***http://www1.eere.energy.gov/femp/information/download_blcc.html.***

H.1.10 BUILDING ENERGY CONSUMPTION SIMULATION MODELS (DOE-2, EQUEST, ENERGYPLUS)

Simulation is an effective way to pre-test proposed programs, plans, or policies before actual implementations. By using computer-based simulation models, it is possible to estimate in detail the consequences and implications of a particular project development on energy consumption.

DOE-2 is a computer program for designing energy-efficient buildings. Developed for DOE by the LBNL's Simulation Research Group, DOE-2 is a widely-used building energy analysis program that can predict the energy use and cost for all types of buildings. DOE-2 uses a description of the building layout, infrastructure, occupant usage, conditioning systems (e.g., lighting, HVAC) and utility rates provided by the user, along with weather data, to perform an hourly simulation of the building and to estimate utility bills.

EQUEST is an energy use analysis tool designed to perform detailed comparative analyses of building designs and technologies by applying sophisticated building energy use simulation techniques but without requiring extensive experience in the "art" of building performance modeling. This is accomplished by combining schematic and design development building model creation wizards, an energy efficiency measure wizard, and a graphical results display module with an enhanced DOE-2-derived building energy use simulation program.

EnergyPlus is an innovative building energy simulation program with capabilities such as sub-hour time steps, built-in template and external modular systems that are integrated with a heat balance-based zone simulation, and input and output data structures tailored to facilitate third-party module and interface development. Other capabilities include multi-zone airflow, moisture adsorption/desorption in building materials, radiant heating and cooling, and PV simulation.

Web site: ***http://www.doe2.com/DOE2/***

H.2 EMISSION INVENTORY TOOLS

The tools described in this section can be used to estimate the emissions associated with energy consumption and the emission reductions associated with reduced energy consumption.

H.2.1 CACP SOFTWARE

The National Association of Clean Air Agencies (NACAA, formerly STAPPA and ALAPCO) CACP is a Windows-based software tool designed to help state and local governments develop harmonized strategies to reduce both GHG and air pollution emissions. It allows users to create a cross-sectoral emission inventory at the entire community level or at the government operations level only. The software disaggregates government's own operations into seven main areas of analysis (see Table H.2.1). Using an extensive set of emissions factors, the software creates a comprehensive inventory of emissions resulting from government operations.

In addition to developing an inventory of cross-sector emissions, the CACP software offers a "measure" module that can provide users with suggested demand-side strategies for managing emissions. The "government measures" module helps assess the relative benefits and drawbacks of potential emission reduction measures by quantifying the projected GHG and criteria air pollutant emissions resulting from government-owned and -operated facilities and activities in both baseline and project scenarios. Possible measures described within the module include energy efficiency measures,

TABLE H.2.1. CACP SECTORS AND DATA REQUIREMENTS

Sector	Required Data	Optional Data
Buildings	Name of building or building group, energy consumption, and costs by type of fuel.	Floor area, operating hour, occupants.
Vehicle fleet	Name of vehicle or vehicle group, energy consumption by type of fuel or vehicles mile traveled by type of vehicle, and costs.	A complete set of fuel efficiency indicators are already predefined in the software.
Employee commute	Name of employee commute group, energy consumption by type of fuel or vehicles mile traveled by type of vehicle, and costs.	A complete set of fuel efficiency indicators are already predefined in the software.
Streetlights	Name of streetlight group, energy consumption, and costs by type of fuel (electricity/green electricity).	Number of street lights.
Water/ sewage	Name of water and/or sewage group, energy consumption, and costs by type of fuel.	Output in liters.
Waste	Name of landfill site or landfill group, tons of waste disposed per year, % category (e.g., paper, food), haulage and tipping costs, and waste disposal technology (e.g., open dump, open burning, incineration).	Employees.
Other	Allows users to account for emissions not represented in the sectors listed above.	

Source: CACP, 2006.

changes in energy source or fuel type, changes in vehicle types and vehicle miles traveled, and waste reduction and recycling measures.

Web site: ***http://www.cacpsoftware.org/.***

H.2.2 GHG PROTOCOL INITIATIVE

The World Resources Institute and the World Business Council for Sustainable Development (WRI/WBCSD) developed the Greenhouse Gas Protocol Initiative (GHG Protocol) to harmonize international GHG trading schemes. The GHG emission calculation tool offers step-by-step guidance for calculating GHG emissions data. The tool includes a guidance section and automated worksheets. Most agencies will need to apply more than one worksheet to cover the complete inventory of their GHG sources, which can include CO_2 emissions from building energy consumption, employee commuting, and business travel.

The automated worksheet section requires users to input activity data and appropriate emission factors; default emissions factors are provided if users do not enter them. The emissions of different GHGs are calculated separately and converted to CO_2 equivalents on the basis of their global warming potential.

Web site: ***http://www.ghgprotocol.org/.***

H.2.3 GHG EQUIVALENCIES CALCULATOR

The Greenhouse Gas Equivalencies Calculator is designed to translate GHG reductions from units such as tons and metric tons, into units that can be easier to conceptualize (e.g., equivalent number of cars not driven for one year). Results from the calculator can be used for communicating reduction targets and developing a GHG reduction strategy.

Web site: ***http://www.epa.gov/cleanenergy/energy-resources/calculator.html.***

H.2.4 ISO 14064 STANDARDS

The International Organization for Standardization (ISO) has published standards for accounting and verifying GHG emissions by government and industry sources. The new standards include an integrated set of tools for programs aimed at reducing emissions, including guidance at the organization level for quantifying and reporting emissions; at the project level; and for validating and verifying GHG emissions.

Web site: ***http://www.iso.org/iso/pressrelease.htm?refid=Ref994.***

H.2.5 EGRID

EPA's eGRID is a comprehensive source of data on the environmental characteristics of domestic electric power generation. It compiles data from 24 federal sources on emissions and resource mixes for virtually every power plant and company that generates electricity in the United States. It also provides user search options, including aspects of individual power plants, generating companies, states, and regions of the power grid. The current version contains U.S. power plant emission totals for 1996 through 2000, and state-by-state power plant emission totals for 2000.

Web site: ***http://www.epa.gov/cleanenergy/egrid/index.htm.***

H.2.6 CHP EMISSIONS CALCULATOR

The CHP Emissions Calculator is a tool that compares the anticipated emissions from a CHP system to the emissions from separate heat and power systems. Users select from a large number of different separate heat and power system profiles and compare them to a CHP system (characterized by the user). The calculator then estimates the carbon, CO_2, SO_2, and NO_x emissions from both systems and the corresponding emission reductions achieved by the CHP system. In addition to estimating emission reductions, the calculator presents the carbon equivalency of these reductions in terms of acres of trees planted and number of cars removed from the road. This tool is designed for users with at least a moderate understanding of CHP technology and terminology. Results are intended for educational and outreach purposes; the tool is not designed for developing emission inventories or preparing permitting processes.

Web site: ***http://www.epa.gov/chp/basic/calculator.html.***

H.2.7 POWER PROFILER

The EPA Power Profiler is an online tool that allows users to evaluate the air pollution and GHG impacts of their electricity choices. Using only a zip code, the Power Profiler can evaluate the environmental benefits of choosing cleaner sources of energy as compared with conventional energy sources. It is particularly useful given increased opportunities for customer choice, which allows many electricity customers to choose the source of their power.

Web site: ***http://www.epa.gov/cleanenergy/powerprofiler.htm.***

H.2.8 STATE INVENTORY TOOL

EPA's State Inventory Tool (SIT) is an interactive spreadsheet model designed to help states develop GHG emissions inventories. SIT gives users the option of applying their own state-specific numbers or using default data pre-loaded for each state. The default data is gathered by federal agencies and other sources covering fossil fuels, agriculture, forestry, waste management, and industry. SIT provides a streamlined way to update an existing inventory or complete a new inventory and is also accompanied by updated guidance describing best practices.

Web site: ***http://www.epa.gov/climatechange/wycd/stateandlocalgov/analyticaltools.html.***

H.2.9 EMISSIONS FORECASTING TOOL

This spreadsheet model builds on the design of the EPA State Inventory Tool (SIT) to help states create forecasts of business-as-usual GHG emissions through 2020. The tool estimates future emissions through a combination of linear extrapolation of SIT results and economic, energy, population, and technology forecasts conducted by the federal government. The tool can be customized, allowing states to enter their own assumptions about future growth and consumption patterns.

Web site: ***http://www.epa.gov/climatechange/wycd/stateandlocalgov/analyticaltools.html.***

H.2.10 LANDFILL GAS EMISSIONS MODEL

The EPA Landfill Gas Emissions Model is an automated tool for estimating air pollutant emissions from municipal solid waste landfills. The model can be used to estimate emission rates for methane, carbon dioxide, non-methane organic compounds, and individual air pollutants from landfills. The program can also be used by landfill owners and operators to determine if a landfill is subject to the control requirements of the federal New Source Performance Standard for new MSW landfills (40 CFR 60 Subpart WWW) or the emission guidelines for existing MSW landfills (40 CFR 60 Subpart Cc).

Web site: ***http://www.epa.gov/lmop/res/index.htm#5.***

H.3 ENERGY SAVINGS TOOLS

The tools described in this section can be used to estimate the energy savings associated with different clean energy measures and products.

H.3.1 EPA ENERGY SAVINGS CALCULATORS

EPA has developed a series of simple customizable tools that calculate energy savings and cost savings from ENERGY STAR-qualified equipment. Descriptions of a selection of products for which energy savings calculators are available are presented below. EPA periodically updates its savings calculators so it is important to check the Web site to identify the most updated version.

Web site: ***http://www.energystar.gov/index.cfm?c = bulk_purchasing.bus_purchasing.***

Lighting

Exit Signs. More than 100 million exit signs are in use throughout the United States. Typically lit by

incandescent bulbs, these signs consume 30–35 billion kWh hours of energy each year.

Web site: ***http://www.energystar.gov/index.cfm?c=exit_signs.pr_exit_signs.***

Compact Fluorescent Lights (CFLs). ENERGY STAR-qualified CFLs use 66% less energy than a standard incandescent bulb and last up to 10 times longer. Replacing a 100-watt incandescent with a 32-watt CFL can save at least $30 in energy costs over the life of the bulb.

Web site: ***http://www.energystar.gov/index.cfm?c=cfls.pr_cfls.***

Light Fixtures. ENERGY STAR-qualified light fixtures must last at least 10,000 hours. This means that with regular use (i.e., four hours per day), an ENERGY STAR bulb would not need to be replaced for at least seven years.

Web site: ***http://www.energystar.gov/index.cfm?c=fixtures.pr_light_fixtures.***

Traffic Signals. Energy and cost savings from LEDs are significantly better than standard incandescent signals, and many states, cities, and counties have already adopted LEDs to take advantage of these benefits. Transportation and public works officials are encouraged to specify and purchase ENERGY STAR-qualified traffic signals.

Web site: ***http://www.energystar.gov/index.cfm?c=traffic.pr_traffic_signals.***

Office Equipment

Office Equipment. Energy savings calculators are available for a variety of different types of office equipment, including computers, copiers, external power adapters, fax machines, laptops, mailing machines, monitors, multifunction devices, printers, scanners, and water coolers.

Web site: ***http://www.energystar.gov/index.cfm?c=ofc_equip.pr_office_equipment.***

Heating and Cooling

Heating and Cooling Equipment. Replacing old cooling and heating equipment with more efficient, ENERGY STAR-qualified equipment is one way to save energy and money.

Web site: ***http://www.energystar.gov/index.cfm?c=heat_cool.pr_hvac.***

Air Conditioning. About one-sixth of all the electricity generated in the United States is used to cool buildings.

Web site: ***http://www.energystar.gov/index.cfm?c=cac.pr_central_ac.***

Boilers. Whether gas or oil, ENERGY STAR-qualified boilers use about 10% less energy than a standard boiler.

Web site: ***http://www.energystar.gov/index.cfm?c=boilers.pr_boilers.***

Ducts. Ducts are an integral part of a forced-air heating or cooling system and their purpose is to circulate air to evenly heat and cool a building. Unfortunately, ducts are often leaky—wasting 7–12% of heating and cooling energy used.

Web site: ***http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_ducts.***

Heat Pumps. Electric air-source heat pumps, often used in moderate climates, use the difference between outdoor air temperatures and indoor air temperatures to cool and heat.

Web site: ***http://www.energystar.gov/index.cfm?c=geo_heat.pr_geo_heat_pumps.***

H.3.2 DOE ENERGY SAVINGS CALCULATOR TOOLS

DOE's Office of Energy Efficiency and Renewable Energy maintains a database of software tools for evaluating energy performance in buildings and the associated costs and savings resulting from energy efficiency improvements. The database provides descriptions of each software tool, including required expertise to use each tool and the strengths or weaknesses of each tool. The database can be searched by a number of narrowing criteria to find the most appropriate tool.

Web site: ***http://www.eere.energy.gov/buildings/tools_directory/.***

H.3.3 COMMUNITY ENERGY OPPORTUNITY FINDER

The Community Energy Opportunity Finder is an interactive tool that can help determine a community's energy efficiency investment opportunities that are most likely to benefit the local economy, the community, and the environment. This tool helps collect information on a community's energy use, and then presents the potential benefits from specific programs,

including energy savings, dollar savings, reductions in CO_2, NO_x, and SO_2 emissions, and job creation. The Finder also provides an overview of the kinds of renewable energy sources that could power the community.

Web site: http://www.energyfinder.org.

H.3.4 ECALC

ECalc is a collection of Texas-based, Web-based calculators that building managers can use to design and evaluate a wide range of projects for energy savings and emission reduction potential. ECalc routes user-provided data to various specialty tools, including the DOE-2 program, PV-Chart, the ASHRAE Inverse Model Toolkit, and E-GRID. Using data obtained from these tools, ECalc calculates energy savings and associated CO_2 reductions for new buildings, community projects, and renewable energy sources. Community projects include municipal buildings (new construction and retrofits), street lights (new construction and retrofits), traffic lights (new construction and retrofits), municipal water supply and waste-water systems (retrofit only), and wind energy systems (new systems connected to the grid).

Web site: *http://ecalc.tamu.edu/.*

H.3.5 F-CHART SOFTWARE

F-CHART software estimates solar energy production and installation. It calculates monthly electricity or thermal output produced by a solar PV or solar thermal system based on information specified by the user. It also contains a weather database.

Requisite information for calculating the benefits of solar energy includes the type of PV system, the area of the PV array, the array of solar photovoltaic collectors, including the area of the array, the slope of the array, and whether the collector array is facing south (i.e., array azimuth). Information needed to calculate the benefits of solar thermal systems includes the same details required for the PV system plus information about the design of the solar thermal system, including size of the heating pool, pool temperature, hours of operation per day, and daily hot water usage. F-CHART software uses these data to calculate the thermal energy produced by using solar energy and/or the thermal heating system.

Web site: *https://www.fchart.com/.*

H.4 FINANCIAL AND ECONOMIC ANALYSIS TOOLS

H.4.1 CFO CALCULATOR

This ENERGY STAR financial decision-making tool can be used to quantify the costs of delaying energy efficiency improvements. It answers questions about the quantity of energy-efficient equipment that can be purchased and financed using anticipated savings, the timing of energy efficiency investments, and whether waiting for a lower interest rate will affect an energy efficiency investment. By comparing the costs and benefits of financing a project now versus waiting for a lower interest rate, the tool can provide answers to critical financial questions.

Using graphs and tables, the CFO calculator is written so that managers who are not financial specialists can use it to make informed decisions, yet it is sophisticated enough to satisfy financial decision-makers.

Web site: *http://www.energystar.gov/ia/business/cfo_calculator.xls.*

H.4.2 BUILDING LIFE-CYCLE COST SOFTWARE

The BLCC Program was developed by the National Institute of Standards and Technology (NIST) to provide computational support for analyzing capital investments in buildings. The BLCC program conducts economic analyses by evaluating the relative cost-effectiveness of alternative buildings and building-related systems or components. Typically, BLCC software is used to evaluate alternative designs that have higher initial costs but lower operating-related costs over the project life than the lowest-initial-cost design. It is especially useful for evaluating the costs and benefits of energy and water conservation and renewable energy projects.

Web site: *http://www1.eere.energy.gov/femp/information/download_blcc.html.*

H.5 MEASUREMENT AND VERIFICATION PROTOCOLS

H.5.1 ENVIRONMENTAL MANAGEMENT SYSTEMS

An Environmental Management System (EMS) is a framework used by states to manage environmental affairs and issues, including those where legal requirements exist. An EMS allows organizations to identify

activities that may have an adverse impact on the environment, develop plans and controls to ensure personnel have adequate training to manage and comply with system requirements, ensure that regulated activities are properly monitored and measured, and identify opportunities for improving environmental performance and pollution prevention. An EMS can provide a structured way to monitor and verify energy use and savings in addition to identifying additional energy and money saving opportunities. EPA maintains a Web site that provides information about EMS services.

Web site: ***http://www.epa.gov/ems/.***

H.5.2 IPMVP PROTOCOL

The IPMVP provides an overview of best practices for verifying the results of energy efficiency, water efficiency, and renewable energy projects. IPMVP provides a framework for calculating and documenting energy and emission reductions from energy efficiency projects. It presents the user with several measurement and verification options based on a project's particular energy consumption calculations and project-specific factors, such as the complexity of the efficiency measures under evaluation and the risk expectations.

IPMVP can also be used to verify reductions in emissions and for emissions trading programs, defining broad techniques for determining energy savings, and defining savings on a project or facility scale.

Web site: ***http://www.evo-world.org/.***

H.6 WEATHER NORMALIZATION INFORMATION

H.6.1 ENERGY CAP WEATHER SOFTWARE

Energy Cap is a quick and easy-to-use Web-based tool that provides information on historical degree days for 1,200 stations in the United States and Canada from 1994 to present. Users select a weather station and balance point temperature, and the software provides degree day report charts that show mean daily temperature, cumulative heating and cooling degree days, and monthly comparisons of any two years. An optional report (provided via e-mail) compares month-by-month degree days for any two years and any balance point temperature. These reports can help states adjust LBE tracking results to account for variations in weather.

Web site: ***http://www.energycap.com/weather/.***

H.6.2 NOAA

NOAA provides extensive data sets relating to historical climate trends. Its National Climatic Data Center provides users with a searchable database from weather observation stations from around the country. Weather reports are available for each of these stations. Additionally, the Center maintains a library of heating and cooling degree days that can help states adjust LBE tracking results to account for variations in weather.

Web sites:

Station Locator: ***http://www.ncdc.noaa.gov/oa/climate/stationlocator.html***

Degree Day Reports: ***http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html.***

H.7 ADDITIONAL INFORMATION RESOURCES

H.7.1 EPA GREEN POWER PARTNERSHIP

EPA's Green Power Partnership provides assistance and recognition to organizations that demonstrate environmental leadership by choosing green power. The Web site provides information about green power and how to purchase it. It also includes the national Green Power Locator tool to help consumers find green power options throughout the country.

Web site: ***http://www.epa.gov/greenpower/index.htm.***

H.7.2 EPA CLIMATE LEADERS PROGRAM

Climate Leaders is a voluntary EPA industry-government partnership that works with companies to develop long-term comprehensive climate change strategies. Partners set a corporate-wide GHG reduction goal and conduct an inventory of their emissions to measure progress. By reporting inventory data to EPA, partners create a record of their accomplishments. EPA Climate Leaders Partners use the WRI/WBCSD GHG protocol to develop their GHG emission inventory. Companies are required to document emissions of the six major GHGs (i.e., CO_2, CH_4, NO_x, HFCs, PFCs, and SF_6) on a company-wide basis.

Web site: ***http://www.epa.gov/climateleaders/index.html.***

H.7.3 EPA CHP PARTNERSHIP

The CHP Partnership is a voluntary program that seeks to reduce the environmental impact of power generation by promoting the use of CHP. The Partnership works closely with energy users, the CHP industry, state and local governments, and other stakeholders to support the development of new projects and promote their energy, environmental, and economic benefits.

Web site: *http://www.epa.gov/chp/.*

H.7.4 SCHOOL AND UNIVERSITY PARTNERSHIPS

The following Web sites, many of which are maintained by the ENERGY STAR program or the DOE Energy Efficiency and Renewable Energy office, provide information on clean energy initiatives in schools and universities.

- K–12 Schools:
  - EPA ENERGY STAR for K–12 Schools: *http://www.energystar.gov/schools*
  - Energy Efficiency and Renewable Energy: *http://www1.eere.energy.gov/buildings/energysmartschools/*
  - National Clearinghouse for Educational Facilities: *http://www.edfacilities.org/rl/energy.cfm*
  - Rebuild America: *http://www.rebuild.gov*
- Colleges and Universities:
  - EPA ENERGY STAR for Higher Education: *http://www.energystar.gov/highered*
  - EPA 2006 College and University Green Power Challenge: *http://www.epa.gov/greenpower/documents/highed_challenge_apr07.pdf*
  - Creating an ENERGY STAR Showcase Dorm Room: *http://www.energystar.gov/index.cfm?c = news.nr_dormroom&layout = print*
  - EPA's C&U Sector Strategies program: *http://www.epa.gov/sectors/pdf/2006/collegesbw.pdf*
  - State University of New York at Buffalo: *http://wings.buffalo.edu/ubgreen/guidelines.html*

H.8 ADDITIONAL TOOLS

A number of additional tools for estimating the impacts of LBE activities are available, as described below.

H.8.1 TRACE 600

This tool was developed by Trane Corporation to support HVAC design criteria, space heating and cooling load calculations, free cooling and heat recovery, thermal storage, and chilled water piping arrangements.

Web site: *http://www.wbdg.org/tools/trace.php.*

H.8.2 HAP V4.0

The Hourly Analysis Program (HAP) is an energy simulation module developed by Carrier Corporation that performs an 8,760-hour energy simulation of building heat flow and equipment performance.

Web site: *http://www.commercial.carrier.com/commercial/hvac/general/1,CLI1_DIV12_ETI496,00.html.*

H.8.3 BLAST

Building Loads and System Thermodynamics (BLAST) performs hourly simulations of buildings and central plant equipment, and zone analysis based on the fundamental heat balance method. This tool can also be used to analyze thermal comfort, passive solar structures, high- and low-intensity radiant heat, moisture, and variable heat transfers coefficients.

Web site: *http://www.cecer.army.mil/td/tips/product/details.cfm?ID=132&TOP=1.*

H.8.4 TRNSYS

The Transient System Simulation (TRNSYS) program is used for HVAC analysis and sizing, solar design, daylighting, building thermal performance, PV systems, wind systems, and analysis of control schemes.

Web site: *http://sel.me.wisc.edu/trnsys/.*

H.8.5 ADELINE AND RADIANCE

These specialized design tools are also available to evaluate daylight, air flows [computational fluid dynamics (CFD)], three-dimensional heat flows, and other design considerations.

Web sites: *http://www.eere.energy.gov/buildings/tools_directory/software.cfm/ID = 28/*; *http://www.eere.energy.gov/buildings/tools_directory/software.cfm/ID = 66/.*

H.8.6 ALGOR

This program quantifies and illustrates airflows (CFD) and three-dimensional heat flows.

Web site: ***http://www.algor.com.***

H.8.7 ASEAM

A Simplified Energy Analysis Method (ASEAM) is a simplified energy analysis tool that can also create DOE-2 input files. This is easier to use but less accurate than DOE-2.

Web site: ***http://gundog.lbl.gov/dirsoft/d2whatis.html.***

H.8.8 FRESA

Federal Renewable Energy Screening Assistant (FRESA) assesses the feasibility of various renewable energy applications, including active solar heating, active solar cooling, daylighting with windows, skylights, PV systems, solar thermal electric, wind electricity, small hydropower, biomass electricity, cooling load avoidance, and infiltration control.

Web site: ***http://analysis.nrel.gov/fresa/.***

REFERENCES

- **CACP** 2006. Clean Air and Climate Protection Software Web site. Available: ***http://www.cacpsoftware.org/.*** Accessed: 12/06/2006.
- **ENERGY STAR** 2007. ENERGY STAR Web site. Service and Product Providers. **Available:** ***http://www.energystar.gov/index.cfm?c = spp_res.pt_spps_automated_benchmarking.*** Accessed: 1/14/2007.
- **Georgia** 2006. Personal communication with Kevin Kelly, Georgia Environmental Facilities Authority. June 8, 2006.
- **SECO**. Year. Texas Energy Management Project Text Box Source.

APPENDIX I

EM&V Protocols and Guidance

This appendix provides information on evaluation, measurement, and verification (EM&V) protocols and procedures. Tables I.1 and I.2 present some of the most commonly utilized federal and state EM&V manuals. In addition, this appendix lists other reference materials and resources. Additional information on M&V protocols can be found in Section 6.4, *Conduct Evaluations*.

FEDERAL GUIDELINES FOR DETERMINING INDIVIDUAL PROJECT SAVINGS

Table I.1 summarizes federal guidelines that are designed for determining savings from individual projects: IPMVP, FEMP M&V Guidelines, and ASHRAE Guideline 14.

STATE AND UTILITY PROGRAM EM&V GUIDELINES

Several utility- and state-sponsored performance-contracting programs offer incentive payments for verified energy savings. Each of these incentive programs has guidelines specifying their individual requirements for the EM&V of energy savings. Table I.2 presents examples of programs that have readily accessible guidelines.

APPENDIX I CONTENTS

TABLE I.1 GUIDELINES FOR DETERMINING SAVINGS FROM INDIVIDUAL PROJECTS

Title	Description	URL
International Performance Measurement and Verification Protocol	Provides a framework and definitions that can help practitioners develop M&V plans for their projects. It includes guidance on current best practice techniques available for determining energy savings and verifying the results of energy efficiency, renewable energy, and water efficiency projects in commercial and industrial facilities. The IPMVP includes separate volumes related to (1) determining energy savings, (2) improved indoor environmental quality, (3) determining energy savings in renewable energy technologies applications, and (4) determining energy savings in new construction. It is important to remember that the IPMVP is not a compliance document. Simply requiring parties to comply with the IPMVP is insufficient for defining how the actual M&V will be conducted or the level of rigor and uncertainty expected of the analyses. The IPMVP is often referenced in M&V planning, but additional requirements must also be specified in order for M&V requirements to be defined.	*http://www.evo-world.org/* (Web site contains IPMVP protocol plus a wide range of other M&V resources.)
FEMP M&V Guidelines	Provides guidelines and methods for measuring and verifying the savings associated with federal agency performance contracts. It contains procedures and guidelines for quantifying the savings resulting from energy efficiency equipment, renewable energy, cogeneration, water conservation, and improved operation and maintenance projects. The current version of the FEMP M&V Guidelines is Version 2.2 (2000). The FEMP Guidelines provide similar background information as the IPMVP, but offer more detail on measure-specific M&V techniques. For example, the guidelines include summaries of techniques for determining the savings from lighting retrofits, motor retrofits, and chiller retrofits.	*http://www1.eere.energy.gov/femp/financing/superespcs_measguide.html* *http://ateam.lbl.gov/mv/* *http://ateam.lbl.gov/mv/docs/26265.pdf* (This LBNL Web site contains the FEMP M&V Guidelines and a number of other M&V resource documents, including some on the use of stipulations for determining savings, M&V checklists, and M&V resource lists.)
EPA Model Energy Efficiency Program Impact Evaluation Guide	This EPA document provides guidance to utilities and state regulators on evaluating the impacts of energy saving activities implemented under the National Action Plan for Energy Efficiency.	*http://www.epa.gov/cleanenergy/documents/evaluation_guide.pdf*
Lawrence Berkeley National Laboratory Measurement and Verification Documents	LBNL has collected a number of resources that organizations can rely on for M&V guidance.	*http://ateam.lbl.gov/mv/*
ASHRAE Guideline 14-2002 Measurement of Energy and Demand Savings	This guideline was developed under the auspices of ASHRAE, a professional engineering society that has been involved in writing guidelines and standards associated with energy efficiency. Compared to the FEMP M&V Guidelines and the IPMVP, Guideline 14 is a fairly technical document that addresses the analyses, statistics, and physical measurement of energy use for determining energy savings. Guideline 14 provides guidance on how to use measured pre- and post-installation data for quantifying energy and demand savings. Unlike most guidelines and protocols it provides a specific compliance path for a few M&V approaches. It provides valuable information on project-specific uncertainty analyses, regression analyses, measurement systems and equipment, and case studies. There is a fee for this document.	*http://www.ashrae.org*

TABLE I.2. STATE AND UTILITY PROGRAMS WITH EM&V GUIDELINES

State and/or Utility	Description	URL
California Utility Standard Performance Contracts (SPC) Program **(Utility Administrators: San Diego Gas & Electric, Pacific Gas and Electric Company, and Southern California Edison)**	A statewide energy efficiency program under the direction of the CPUC, the Large Non-Residential Standard Performance Contract (LNSPC) Program is a performance-based program that offers incentive payments to project sponsors who develop projects delivering verified energy savings at host customer facilities. Energy savings are measured and verified annually by the project sponsor over a two-year period following the approval and installation of the energy-efficiency equipment.	*http://www.sce.com/RebatesandSavings/LargeBusiness/SPC/* (This Pacific Gas and Electric Company Web site provides a link to additional information about the SPC programs, including M&V protocols)
NYSERDA Energy $mart[SM] Commercial/ Industrial Performance Program	This program offers fixed-price incentives to ESCOs that install cost-effective energy efficiency measures. Project-specific incentives are paid based on measured data from the performance period.	*http://www.nyserda.org/programs/Commercial_Industrial/cipp.asp*
State of Hawaii Performance Contracting Guide	The State of Hawaii has published *A Guide to Performance Contracting*, which includes M&V guidelines. These guidelines are modified from DOE's Rebuild America Program.	*http://hawaii.gov/dbedt/info/energy/efficiency/state/performance/*
State of Texas Programs	Texas operates statewide programs sponsored by the Public Utilities Commission of Texas, including the TXU Electric programs. TXU's Energy Efficiency Markets currently has several energy efficiency programs, including a Small Air-Conditioner Program and a Commercial and Industrial Standard Offer Program.	*http://www.oncorgroup.com/electricity/teem/default.aspx*
Texas Loan Star Program	This program, which includes M&V of savings, is used as a funding mechanism for Texas state agency energy projects.	*http://www.seco.cpa.state.tx.us/ls_guideline.htm*
Wyoming Energy Conservation Improvement Program: Measurement and Verification Plan Guidelines	The Wyoming Business Council State Energy Office has developed these M&V plan guidelines for state agencies involved in energy performance contracts.	*http://www.wyomingbusiness.org/pdf/energy/Appx_1K-WYECIP_Contract_Attach_FMandV_Plan_Guide.pdf*

APPENDIX J

Resources for Reporting the Results of LBE Programs

This appendix provides state examples and resources to complement information provided in the *LBE Guide*. Additional information about tracking and reporting the results of LBE projects and programs is provided in Chapter 6, *Track, Evaluate, and Report on Progress*.

TABLE J.1 RESOURCES FOR REPORTING THE RESULTS OF LBE PROGRAMS

State or Title	Description	URL
Examples of State LBE Reporting		
Arizona	The *State Agency Annual Energy Usage Report* highlights the accomplishments of LBE programs in three Arizona state agencies. The three component reports provide detailed descriptions of the data collected and how it was analyzed.	*http://www.azcommerce.com/doclib/energy/2007_state_agency_annual_energy_usage_progress_report.pdf*
California	The *Green California, Energy Efficiency Projects at State Facilities* Web site is an online guidebook that outlines the steps to implement and fund energy efficiency projects at state facilities.	*http://www.green.ca.gov/EnergyEffProj/default.htm*
Colorado	The *State of Colorado Greening Government Status Report* describes the early successes of the state's Greening Government initiative, based on preliminary data. The report highlights achievements in energy efficiency, water conservation and water quality, waste reduction and recycling, environmentally preferable purchasing, and transportation.	*http://www.colorado.gov/energy/greening/*
Connecticut	The *Leading by Example* report highlights some of the major accomplishments of the initiatives to cut greenhouse gas emissions resulting from state government operations.	*www.ctclimatechange.com*
	Energy Management In State Facilities: A New Direction presents a survey on energy use and needs completed by each Connecticut state agency and provides a report that compiles these energy statistics.	*http://www.opm.state.ct.us/pdpd2/energy/PA_03-132_Report.doc*

TABLE J.1 RESOURCES FOR REPORTING THE RESULTS OF LBE PROGRAMS *(cont.)*

State or Title	Description	URL
Florida	The *Leadership by Example, Energy Efficiency and Conservation* report was produced pursuant to the Florida Energy Act of 2006. It outlines state clean energy LBE activities in buildings and fleets and includes recommendations for a rebate program fro energy-efficient appliances. The appendix includes a list of programs used and funding obtained.	*http://www.dep.state.fl.us/energy/reports/files/energy_leadership_report.pdf*
Hawaii	This January 2007 report to the Hawaii state legislature highlights past and present state LBE initiatives.	*http://hawaii.gov/dbedt/info/energy/publications/LBE-all-07.pdf*
Maine	The 2006 *Clean Government Initiative Report* to the state legislature highlights achievements by state agencies and institutions of higher learning in improving energy efficiency and developing clean energy policies.	*http://www.maine.gov/cleangovt/rulesanddocuments/cleangovtfinal.doc*
Massachusetts	Massachusetts has developed an *Agency Sustainability Tracking, Reporting and Plan Update Form* that state agencies use to help measure and track the environmental impacts of state agency operations.	*http://www.mass.gov/envir/Sustainable/documents/agencytrackingform_fy06.doc*
	Massachusetts has produced a *Greenhouse Gas Inventory for State Agencies* to present information on tracking GHG emissions and energy consumption within state government.	*http://www.mass.gov/envir/Sustainable/pdf/MA_GHG_Inventory_FY02_web.pdf*
Minnesota	The *State Agency Energy Conservation* report describes progress in meeting LBE goals set forth in Executive Order 05-16. The report describes actions taken, results achieved, and strategies for improvement.	*http://www.savingenergy.state.mn.us/files/Saving%20Energy%20Report%20to%20the%20Governor%2004%2007.pdf*
	Minnesota's Web site, *Saving, Energy, Energy Conservation Information for Minnesota State Employees* contains data reporting forms for state building operators and managers. Forms include a site data, electrical energy usage, thermal energy usage, and water utility usage forms.	*http://www.savingenergy.state.mn.us/reporting.htm*
	An *Energy Savings Report* completed for the state Department of Commerce details energy consumption and savings for the state government, the University of Minnesota, and other state colleges and universities. The report also describes the different projects the state is working on as part of a comprehensive LBE program.	*http://www.hhh.umn.edu/centers/stpp/pdf/energy_savings_report_feb2008.pdf*
New York	The *"Green and Clean" State Buildings and Vehicles Guidelines* contain a section on reporting and determining a baseline. Appendix H of the Guidelines contains a template for reporting agency energy use in operations and procurement.	*http://www.nyserda.org/programs/State_Government/exorder111guidelines.pdf*
	NYSERDA publishes annual reports under its Executive Order No. 111—*"Green and Clean" State Buildings and Vehicles program*, which includes energy use, reduced consumption, avoided costs, reduced air pollution, and other information for state facilities.	*http://www.nyserda.org/programs/exorder111.asp*
	Executive Order No. 111 "Green and Clean" State Buildings and Vehicles 2005/06 Annual Energy Report Form is a template for reporting agency energy use.	*http://www.nyserda.org/programs/State_Government/AnnualEnergyReportSFY0506.doc*

TABLE J.1 RESOURCES FOR REPORTING THE RESULTS OF LBE PROGRAMS *(cont.)*

State or Title	Description	URL
North Carolina	*Energy Impacts in North Carolina: the Annual Report of the Energy Policy Council and State Energy Office* is North Carolina's annual report summarizing the state's energy efficiency and renewable energy programs (including LBE programs) and the economic and environmental impacts of energy production and use.	*http://www.energync.net/resources/docs/pubs/Annual%20Report%20Jan%2005.pdf*
Ohio	Ohio is using ENERGY STAR's Portfolio Manager to track and evaluate energy consumption in state facilities.	*http://www.eere.energy.gov/state_energy_program/project_brief_detail.cfm/pb_id=1134* *http://www.das.ohio.gov/gsd/oes/PDFs/2007PortfolioMgrTraining.pdf*
Oregon	Oregon uses the *Sustainable Oregon: Government Web site* to present reports on state agency LBE achievements and goals.	*http://www.sustainableoregon.net/agency/*
South Carolina	The *Energy Use in South Carolina's Public Facilities* report presents historical trends in energy use by state agencies, school districts, and the university system, and provides cost per square foot calculations in addition to total Btu and cost figures.	*http://www.energy.sc.gov/publications/2004%20Energy%20Use%20in%20SC%20Public%20Facilities.pdf*
Washington	Executive Orders 02-03 and 05-01 call for state agencies to develop sustainability plans and for plan progress to be reported annually. The Department of Administration is responsible for reporting the progress of each agency in its annual *Sustainability Progress Report*.	*http://www.ofm.wa.gov/sustainability/plans/progress_06/pdc.pdf*
Wisconsin	The *Energy Use in State-Owned Facilities* report provides information on energy consumption by state agencies and the state university system.	*http://www.doa.state.wi.us/docs_view2.asp?docid = 990*
Resources on Reporting the Results of LBE Programs		
CALeep	CALeep provides a set of resources to help local governments implement energy efficiency programs. It includes a section on evaluating and reporting on program results.	*http://www.caleep.com/*
California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals	This document provides guidance on evaluating and reporting on energy efficiency activities. The protocols are intended for policy makers to use when planning and structuring energy efficiency evaluation programs.	*http://www.calmac.org/publications/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf*
EERE Guide to Managing General Program Evaluation Studies	This DOE Office of Planning, Budget, and Analysis guidance document provides information to federal EERE program managers on how to evaluate the performance of their programs. The document includes a collection of important considerations for producing final reports and communicating results.	*http://www1.eere.energy.gov/ba/pba/performance_measurement.html*
EERE *Impact Evaluation Framework for Technology Deployment Programs*	This document provides an approach for quantifying energy savings, clean energy advances, and market effects resulting from energy efficiency activities.	*https://apps3.eere.energy.gov/ba/pba/analysis_database/docs/pdf/2007/impact_framework_tech_deploy_2007_main.pdf*

TABLE J.1 RESOURCES FOR REPORTING THE RESULTS OF LBE PROGRAMS *(cont.)*

State or Title	Description	URL
EERE Program Evaluation Guidance	The DOE Office of Planning, Budget, and Analysis provides guidance for evaluating the performance of DOE's Energy Efficiency and Renewable Energy programs. Evaluation documents for each of EERE's programs are now under development.	*http://www1.eere.energy.gov/ba/prog_mgmt_guide.html*
ENERGY STAR for Buildings Automated Benchmarking	This presentation provides steps for using the ENERGY STAR performance rating system to benchmark state facilities. The presentation includes case studies from California, Georgia, and Texas.	*https://www.energystar.gov/istar/pmpam/help/About_Automated_Benchmarking.htm*
EPA Model Energy Efficiency Program Impact Evaluation Guide	This EPA document provides guidance to utilities and state regulators on evaluating the impacts of energy saving activities implemented under the National Action Plan for Energy Efficiency.	*http://www.epa.gov/cleanenergy/documents/evaluation_guide.pdf*
FEMP Measurement and Verification Guidelines	This set of guidelines provides federal energy managers and procurement officials with standard procedures and guidance for quantifying savings from energy efficiency projects.	*http://www1.eere.energy.gov/femp/financing/superespcs_measguide.html*
FEMP Reporting Guidance	FEMP has issued guidance to assist federal agencies in providing information for the annual report to Congress. This guidance is applicable to state agencies as well.	*http://www1.eere.energy.gov/femp/about/reporting_guidance.html*
Measuring Energy Use	This South Carolina Energy Office Web site provides information to state agencies on how to manage and account for energy use in state buildings.	*http://www.energy.sc.gov/index.aspx?m=7&t=49*
Program Analysis for the Connecticut Clean Energy Fund's Public Awareness, Education, and Voluntary Market Demand Initiatives	This report contains an assessment of the effectiveness of the Clean Energy Fund's communications through a public awareness study.	*http://www.ctinnovations.com/communities/files/CCEF_Program%20Goal%203_ME%20Plan_2005%20Evaluation_April%202006.pdf*
The Resource Conservation Management Guidebook	This **Guidebook** was prepared by the Washington State Department of general Administration and the Oregon Office of Energy to provide information on how to develop, implement, and communicate the results of a state's Resource Conservation Management Program to manage the resources and services used, and the waste generated, by state facilities.	*http://www.oregon.gov/ENERGY/CONS/RCM/rcmGuide.shtml*
State Implementation Plan Guidance for Energy Efficiency/ Renewable Energy (EE/RE) Measures	This EPA guidance document provides information on how to estimate emission reductions for EE/RE measures and include them in State Implementation Plans. The document includes a basic four-step process to quantify SIP credits, as well as discussion points, references, resources, and two case studies of measures proposed for SIP credit.	*http://www.epa.gov/ttn/oarpg/t1/memoranda/ereseerem_gd.pdf*
State of Hawaii Facilities on Oahu Energy Benchmarking Study	This study evaluates the energy consumption and characteristics of state facilities on Oahu. Benchmarking data is based on energy audits, billing history, rebate history, square footage characteristics, and energy surveys.	*http://www.hawaii.gov/dbedt/info/energy/publications/benchmarking/benchmarking.pdf*
Tracking State Government Greenhouse Gas Emissions: The Good, the Bad, the Ugly	This presentation provides information on the basics of establishing baselines and gathering data for GHG inventories. The presentation also outlines potential tracking barriers.	*http://www.keystone.org/spp/documents/1_17MA%20Tracking%20State%20Building%20Performance_Friedman.ppt*