Guide to Purchasing Green Power

Renewable Electricity, Renewable Energy Certificates and On-Site Renewable Generation

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Federal Energy Management Program

EPA GREEN POWER PARTNERSHIP

World Resources Institute
Sustainable Enterprise Program

Center for Resource Solutions
Green-e Renewable Energy
Certification Program

This guide can be downloaded from:

www.eere.energy.gov/femp/technologies/renewable_purchasepower.cfm

www.epa.gov/greenpower/buygreenpower.htm

www.thegreenpowergroup.org/publications.html

www.resource-solutions.org

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Summary

The *Guide to Purchasing Green Power* is intended for organizations that are considering the merits of buying green power as well as those that have decided to buy it and want help doing so. The *Guide* was written for a broad audience, including businesses, government agencies, universities, and all organizations wanting to diversify their energy supply and to reduce the environmental impact of their electricity use.

The *Guide* provides an overview of green power markets and describes the necessary steps to buying green power. This section summarizes the *Guide* to help readers find the information they need.

Chapter 1 describes the concepts of renewable energy and green power and discusses their differences from traditional energy sources. This section also summarizes recent changes in electricity markets.

Chapter 2 defines three types of green power products: renewable electricity, renewable energy certificates, and on-site renewable generation. Renewable electricity is generated using renewable energy resources and delivered through the utility grid; renewable energy certificates (RECs) represent the environmental, social, and other positive attributes of power generated by renewable resources; and on-site renewable generation is electricity generated using renewable energy resources at the end-user's facility.

Chapter 3 summarizes the benefits and costs of purchasing green power. Benefits include a financial hedge against various risks, improving relations with organizational stakeholders, helping the environment, and bolstering economic development and security. Conversely, green power may be more expensive than traditional power and present new contracting challenges.

Chapter 4 describes in detail the three main green power products, including the alternative renewable electricity products, the details of RECs transactions, and the technologies that can be used to harness on-site renewable resources.

Chapter 5 outlines the general steps needed to prepare to buy green power: identifying the key decision makers, gathering energy data, and choosing the specific green power options available to the purchaser's facilities.

Chapter 6 discusses the steps to procure renewable electricity or renewable energy certificates: developing screening criteria, collecting product information, and drawing up a procurement plan.

Chapter 7 describes the steps to establish an on-site renewable energy system: screening the technologies best suited to the purchaser's site, obtaining technical and financial assistance, creating a project plan, anticipating possible barriers, and installing and operating the on-site generation system.

Chapter 8 explores ways of taking advantage of promotional opportunities after buying green power. This section covers promotion both inside and outside the organization and options for quantifying the environmental benefits of the purchase.

Chapters 9 and 10 of the *Guide* conclude with a list of resources offering more information about all aspects of green power. Because electricity from renewable resources is relatively new and may be generated in a variety of ways, many institutions are working to facilitate the development of green power markets. Several of these organizations' programs—the U.S. Department of Energy's Federal Energy Management Program (FEMP), the U.S. Environmental Protection Agency's Green Power Partnership, the Sustainable Enterprise Program of the World Resources Institute (WRI), and the Green-e Renewable Energy Certification Program administered by the Center for Resource Solutions—worked together to write this purchasing guide. More information about these programs is available from the Web sites listed in chapter 10, Resources for Additional Information.

Finally, the appendix to the *Guide* discusses considerations specific to federal agencies that buy green power, particularly the procurement regulations that cover the purchase of green power.

Chapter 1
Introduction

Today the energy sources used to create electricity differ in many ways, including in their environmental impacts. In the United States, conventional means of electricity generation use fossil or nuclear fuels—forms of power generation that impact human health and the environment through air emissions and other effects. Despite advances in pollution controls over the last 30 years, conventional power generation is still the nation's single largest source of industrial air pollution.

Electricity markets are changing, however, offering cleaner ways of producing power and giving many consumers the ability to choose how their power is generated. One of these choices is power from renewable sources that is marketed as green power. Innovative organizations are encouraging the use of these new sources of green power and, at the same time, are reducing their own impact on the environment.

In some parts of the United States, the deregulation of electricity has enabled consumers to choose the provider of their electric power and thus to buy green power from their chosen supplier. In regulated markets, too, hundreds of utilities now offer their customers the opportunity to purchase green power through "green-pricing" programs. Even in areas where consumers cannot buy green power directly, renewable energy certificates (RECs) are available in every state to allow consumers to support green power.

While no form of electric power generation is completely benign, electricity generated from renewable resources such as solar, wind, geothermal, small and low-impact hydropower, and biomass has proved to be environmentally preferable to electricity generated from conventional energy sources such as coal, oil, nuclear, and natural gas. The *Guide to Purchasing Green Power* focuses on electricity generated from renewable energy resources, both delivered through the grid and generated on-site. Although renewable energy can also be used for heating needs or for transportation fuels, the *Guide* does not address those applications.

By buying green power instead of conventional power, consumers can reduce the environmental impact caused by their use of electricity and fossil fuel. For instance, on average, every kilowatt-hour (kWh) of renewable power avoids the emission of more than one pound of carbon dioxide. Because of the sheer quantities of energy involved, consumers of a large amount of electricity may have an enormous environmental impact. If the typical commercial facility switched to 100 percent renewable power or used RECs to offset emissions, this could amount to thousands of tons of emissions avoided each year.

A wide range of organizations have purchased green power: federal, state, and local governments; universities; businesses; nonprofits; and individual consumers. By purchasing green power, these organizations are both helping the environment and meeting their own environmental goals. The many other benefits to buying green power range from financial benefits to public relations and even national security. As of the end of 2003, nearly 1,650 megawatts (MW) of new renewable generating capacity had been added to meet the United States' demand for green power. This capacity is enough to meet the annual electricity needs of more than 500,000 houses.

Leading organizations are finding that green power is an effective part of a strategic energy management plan to achieve environmental, financial, and other goals. Successful energy management plans are often a "portfolio analysis" that considers options such as energy efficiency, load management, power purchases, on-site generation, and nonelectric (thermal) energy needs. As with any investment portfolio, the best mix of these options depends on the particular situation.

Because buying green power is still relatively uncommon in today's energy markets and because these markets offer a wide range of choices, the *Guide* is intended for organizations that have decided to buy green power but want help in figuring out how to do it, as well as for organizations that are still considering the merits of buying green power.

The *Guide to Purchasing Green Power* addresses the following commonly asked questions:

- What are renewable energy and green power? (p. 4)
- What benefits will my green power purchase bring? (p. 5)
- How do I make a business case for buying green power? (p. 5)
- What is the cost of green power? (p. 6)
- What are the options for purchasing green power? (p. 9)
- What is the importance of product certification and verification? (p. 9)
- What are the best ways of buying green power? (p. 16)
- How should an organization choose a green power product? (p. 13)
- What are the steps to installing on-site renewable generation? (p. 21)
- What is the best way of telling the organization, employees, and community about the benefits of green power? (p. 25)

Chapter 2
The Definition of Green Power

Renewable energy is derived from natural sources that replenish themselves over short periods of time. These resources include the sun, wind, moving water, organic plant and waste material (biomass), and the earth's heat (geothermal). This renewable energy can be used to generate electricity as well as for other applications. For example, biomass may be used as boiler fuel to generate steam heat; solar energy may be used to heat water or for passive space heating; and landfill methane gas can be used for heating or cooking.

Although the environmental impacts of renewable energy are generally minimal, these power sources still do have some effect on the environment. For example, biomass resources are converted to electricity through combustion, which emits some air pollutants. Hydroelectric dams can flood the surrounding land and impede the passage of fish. Compared with conventional power, however, renewable power generally avoids, or at least significantly reduces, the adverse environmental impacts of conventional electricity generation.

The term *green power* is used in a number of different ways. In the broadest sense, green power refers to environmentally preferable energy and energy technologies, both electric and thermal. This definition of green power includes many things, from solar photovoltaic systems to wind turbines to fuel cells for automobiles.

Although renewable resources do more than generate electricity, green power is most commonly used in a narrower, marketing, sense to refer specifically to *electricity* from renewable resources. In the context of the *Guide to Purchasing Green Power*, the term *green power* refers to electricity products that include significant proportions of electricity generated from energy resources that are both renewable and environmentally preferable.

In the *Guide*, green power includes the following three products:

- "Renewable electricity" is generated using renewable energy resources and is delivered through the utility grid.
- "Renewable Energy Certificates" (RECs) represent the environmental, social, and other positive attributes of power generated by renewable resources.
- "On-site renewable generation" refers to electricity generated using renewable energy resources at the end-user's facility.

Note that the terms *green power*, *environmentally preferable*, and *renewable energy* may be used in slightly different ways, which differ primarily according to the varying assessments of the environmental impacts of harnessing specific resources and of the relative significance of each impact. The exact definitions of these terms, while always important, take on added significance when dealing with state and federal government requirements or determining eligibility for government and utility incentives. For more discussion of how each of the organizations that collaborated on this document defines green power, please refer to their Web sites, listed in Chapter 10.

Helping Define Green Power

To help consumers more easily identify green power products, the "Green-e" Renewable Energy Certification Program is working to build market-based, consensus definitions for environmentally-preferable renewable electricity and renewable energy certificates. The Green-e program, administered by the non-profit Center for Resource Solutions (CRS), certifies and verifies renewable electricity products in competitive power markets, as well as utility green pricing programs and in national markets for RECs. Further details about Green-e certification are available from the Green-e Web sites listed in Chapter 10.

Chapter 3
The Benefits and Costs of Green Power

The Benefits

Green power can help many organizations meet environmental, financial, stakeholder relations, economic development, and national security objectives.

Environmental

- **Avoid environmental impacts.** Green power and renewable energy avoid most of the environmental impacts associated with traditional power generation, helping protect human health and the health of the environment.

Financial

- **Provide a hedge against risks posed by**
  - *Electricity price instability*. Purchasing electricity generated by renewable energy resources creates a financial hedge against unstable or rising fossil fuel prices by diversifying a consumer's energy portfolio. Wind, geothermal, hydro, and solar energy are not subject to the rise and fall of fuel costs. For these reasons, renewable electricity can offer a fixed price over the long term.
  - *Fuel supply disruptions*. On-site renewable generation can reduce the risk of disruptions in fuel supplies resulting from transportation difficulties or international conflict.
  - *Additional environmental regulation*. To address global climate change and regional air quality issues, federal and state regulations have been proposed that would effectively increase the price of conventional electricity. But green power would be largely unaffected by these regulations, resulting in more stable prices over the long run.
  - *Electricity blackouts*. Organizations that need highly reliable power usually use on-site power generation, such as diesel engines and gas turbines, for their facilities in the event of a power outage. On-site renewable generation can provide this backup power without fossil fuel emissions. Some renewable sources, however, require battery storage or other backup devices for essential electrical services during an outage.

Price Stability of Green Power

IBM has a longstanding corporate energy management program that is intended to improve the environment and reduce energy costs. The energy managers at IBM's Austin, Texas facility furthered both these goals by signing up for Austin Energy's GreenChoice® program in 2001. Under GreenChoice, the normal fossil fuel charge on the customer's bill is replaced by a green power charge for the amount of green power that the customer chooses to buy. Unlike the fossil fuel charge, which fluctuates over time, the green power charge is fixed until 2011. As it turned out, Austin Energy's fuel charge for conventional power spiked in 2001 and IBM saved $20,000 in its first year in the program. With the fuel charge having increased again in 2004, IBM expects to save over $60,000 per year. Moreover, the cost stability provided by this contract made it easier to manage the facility's energy budget.

Stakeholder relations

- **Meet organizational environmental objectives.** Reducing an organization's environmental impact is one of the main motivations for buying green power. For example, buying green power can help meet greenhouse gas reduction targets. If an organization is interested in ISO-14001 certification for environmental performance, a program for reducing energy-related emissions will be an important part of this certification process.
- **Demonstrate civic leadership.** Being among the first in a community to purchase green power is a demonstration of civic leadership. It makes a statement that an organization is willing to act on its stated

environmental or social goals. These purchases also demonstrate an organization's responsiveness to its customers, the majority of whom favor renewable energy (see chapter 10 for more details).

- **Generate positive publicity.** Buying green power affords an opportunity for public recognition and public relations that advertising and media relations cannot buy. Companies that are in the public eye need to be responsive to the concerns of environmentally conscious customers, shareholders, regulators, and other constituents. Groups promoting green power, such as the EPA's Green Power Partnership, provide assistance in reaching broad audiences to convey the benefits of green power purchases.

- **Improve employee morale.** Progressive action and leadership on environmental issues like renewable energy may improve employee morale, which in turn can reduce employee turnover, attract new employees, and improve productivity. In a survey of 464 organizations, sponsored by the National Wind Coordinating Committee, improving employee morale was cited as the third most important motivation for buying green power.

- **Differentiate products or services.** By purchasing green power, a company may be able to differentiate its products or services by, for example, offering them as "made with certified renewable energy" or "climate neutral." Purchasers of green power can also join their power supplier to market their products together. In addition, purchasers of products certified by the Center for Resource Solutions Green-e program can display the Green-e logo on their product packaging to indicate the share of renewable energy used by the company or in its production.

Demonstrating Leadership

On January 1, 2003, Dyess Air Force Base (AFB), Texas, became the largest consumer of renewable electricity at a single site in the nation. The base now purchases 100 percent wind-generated electricity for all its electrical needs, resulting in approximately 80 million kWh of wind energy generated annually. The Dyess energy managers decided to make such a large purchase in order to demonstrate leadership to other agencies in meeting the federal renewable purchase goal. This builds on earlier, award-winning improvements that the base made in energy efficiency and water conservation.

Economic development and national security

- **Stimulate local economies.** Because renewable resources are typically local, jobs are created to install and operate renewable generation facilities. Renewable power facilities also increase the local tax base and can provide income for farmers and rural communities. The renewable energy industry may be an important growth opportunity in mature, postindustrial economies like that of the United States.

- **Increase fuel diversity.** Renewable energy diversifies the nation's fuel resources—a good way to manage risk—and, because renewable resources are indigenous, reduces its dependence on imported fuels.

- **Reduce infrastructure vulnerability.** The wide distribution of most renewable energy resources improves the robustness of energy systems by reducing the country's reliance on a vulnerable, centralized energy infrastructure.

- **Market transformation.** By purchasing green power now, organizations can reduce long-term production costs and transform markets for renewable energy technologies. Most renewable technologies are not yet produced in great volumes, but their production costs should drop significantly as their production volume increases, which in turn will attract more purchases.

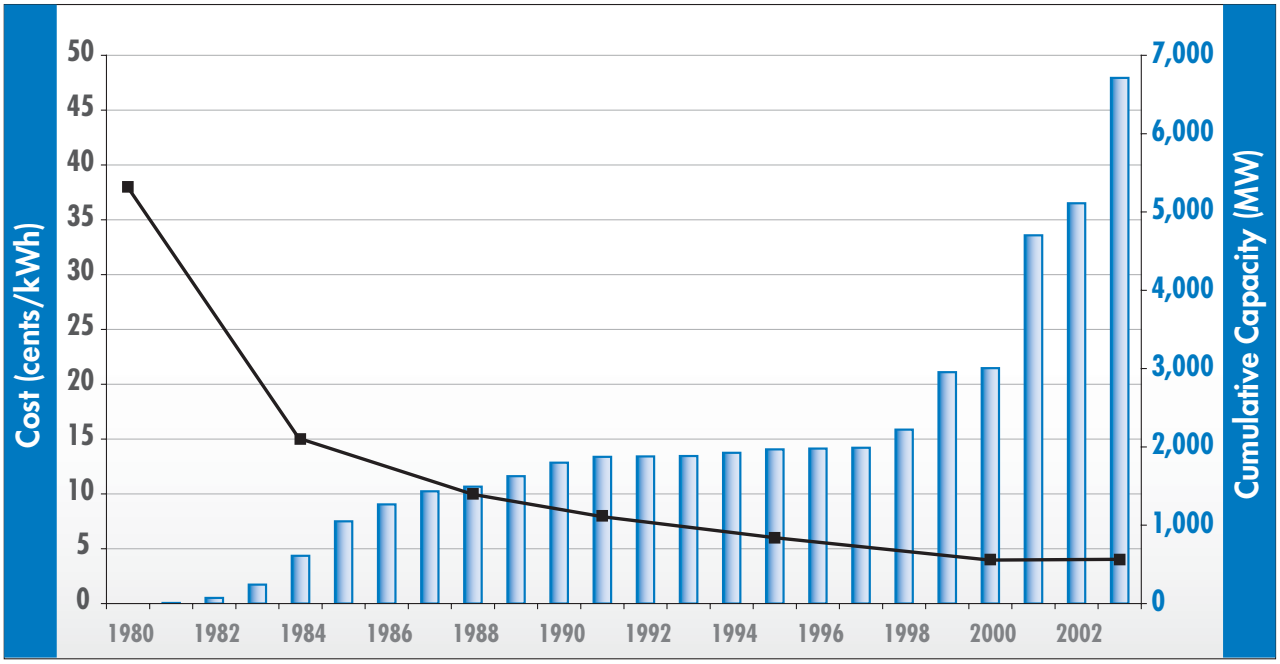
The Costs

Green power may cost more than standard power sources, for several reasons.

Price premiums

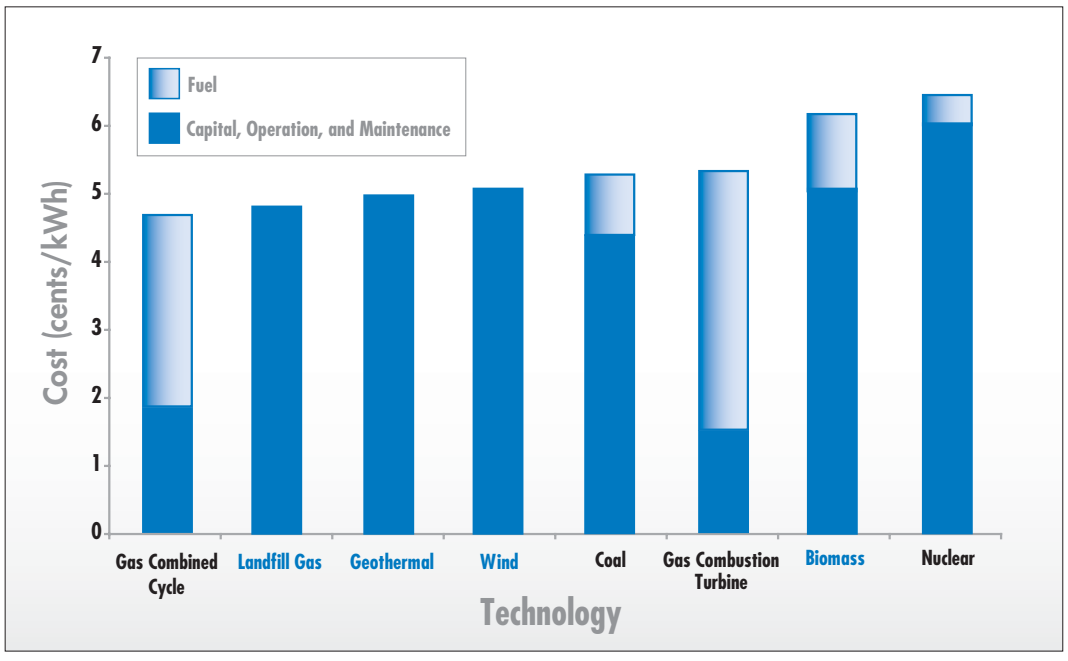
Renewable energy has usually been more expensive than conventional power sources. These higher costs are largely due to the relative immaturity of renewable technologies and their concentration in niche markets, compared with conventional energy sources. Chapter 6 of the *Guide* suggests ways of minimizing these costs in conjunction with a procurement plan. Nonetheless, despite the currently higher prices, the cost of renewable energy is falling as the growing demand justifies the expansion of manufacturing facilities and reduces production costs. Figure 1 illustrates the dramatic decline in the cost of wind power over the last two decades, while figure 2 shows that several renewable power technologies are now nearly cost competitive with conventional sources.

Figure 1: Wind Energy Costs Fall as Installed Capacity Increases



Source: American Wind Energy Association, 2003.
Capacity figure for 2003 is an estimate. Cost figures are averages and will vary by project.

Figure 2: Cost Comparison of New Power Plants Using Renewable and Conventional Electricity Technologies



Source: Energy Information Administration Annual Energy Outlook, 2004.
Solar technologies are not included because their costs are application specific.

The actual price for green power depends on a number of factors, including the availability and quality of the resource, the market price of conventional electricity, the availability of subsidies to encourage green power, and the quantity and terms of the contract. Generally, the price of green power ranges from less than that of the standard power mix, especially in competitive markets and where state subsidies exist, up to one to four cents more per kilowatt-hour. When the market price of conventional electricity is high, purchasers of green power at a fixed price may actually save money. Of course, when the market price of conventional electricity drops, they will be paying a premium.

Contracting challenges

Green power may also be more difficult than conventional power for an organization to purchase, causing transaction costs in addition to any price premiums. Although organizations that are buying green power for the first time may need to invest extra effort, these costs fall significantly over time as the electricity purchasers gain experience. Following the information and strategies provided in this guidebook, particularly chapter 6, should help reduce the contracting challenges faced by new purchasers of green power. In addition, sample contract templates are publicly available to help buyers avoid difficulties in signing a green power contract (see chapter 10, Resources for Additional Information).

Public relations risk

Some stakeholders may regard the purchase of green power as a token effort or "green washing." Organizations can avoid this criticism by buying green power as part of a broader environmental management program. Another strategy to improve the credibility of a purchase is to work with third-party organizations for independent auditing, endorsement, and minimum purchasing benchmarks.

Chapter 4
Options for Purchasing Green Power

Green power can be purchased in several different ways. The main distinction among the options depends on where the power generation equipment is located: on the power grid or on-site at the facility. For electricity delivered over the power grid, the status of utility restructuring in that state will determine whether an organization can buy green power from either the existing utility or a competitive power supplier. Even if the state has no green power marketers or the utility does not offer a green power option, an organization can buy renewable energy certificates (RECs). For on-site renewable generation, the renewable energy resources available at that site (e.g., solar, wind, biomass) are the main factors determining the project's feasibility.

These options are not mutually exclusive. Some organizations may want to first buy a green power product requiring less financial commitment (such as an electricity product with a smaller fraction of renewable content). Over time, this can be supplemented by larger purchases or the installation of on-site generation. As discussed later, RECs can be a good place to start because of the ease and flexibility of the purchase.

Renewable Electricity Products

Renewable electricity products—offered by either the utility or the power marketer that provides the organization's power—can be structured in several different ways. The availability of each of these products varies according to the facility's location and the electricity provider's offerings. Although each product differs slightly, most renewable electricity products fall into one of two types.

- **Fixed energy quantity block.** A block is a quantity of 100 percent renewable electricity, often 100 kilowatt-hours (kWh), offered for a fixed monthly price. The price is often expressed as a price premium above the price of conventional power. Customers usually may sign up for as many blocks as they wish, with the monthly cost of these products based on how many blocks they buy. This type of product is available in some competitive markets but is more often found in regulated utility green-pricing programs.
- **Percentage of monthly use.** Customers may choose renewable electricity to supply a fixed percentage of their monthly electricity use. In practice, this usually results in the purchase of a blend of renewable and conventional power. This is typically priced as a premium on a cents per kWh basis over the standard rate or as a fixed charge per kWh. The monthly cost for these products varies with energy use and the percentage of renewable energy chosen.

Some renewable electricity products require a fixed monthly fee to support a given amount of renewable generation capacity, or even require contributing to a renewable energy fund that finances renewable projects. These products can be an effective way to assist the green power industry but do not, however, result in a metered amount of renewable electricity

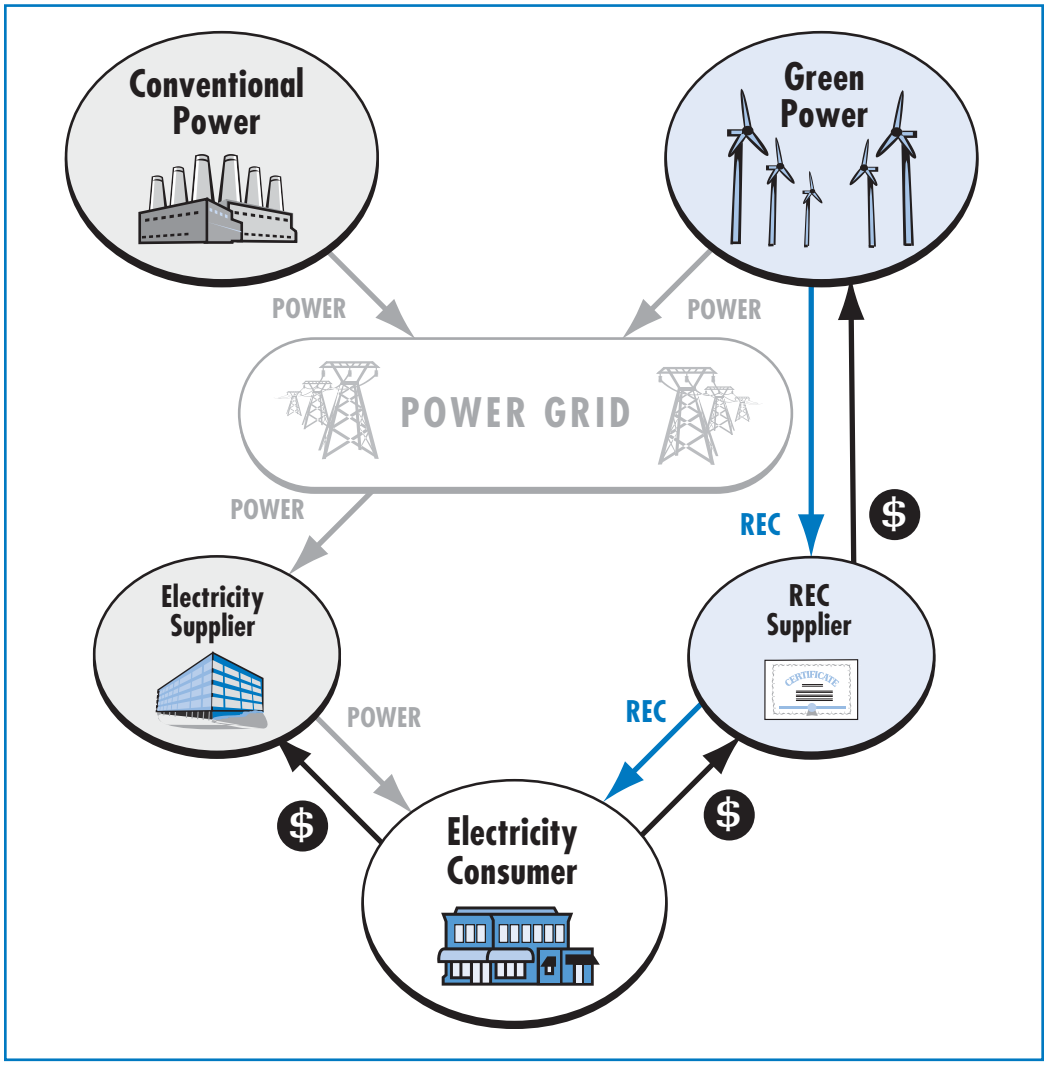
The Role of Product Certification

One of the major concerns with buying green power is ensuring that purchasers get what they pay for. It can be difficult to substantiate claims made about the quantity and characteristics of the product purchased. Also, it is important to ensure that two organizations are not claiming to have purchased the same green power, or are double-counting the same green power benefits. Moreover, purchasers may be unable to ensure public acceptance of their purchase and avoid criticism from external stakeholders without independent information about the product. Third-party certification addresses these concerns by setting standards for green power products in the following areas:

- Minimum levels of environmentally-acceptable renewable resources,
- Overall environmental impact,
- Ethical conduct for suppliers, including advertising claims and regular reporting.

Third-party certification usually also requires independent verification by an auditor to document that green power purchased equals green power supplied, and to verify other resource claims. Visit www.green-e.org for additional information about third-party certification and verification.

Figure 3: REC Transaction



being generated, which is necessary to quantify the environmental benefits of the green power purchase. For this reason, these products are not discussed further in this guide. Chapter 6 provides more details about implementing a renewable electricity purchase.

Renewable Energy Certificates (RECs)

A REC represents the environmental, social, and other positive attributes of power generated by renewable resources. These attributes may be sold separately from the underlying commodity electricity (figure 3). For example, RECs represent the reduced emissions of renewable generation compared with those of conventional generation. The actual power that is sold is no longer considered "green" and is treated like any other commodity electricity. In practice, REC transactions can take many forms in addition to that shown in figure 3. For more details about REC transactions, see chapter 10, Resources for Additional Information.

Because RECs are sold separately from electricity, they can be purchased from locations anywhere, enabling organizations to choose renewable power even if their local utility or power marketer does not offer a green power product. Although theoretically there are no geographic constraints on buying RECs, accounting systems to record and track the exchange of certificates are not yet available everywhere. In addition, the location of environmental benefits may be important to some purchasers. A variety of REC products are available from local and national sources.

Customers do not need to switch from their current electricity supplier to purchase certificates, and they can buy RECs based on a fixed amount of energy (or carbon footprint)

rather than on their daily or monthly load profile. Because certificates are independent of the customer's energy use, load profile, and the delivery of energy to the customer's facility, they provide greater flexibility than purchasing energy and attributes bundled together as renewable power. One drawback to RECs is that they do not offer the same financial hedge value that some other green power products provide.

Purchasing RECs for special events

RECs can offer flexibility by allowing a buyer to offset electricity used for special events, such as conferences, rather than requiring long-term purchases. The Department of Energy used this approach for the Labs for the 21st Century annual meeting, where the conference organizers purchased green power certificates equivalent to 100% of the energy consumed at the meeting. Because special events inherently generate a lot of publicity, the public and employee relations benefit from this approach can be significant.

Price premiums for certificates may be lower than those for renewable electricity products, for several reasons: (1) RECs have no geographic constraints and therefore can provide access to the least expensive renewable resources; (2) the supplier does not have to deliver the power to the REC purchaser with the associated transmission and distribution costs; and (3) the supplier is not responsible for meeting the purchaser's electricity needs on a real-time basis.

An alternative way to buy RECs is through a subscription, or "future RECs," which involves an up-front purchase of RECs to be generated in the future by a new renewable facility. The advantage of this approach is that it promotes new renewable facilities by providing up-front financial assistance for their development and construction. In return, the purchaser receives the RECs as they are generated over an extended period of years. Compared to annually buying RECS close to the time they are generated, the subscription method emphasizes the up-front payment for a future stream of RECs. The additional risk of this approach is that the plant might not be constructed, and buyers should investigate what remedy the seller proposes in such an event. As with all products, independent product certification and verification of the claims made is an important aspect to consider.

For a company or institution with operations and offices in multiple locations, purchasing RECs can consolidate the procurement of renewable energy, thus eliminating the need to buy renewable electricity for different facilities through multiple suppliers. Chapter 6 provides more details about purchasing RECs.

On-site Renewable Generation

In addition to buying renewable electricity from a utility or buying renewable energy certificates, organizations can install renewable power generation at their facilities. They can either buy the system outright or install a system that is owned by another party and buy the electricity as it is generated.

On-site renewable generation offers advantages such as enhanced reliability, power quality, and protection against price volatility, as well as a visible demonstration of environmental commitment. In many states, electricity generated with on-site renewable generation may be sold back to the grid at the same price at which power is bought, through a process called *net metering*. This arrangement may improve the financial return for on-site renewable power systems, although net metering is often limited to small installations.

On-site renewable energy technologies for power generation include photovoltaic panels, wind turbines, fuel cells, and biomass combustion. Large facilities sited near a municipal landfill or sewage treatment plant may be able to use recovered methane gas for on-site electricity and/or heat production. The following describes each of these options in more detail:

- **Solar.** Photovoltaic (PV) cells and modules can be configured to almost any size from a few kilowatts up to more than one megawatt. On-site photovoltaic cells may be situated on schools, homes, community facilities, and commercial buildings. Photovoltaic cells can be made part of a building, displacing other building material costs, for example, roofing shingles or car park shading.

- **Wind.** Wind turbines vary in size. A typical small unit provides fewer than 25 kW, whereas large turbines range from 500 kW to more than 3 MW. On-site applications are usually only possible in nonurban areas, and often require zoning permits to exceed 35-foot height restrictions (a tower for a 250 kW turbine is 130 feet high with a blade sweep of 98 feet). Such installations usually require approximately one acre of land per turbine and wind speeds that average 15 mph at a 50-meter height. In addition, placing turbines near tall buildings is inadvisable because the building may create wind turbulence that can disrupt the turbines' performance.

- **Landfill and sewage methane gas.** Methane gas derived from landfills or sewage treatment plants may be used to generate electricity. Methane gas also may be generated using digesters that operate on manure or agricultural wastes. The methane gas is then converted to electricity

using an internal combustion engine, gas turbine (depending on the quality and quantity of the gas), direct combustion boiler and steam turbine generator set, microturbine unit, or other power conversion technology. Most methane gas projects produce from 0.5 to 4 MW of electrical output.

- **Biomass.** Biomass is plant material burned in a boiler to drive a steam turbine to produce electricity. This system is good for producing combined heat and power (CHP) at facilities with large thermal loads. Biomass projects are best suited to locations with abundant biomass resources (often using waste products from the forest industry or agriculture).

- **Fuel cells.** Fuel cells are another way of producing power. They emit essentially no air pollution and are more efficient than other forms of generation. But they cannot be considered a renewable resource unless they operate on a renewably generated fuel, such as digester gas or hydrogen derived from PV or wind power.

On-site generation case study

Car-maker BMW pipes methane gas 9.5 miles from a landfill to serve the electric and thermal needs of its manufacturing facility in Greer, South Carolina. Rather than invest in new internal combustion engines to generate electricity, BMW converted four turbines that previously ran on purchased natural gas. By recovering the waste heat from the turbines, the 5 MW combined heat and power project satisfies 80% of the facility's thermal needs, as well as 25% of its electricity use.

In this era of power reliability problems and national security concerns, on-site renewable generation offers important advantages over central-station and fossil-fueled power plants. Moreover, on-site generation can be designed to provide backup power for critical loads when power from the grid is interrupted, as well as when the renewable resource is not available. This ability to operate independently of the power grid is a great advantage, particularly at remote facilities. Because renewable generation technologies tend to be modular and used on a small scale, the on-site generation system can be designed to enhance the redundancy and diversity of a facility's energy supply.

On-site renewable generation has higher capital costs and lower operating costs compared with installing fossil-fueled generation. Although these costs may make the initial investment in on-site generation more difficult to justify, once that investment has been made, the annual budgets for maintaining the system are much easier to justify (compared with purchasing renewable electricity), which makes it easier to sustain a commitment to renewable power.

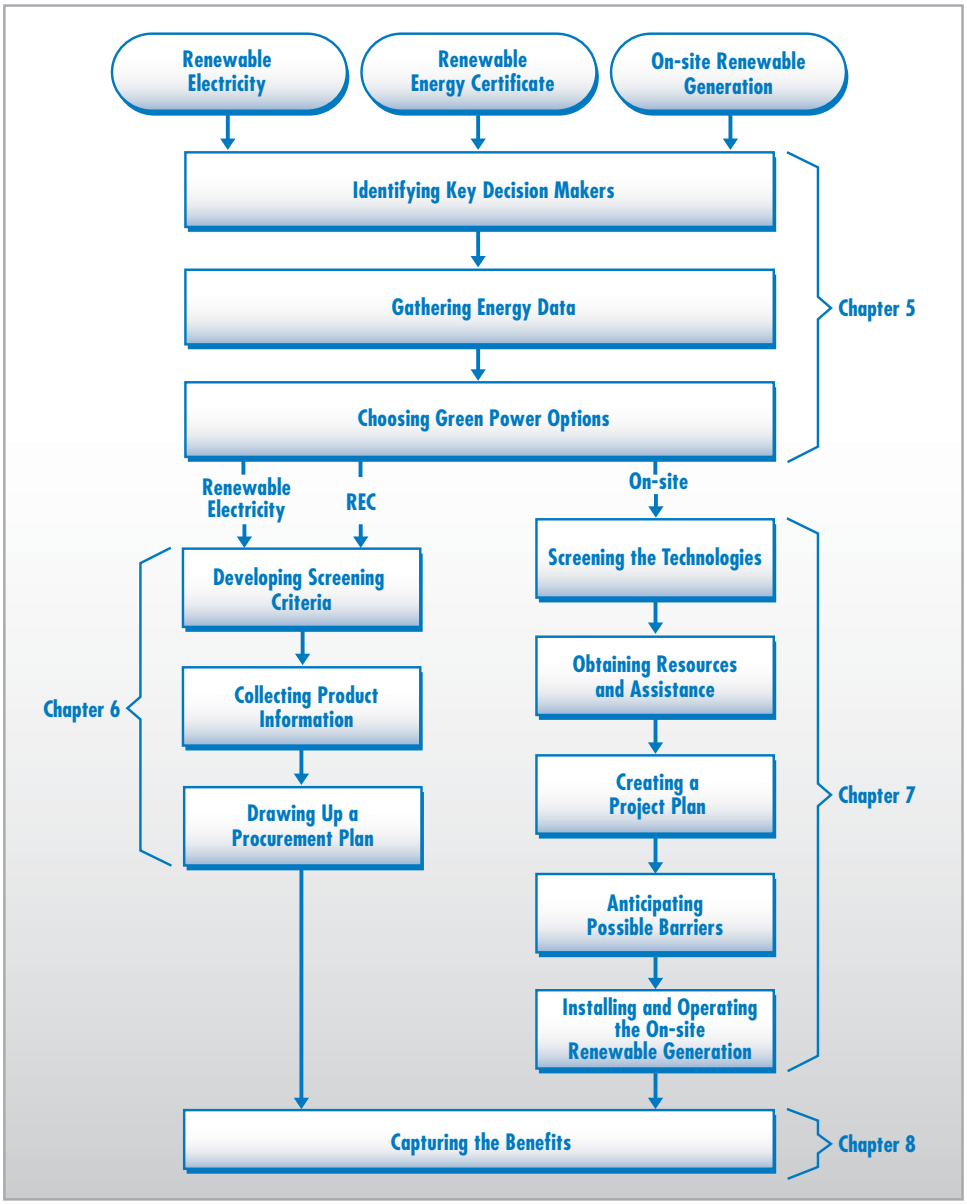
An organization that installs its own generation capability may have problems with the requirements for connecting to the utility distribution system, commonly referred to as *interconnection*. Standardizing the interconnection rules may help in the future, but in some cases, the rules for large generators are unnecessarily burdensome for small installations. In recognition of this problem—and to encourage on-site generation—a few states have simplified their interconnection rules; in addition, national standards are being drawn up that may ease interconnection. Net-metering laws, which allow an owner of an on-site power system to sell electricity back to the grid, usually provide more lenient interconnection rules for small installations. Chapter 7 provides more details about procuring an on-site renewable generation system.

Chapter 5
Steps to Purchasing Green Power

To buy green power, an organization first should determine whether green power will help fulfill its energy needs, identify the best products for its particular situation, and decide how to procure those products. Figure 4 describes the steps in this process.

The preliminary steps, described in this section, are the same for all types of green power products. The final steps differ for purchased green power products and on-site renewable generation. These steps are explained in later chapters of this guide.

Figure 4: Steps to a Successful Green Power Project



Identifying Key Decision Makers

The people in an organization who are interested in green power may be high-level decision makers as well as staff from the purchasing, facilities/energy management, environmental health and safety, legal, corporate relations, and/or marketing departments. Their interests and concerns need to be addressed. Experience has demonstrated that not doing so often leads to disagreements later in the process, whereas including these interested people in the early planning stages goes a long way toward addressing their concerns. These departments (such as environmental or marketing) may also contribute funds to help pay for green power.

It is important to designate a contact person who can draw on expertise from throughout the organization. Which departments are chosen to participate will probably depend on the type of products being considered. It also is important to involve senior management in the planning and decision process. In some cases, the greatest advocate of buying green power is an executive such as a CEO or president. With this high-level support, buying and promoting green power is much easier. Some organizations involve their employees (or students, in the case of educational institutions) in selecting the green power products.

At this early stage it is necessary to decide on the objectives for purchasing green power.

- Why is the organization considering green power?
- What does it hope to get from it?
- What selection criteria are important to the organization?
- Is buying new generation more important than maintaining the generation that has been in place for many years?
- Is independent certification and verification important to the organization?

Gathering Energy Data

The organization should take an inventory of its energy use, including both electricity and fossil fuels. Its monthly energy use can be calculated from the utility bills for each facility or business unit and for the entire organization. These data will help (1) find where energy can be saved, (2) determine how much green power to buy, and (3) evaluate the environmental impacts of the organization's electricity use. Monthly electricity consumption data are the most important, while peak demand and interval-meter data are useful if available. The organization should study its consumption data over the past year before specifying its requirements. Outside consultants or organizations can help with these steps.

As mentioned earlier, green power can be considered part of an energy portfolio that includes energy efficiency upgrades, load management, combined heat and power, and green power. The more an organization's energy requirements can be reduced, the less green power it will need to buy to achieve a given objective, which in turn makes green power more affordable. Some organizations that have bought green power have saved enough from energy efficiency upgrades to enable them to pay the higher price of green power.

Many resources are available to help improve the energy efficiency of buildings and equipment. A good starting point is the ENERGY STAR Portfolio Manager, an online tool that compares a building's energy usage with that of similar buildings. The ENERGY STAR Web site (www.energystar.gov) also offers simple energy-saving tips and a directory of energy services companies to provide additional assistance, such as a facility energy audit.

An organization's annual energy consumption can be used to calculate the emissions associated with its current use and estimate the emissions that could be displaced by buying green power. The EPA's Green Power Partnership offers an online tool to help estimate emissions from an organization's electricity use (www.epa.gov/cleanenergy/powerprofiler.htm).

Paying for green power

Catholic University of America (CUA) has been pursuing energy conservation aggressively for the past eight years, utilizing performance contracting with guaranteed savings. Without an increase in its energy budget, CUA has still come in under budget for six years. CUA decided to use some of the savings to purchase 4 million kWh of wind power (the output of one turbine) for a five-year period. This purchase supplies nearly 12% of the university's total electricity, and the cost is the equivalent of buying each student one soda per month.

Choosing Green Power Options

The next step is finding the appropriate green power solutions for the organization. Another goal of this step is becoming familiar with the electricity markets in the organization's area and the available green power technologies.

The first decision is whether to generate power on-site and/or to purchase power or RECs from outside vendors. The main differences between these options are the ease and cost of implementation, the need for capital investment, the ability to hedge risk, and the length of time over which one realizes the benefits. On-site renewable generation requires an up-front investment (as part of either a financed project or a capital appropriation), but the reduction in the consumption of conventional energy can last for as many as 30 years. Renewable electricity purchases and renewable energy certificates, however, require no up-front capital and are relatively easy to procure, but they deliver benefits only for the term of the purchase contract.

An organization's motivations for purchasing green power will help decide which costs and benefits are most important and thus which type of green power is most appropriate. For example, an organization wanting to manage fuel price risk may be more interested in buying fixed-price renewable electricity. An organization to which the reliability of its power supply is most important may be more interested in on-site renewable generation. These options can also be combined. For instance, an organization might install on-site generation to meet part of its electrical needs and purchase RECs to offset some or all of its remaining electricity usage. Likewise, organizations with facilities in multiple locations must select the appropriate green power product for each site.

The choice of green power options is determined partly by the electricity market structure in the state in which the facility is located. For renewable electricity, if the state's electricity market has been restructured, an organization can probably choose both its supplier and the product it prefers. Each state has different rules governing power marketers, and the level of competition varies among the states. If the organization's state electricity market has not been restructured, the local utility may offer a renewable electricity option (sometimes called utility green pricing). Large electricity purchasers may be able to work with their local utility or electricity provider to tailor a product to meet their needs.

Assembling a list of green power products offered in a specific area

- Perhaps the most complete source of information is the U.S. Department of Energy's Green Power Network Web site (www.eere.energy.gov/greenpower).
- Many state governments, often the public utilities commission, maintain a list of power marketers offering green power products in their state.
- Organizations with facilities in several states should use a national locator such as EPA's Green Power Locator (www.epa.gov/greenpower/locator.htm) or the Green-e "Pick your Power" locator (www.green-e.org/your_e_choices/pyp.html). The latter is also useful for locating certified products.
- Smaller facilities (such as retail stores) may find it easier to have a single point of contact compiling this information and making it available across the entire organization. Larger facilities (such as factories or research campuses) often have enough expertise to gather information and negotiate contracts on their own.
- See Section 10 for more resources.

For on-site renewable generation, the organization should assess the renewable energy resources available at its facility, including the quality of wind and solar resources, the availability of biomass fuel or landfill gas, and siting constraints (such as space limitations or shading from neighboring buildings). The cost of conventional power at the facility also is important to consider. The organization should read over its utility's and state's interconnection rules to make sure there are no obvious provisions that would prohibit grid-connected, on-site generation. The goal at this stage is to eliminate any renewable options that are clearly not feasible for the organization.

Chapter 6
Procuring Renewable Electricity and Renewable Energy Certificates

Developing Criteria for Screening Suppliers and Products

To help select both the green power supplier and the product, it is helpful to develop specific criteria for judging the alternatives. These criteria may be ranked, keeping in mind the goals identified early in the process when the project team was assembled.

For selecting green power suppliers, the following criteria may be helpful:

- **Reputation.** A supplier's reputation is influenced by factors such as how well it honors its commitments, how easy it is to work with, and how well it is viewed by the industry. Assessing a supplier's reputation may require references and a perusal of the energy industry's literature. Environmental groups also may have information about the supplier.

- **Financial strength.** To research the financial health of a power supplier, look at its Web site and perhaps its annual report, SEC filings, and bond ratings.

- **Location.** If buying green power from a local supplier is important, call the supplier and find out where its headquarters and branch offices are located. Public utility commissions' Web sites often have contact information for registered retail suppliers.

- **Product choice.** Some suppliers offer several green power products, varying in the amount of renewable power, types of resources, and the like. If a supplier offers a choice of green power products, this may enable the organization to change the product it purchases in the future without having to search for a new supplier and negotiate a new contract.

- **Social responsibility.** Determining a supplier's social values and commitment to environmental conservation requires some research. The supplier's Web site is a good place to start. Organizations should review the supplier's annual report or environmental report, examine its other electricity products, and review its other business activities.

For green power products, consider the following criteria:

- **Price.** Green power prices may be quoted in total cents per kilowatt-hour or in extra cents per kilowatt-hour (incremental to the standard power rate). If the organization is in a regulated utility's service territory, compare the price of green power with the price of conventional power. In competitive markets, compare the price of green power with that of electric service under standard utility rates, that of electric service under the lowest-price competitive alternative, and that of the electric service that the organization is currently receiving. Also make sure to determine whether the price is fixed over time or fluctuates with changes in standard power rates (some utility green-pricing program participants are exempt from variable fuel charges).

- **Percentage of renewable energy.** For a particular green power product, the resource mix can range from 1 to 100 percent renewable power. When buying certificates or block products, an organization can still calculate the percentage of its energy use served by renewable power.

- **Percentage of new or incremental renewable sources.** Although it is important to support existing renewable generation, many experts argue that only new generation provides incremental environmental benefits. "New" renewable resources refer to renewable facilities that have been created specifically for the green power market. Existing facilities presumably sold power into the grid before a particular green power purchase and would continue to do so. Therefore, purchasing power from the existing facilities may not change the composition or the environmental impact of the region's generation mix. Besides the direct impact of purchases from new renewable sources, these purchases also create the demand necessary for constructing additional renewable resources.

In some situations, however, buying power from existing renewable generation facilities can provide support for existing facilities that otherwise would have been underutilized or possibly even shut down, thus preventing their displacement by dirtier nonrenewable plants. When the demand for green power exceeds the supply, purchasing from existing facilities can eventually lead to the installation of new renewable generation capacity.

In states that have adopted a renewable portfolio standard (RPS), electricity providers are required to include a minimal percentage of renewable electricity in their standard product offering. Renewable electricity products create additional environmental benefits only if the power purchased is not already part of the provider's minimal RPS requirement.

- **Renewable energy/resource mix.** A renewable energy/resource mix refers to the kinds of resources used in the green power product. For example, is the product generated from wind, biomass, solar, geothermal, or hydro? Some resources have a greater environmental impact than others do, with different associated costs. Wind, solar, and geothermal power usually are the most environmentally preferable energy sources. Each is renewable and nonpolluting, with little impact on the land or local habitats. Certain environmental groups regard some types of hydropower, biomass, and municipal solid waste as less desirable. Hydropower dams may drastically alter river habitats and fish populations; biomass facilities may emit significant quantities of NO_X; and burning municipal solid waste may release heavy metals and other toxins into the environment.

  It also is important to check the environmental characteristics of any nonrenewable generation resources, as they will contribute to the overall environmental impact of the power purchased. One advantage of buying Green-e certified power is that the certification requires a product's nonrenewable resources to be, on average, cleaner than those of the local system power.

- **Length of contract.** Some buyers prefer a short-term contract in case the market changes and better offers come along. But an organization may be able to lock in a lower price if it signs a multiyear contract. A longer-term contract may also offer greater price stability. When determining the value of price stability, be aware of "typical" market fluctuations in power prices and how the price of renewable electricity can vary. Finally, a contract may include options for renewal, which can offer flexibility in the future.

- **Third-party certification and verification.** A green power product can be certified and verified by an independent third party. Such certification can provide credibility and confirmation of the product's environmental value. Visit www.green-e.org for more information about certification.

- **Location of generation.** In order to support the local economy and to contribute local environmental benefits, some organizations may prefer local or in-state renewable generation. Some renewable electricity products, however, use resources located out-of-state, and renewable energy certificates may be based on generation located nationally or even internationally.

- **Specific generation facility.** Some green power providers generate their power at a specific site, such as a nearby wind farm. These products, such as the annual output of one particular wind turbine, offer the benefit of being more tangible because they are associated with an identifiable generating facility.

Collecting Product Information

A good place to start collecting information about specific green power options is the many Internet sources listed in this *Guide*. Be sure to collect enough information to answer the decision criteria listed earlier. For useful comparisons, the information should be as consistent as possible among suppliers and among products. A good way to find consistent information is through an exploratory letter or a request for information (RFI) addressed to specific suppliers.

In many states, competing electricity suppliers are required to provide an electricity label—like a list of food ingredients—that provides information in a standard format and makes product comparisons easier. This information is generally available from the state's public utility commission. Another source of public information is third-party certifiers, such as Green-e, Environmental Resources Trust, or Climate Neutral Network, which provide information about the products they have certified to meet minimum environmental standards. All Green-e certified products give standardized product content labels to prospective customers.

The next step is estimating the cost of green power for the organization and calculating the cost/benefit ratio. For help finding data, contact one of the organizations that sponsored this guidebook (listed in chapter 10).

Creating a Procurement Plan

A procurement plan documents the project team's decisions and addresses possible problems in buying green power. A procurement plan can also help convince others in the organization that purchasing green power is a wise choice.

The main audience for the procurement plan is the managers who need to support the purchase decision. Their support should be secured as early in the process as possible. As soon as the team can show the costs and benefits of purchasing green power to the organization, they should present their information to management. Expect the managers to ask about the products the organization would buy, their cost, and their benefits. Also find out whether management might limit a green power purchase or whether they would buy more aggressively.

Besides providing the information that management needs to make the decision, a procurement plan can also help overcome resistance to green power within the organization. Some organizations have outdated perceptions of the reliability of renewable energy technologies, misunderstandings about using an intermittent resource, or worries about the cost. As part of the procurement process, the project team will probably need to educate others about these topics and the benefits of green power. The organizations that sponsored this guidebook can provide helpful information to overcome these misconceptions.

The scope and detail of the procurement plan will depend on the organization's needs and requirements, but it should address the following:

Scope of procurement

Specify the amount of power that will be purchased (as either a fixed amount of money for renewable purchases or a percentage of total power use) and for which facilities. If this procurement is a trial that may lead to additional purchases in the future, spell out the criteria that will be used to judge the trial's success. Also discuss whatever is known at this point about future procurement phases.

Expected benefits

Keeping in mind the general benefits outlined earlier in this guide, list the particular benefits hoped for by buying green power for the organization. Wherever possible, these benefits should be linked to the organization's environmental goals.

Financial considerations

Cost is usually the primary concern with green power, so the procurement plan should make a point of discussing it. Several strategies are available to help minimize and manage the extra cost of green power:

- **Buy green power for only part of the organization's energy use.** Green power does not have to be used for all energy needs. For example, the organization might buy green power for just 5 or 10 percent of its electricity use. Buying 5 percent green power may add less than 2 percent to the organization's electricity bill. Alternatively, some renewable electricity products cost less because they already are blended with conventional electricity.

- **Make a longer-term purchase.** Consider the contract's length in conjunction with the quantity and cost of power purchased. A short-term contract (typically less than three years) may offer greater flexibility in the future but also may cost more. But a longer contract can reduce the risk to the supplier, allowing it to offer a lower price than under a shorter contract. The right contract length is based on the particular situation and products available.

- **Seek a fixed-price contract.** Because its cost of fuel is predictable, renewable energy is often available at a fixed price without any fuel-cost adjustments. Check with the supplier, particularly if the organization is considering a utility green-pricing program, to see whether green power customers are exempted from fuel-cost adjustments.

- **Offset the cost with savings from energy efficiency.** Reducing the total amount of electricity purchased helps make green power more affordable. When reviewing green power providers, organizations may find that some providers also offer energy efficiency services, with the goal of no net increase in their customers' power bills.

Reducing the cost of green power

In 2003, the University of Pennsylvania doubled its already large purchase of green power to 40 million kWh. In addition to doubling its purchase, Penn extended its earlier commitment term from 3 years to 10 years. Both of these factors may have reduced the price they pay for green power. Penn also has paid for its significant commitment through savings from aggressive energy conservation. For example, over the past few years, Penn has reduced its peak electric demand by 18%.

- **Use savings from competitive choices.** Competitive choices of either green power or commodity electricity may lead to savings on energy costs, which can be used to buy green power. Or the extra cost of green power can be limited to the amount of savings from competition. Be aware that switching to less expensive conventional power can also mean dirtier power, so ask the electricity supplier for information about the emissions from its product, and make sure those emissions do not cancel out the benefits of the green power bought with the savings.

- **Specify a price cap or maximum total budget**. Specify the maximum price per kilowatt-hour or the total cost, or simply place a cap on the renewable portion of the purchase. A drawback of this approach is that suppliers are likely to bid at or near the specified price cap. But if the organization is interested mainly in other aspects of green power, such as environmental benefits or hedge value, this can be a good approach. Even if a price cap is not the most important consideration, it is a good idea to decide on the highest price the organization is willing to pay for green power, as part of its internal procurement planning.

- **Use incentives for buying green power.** A few states offer incentives that reduce the cost of green power. In almost all cases, these incentives are paid directly to the power marketer, so the incentive will already be factored into the price quoted and does not need to be requested separately. The power marketers and the state's energy department will know about any green power-purchasing incentives that are paid directly to the purchaser. For more information about available incentives, visit the Database of State Incentives for Renewable Energy at www.dsireusa.org.

Even with these cost reduction techniques, green power often is more expensive than standard power. To justify this extra expense, it is important to consider the benefits of green power. After weighing all the benefits, many organizations decide that green power is an inexpensive way to help achieve various organizational goals.

Procurement methods

The best way to buy power depends on the green power options available to the organization as well as its procurement rules. Generally, the greater the load that the organization can bundle together in one purchase, the more attractive it will be to a supplier.

The following explains typical ways to buy green power. Federal agencies must work within the procurement rules applicable to the federal government, which are explained further in appendix A.

- **Negotiate with the utility.** Buying power is simple, though the choices are fewer, if the organization is served by a utility in a regulated market with only one supplier. If the local utility offers green power, the organization can collect information by visiting the utility's Web site and calling to discuss its interest. Perhaps the only issue is the quantity the organization wants to buy, but it may be able to negotiate a slight price break if it is making a large purchase. If the utility does not offer green power and the organization is a large, highly visible customer, it may be able to encourage the utility to offer green power by promising to buy a large amount. Likewise, the organization may be able to persuade the utility to seek third-party certification if its product is not currently certified.

- **Call several sellers.** An organization can keep the procurement process relatively simple by calling the few green power providers active in its area. An off-the-shelf product may meet its needs. If the organization wants something different and only one or two green power suppliers are in the area, it can call them to discuss the options and let them know the organization would be interested in a proposal. After a discussion, the organization may be ready to negotiate directly with one of the suppliers about product definition, certification, price, and terms. Or if the organization is planning a large purchase, the suppliers may be willing to tailor something to its needs.

- **Request proposals.** Large companies, and public institutions in particular, often issue a formal solicitation or request for proposals (RFP). An RFP requires more time and effort for preparation, evaluation, and negotiation, but it may be more suitable for a large purchase and when many green power options are available. With an RFP, it is important to understand the organization's own objectives and communicate them clearly in the solicitation. Third-party certification and verification can be specified in the RFP evaluation criteria.

  RFPs can be as simple as a letter sent to selected suppliers, describing the organization's objectives and asking for a bid. This would be appropriate if just a few suppliers are available. RFPs can also be more formal, casting a wider net through a broadly advertised solicitation. This requires more effort to prepare and evaluate responses. Government agencies must follow the procurement rules governing their agency.

A two-step process is possible, too, in which the organization first issues a request for qualifications (RFQ) and, based on the responses, sends a more detailed RFP to those suppliers that meet its general qualifications. The RFQ would be broadcast to a larger audience, not only to find out who meets the organization's qualifications, but also to gauge the amount of interest.

For large purchases, RFPs may be addressed to renewable power generators (wholesale) as well as retail suppliers. Buying directly from generators may lower the cost but probably will require a longer-term purchase commitment. The Green Power Partnership offers assistance to partners putting together a green power purchase RFP; FEMP provides the same service for federal agencies. For RECs, the World Resources Institute provides guidelines and a sample contract for an RFP (www.thegreenpowergroup.org/credits.html).

RFP procurement

The State of New Jersey is buying 10% of its energy load (54 million kWh/year) from new wind facilities in Pennsylvania. This purchase is consistent with a number of state environmental policies, but was complex because of the many agencies involved and tight state budgets. To find a supplier, New Jersey issued an RFP that gave greater weight to Green-e certified products and lower emissions, resulting in a wind-only purchase.

Special considerations for RECs

Certificates can be bought from REC marketers or sometimes directly from renewable energy generators. Several environmental brokers are active in REC markets, offering another approach to procurement that is increasingly being used by large purchasers. Brokers do not own the certificates but rely on their knowledge of the market to connect buyers and sellers for a small fee. They can help negotiate deals that take into account an organization's unique interests.

Several issues need to be addressed when buying certificates. The attributes that the certificate represents should be clearly stated in a contract. If the organization plans to claim credit for these attributes, the contract should express in writing that the purchaser will receive title to them. If attributes like a reduction in carbon emissions have been sold separately to another party, then the exceptions should be clearly stated. The organization should make sure that the attributes it buys have not been double-sold and claimed by another party. Green-e certification can help ensure that the benefits promised by the supplier are actually realized. In addition, RECs have separate markets, depending on whether the certificates will be used to comply with the state's renewable policy requirements or for voluntary reasons. Prices in voluntary markets are generally well below those in compliance markets.

An organization may want to buy certificates only from renewable energy generators or marketers that meet its specifications, so the same selection criteria mentioned earlier in this chapter should still be considered in the procurement process. In fact, because certificates can come from any geographic area, the location where the certificate was generated, and therefore where the environmental benefits are likely to accrue, can be an important factor to consider.

Chapter 7
Planning an On-site Renewable Generation Project

Depending on the size of the system, on-site power projects tend to take more steps than do power purchases because they require more external coordination with the organization's utility, local governments, and contractors. For this reason, it is helpful to enlist outside technical expertise and not underestimate the length of time needed for a project like this. The following steps, along with the resources listed in chapter 10, can help. In the end, the renewable system will generate power and other benefits for many years to come.

Screening the Technologies

Based on work done in the first steps (chapter 5), the organization should have a good idea of its energy needs and the renewable resources available at its site. The next step is to perform a screening analysis to find those options best suited to the site. This screening should evaluate the options being considered, comparing the cost-effectiveness of the organization's current energy situation with that of a renewable power system. This screening should be based on the financial assessment methods that the organization would normally use for any capital investment, such as life-cycle cost, rate of return, and simple payback. The analysis should account for state and federal financial incentives, interconnection rules (e.g., insurance requirements or standby charges), and net-metering laws that may apply to the facilities. The result of this screening will be a specific technology that meets the organization's energy needs.

For on-site renewable power, bundling energy efficiency with renewable power is a common practice. The organization's site-specific situation (e.g., whether the generation system is connected to a grid, the facility's load shape, the utility's rate structure) determines the appropriate efficiency measures to include. At this point, it is a good idea to consider whether energy efficiency projects should be implemented together with the renewable generation technologies being considered.

An economic analysis must consider the approximate size of the renewable power system that the organization hopes to install. The size can be driven by the load to be served by the system, the organization's capital budget, or physical constraints at the site (such as rooftop area for PV systems or the rate of biomass fuel production). One option is to install the system incrementally, purchasing what the organization can afford now and adding more capacity over time. The modular nature of PV technology makes it especially suited to this approach, although wind can also be installed in somewhat larger modules. A contractor or utility representative can help choose the right-size system. The organization can also use one of the software tools listed in chapter 10.

The economic analysis should also decide whether the on-site power system will be used to provide backup power during utility grid outages. If so, the system must be designed to disconnect from the utility grid when a power outage occurs. The organization also must decide whether the system will include energy storage or backup generation, in order to provide power when renewable resources are not available. This analysis will be affected as well by whether the renewable generation will be part of a combined heat and power system (applicable to systems involving fuel combustion, such as landfill gas and biomass).

Obtaining Resources and Assistance

If the organization chooses to own and operate an on-site power system, it has much to learn, but excellent information resources are available. Before making a purchase, the organization's project team should study the technology and understand what it wants and what questions to ask, in order to be able to write a procurement specification. At this point, it would be wise to call on outside experts who can help with the technical and financial aspects of a renewable power project. Technical assistance may be available through the local utility, the state energy office, energy service providers, energy service companies, consultants, manufacturers, and equipment vendors. In addition, FEMP offers technical assistance to federal agencies.

The financial details are usually what make or break a power project, so the project should collect information about incentives that could make the project more cost-effective. Some state programs may also require that only certified installers install systems. Many states offer financial incentives specifically for customers that install qualified renewable

Using Incentives to Finance an On-Site Generation System

The City of Portland, Oregon used a variety of funding mechanisms to pay for a $1.3 million methane-powered fuel cell. Portland received a $200,000 grant from the U.S. DOE and a utility rebate of $247,000 (essentially returning a green power premium that the City had earlier paid). To finance the remainder, it entered into a lease-purchase arrangement with Western Bank, which was able to qualify for a $224,000 state tax credit because it owned the facility. Western Bank returned much of the tax credit to the City in the form of advantageous lease terms.

generation systems. These incentives may take the form of direct payments (rebates), competitive solicitations, consumer financing, or lower taxes (either sales or property tax). In addition, the federal government offers an investment tax credit for solar and geothermal energy systems, among other incentives for renewable energy. For more information, visit the Database of State Incentives for Renewable Energy at www.dsireusa.org. The state energy office, local utility, or renewable-energy equipment vendor will also have information about which incentive programs apply to its situation.

Utility rate impacts should also be investigated carefully. The organization should check with the local utility to see whether on-site generation would lower its demand charges or generate electricity at a time of day when prices are higher. Facilities with their own generation systems sometimes also qualify for reduced "self-generation" rates.

Creating a Project Plan

Once the organization has decided on a specific technology, it is time to conduct a detailed feasibility study. This study will quantify all the costs and benefits of the project to evaluate its cost-effectiveness. The study should be based on inputs that are as specific as possible to the organization's situation, such as quoted prices from vendors.

If the project appears feasible, the project team can then decide on a plan to have the renewable power system financed, built, and installed. Financing is a critical aspect of the project, and it should account for any federal and state incentives for which the organization's system is eligible. Make sure that the system is designed to meet the requirements of the incentive program.

In addition, some renewable resources, such as biomass, will probably require air permits from the local air resources control board. The project plan should account for the time and expense of acquiring these permits. As with any other type of facilities project, the team must secure the necessary land-use and building permits and variances required for the project. The team also will need to apply for interconnection with the local electric utility (for grid-connected systems), which can be a complex and time-consuming process.

Procurement strategy

Purchases for on-site generation differ from power purchases. In many cases, an organization may buy, own and operate its own generation equipment. In some circumstances, though, it can enter into a power purchase agreement to buy the electricity generated by a renewable energy system installed on its property without actually owning the system. This approach may not be widely available in states that allow electricity to be purchased only from a qualified utility.

The procurement options for on-site generation generally fall into the following categories:

- **Act as the general contractor.** If the organization has design engineers on staff, they can draw up the specifications and then solicit bids for equipment and installation. This arrangement works well if the organization wants to do some of the work in-house. Keep in mind, however, that if the organization has no experience with renewable energy systems, it runs the risk of ending up with a poorly performing system.

- **Hire a general contractor for a turnkey system.** An organization probably will use an RFP to select an equipment manufacturer, a system designer, or a system installer to help design the system to its needs, to buy the materials, to arrange for installation, and to commission the system. Note that some companies (particularly in the PV industry) are vertically integrated, from manufacturing, to design and installation, to operations and maintenance.

- **Hire an energy services company (ESCO).** The ESCO will be responsible for design, installation, maintenance, and financing. This differs from a turnkey project in that ESCOs typically work under performance contracts, meaning that they are paid according to how well the project is carried out. Usually this is through energy savings, but success can also be based on the amount of power generated or the system's reliability. ESCOs also often provide at least part of the project financing, which can be very helpful for organizations—such as government agencies—with very limited capital budgets. Usually, ESCO projects need to be large, or part of a larger contract, in order to justify the transaction costs.

- **Buy power from an independently owned system.** When considering on-site green power, some companies decide not to install solar PV systems because of the high capital investment, maintenance costs, and financial returns that fall short of company standards. To overcome these barriers, an organization can host an on-site generation system and agree to buy the power without actually owning the equipment. This approach is known as a *services model*, and it can greatly simplify the process of installing on-site renewable power. As with other types of green power purchases, make sure that the contract also transfers the environmental and other benefits of the green power, in order to claim full credit for the organization's purchase.

Procuring On-Site Generation Through a Services Model

In 2004, Staples initiated a solar services project for its location in Rialto, CA. The project developer, SunEdison, Inc., arranged for financing, design and construction of a 260 kW solar array. In return, Staples signed a 10-year power purchase agreement (PPA) with SunEdison, with the option to renew for 5-year intervals. The solar PV system will provide benefits of peak load shaving and reduced GHG emissions. Further, Staples will avoid all capital and maintenance costs. The price for power in the contract is competitive with local commercial rates, and the PPA has a fixed cost structure that acts to hedge against price volatility in retail electricity.

Choosing a vendor

When choosing a vendor, it generally is a good idea to get more than one bid, so the first step is to find several possible vendors for a given project. The Web sites for the major trade groups in this area—the Solar Energy Industries Association and the American Wind Energy Association—offer information about their members' expertise and interests, and chapter 10 lists more sources.

When choosing a vendor, the organization should obtain comparative information from the companies it is considering, usually through either a request for qualifications (RFQ) or a request for proposals (RFP). An RFP is appropriate if the organization already has a detailed system design and simply wants a vendor to implement that design. An RFQ is better for comparing vendors' qualifications and experience, to select one to both design and implement the system. Because the design of on-site renewable systems tends to be site specific and because design details are often resolved differently by different vendors, the RFQ approach often leads to the system best tailored to the organization's needs.

Some factors to consider when choosing a provider of on-site generation are the following:

- **Experience.** The vendor's experience and familiarity with the type of system the organization is considering is extremely important. Also determine the vendor's experience with interconnection issues (if the system will be connected to the grid). A quick way to judge a vendor's experience is the length of time it has been in business and the number of similar systems it has installed.

- **Performance history.** It is very important to check references from previous customers, preferably for systems similar to the one the organization is considering. Another important factor is whether there are any judgments or liens against the vendor, which would indicate problems with previous projects.

- **Licenses and certification.** To be eligible for state incentives, some states require that the system be installed by a licensed contractor, whereas other states certify installers that have received the relevant training. As with any other capital project, licenses and certification are an indicator of a contractor's qualifications.

- **Liability and professional insurance.** If any problems arise with the system during installation or operation, it is important that the contractor have adequate insurance to protect the purchasing organization from liability. The contractor should also be responsible for any problems with interconnecting to the grid.

Anticipating Possible Barriers

When implementing a renewable generation project, the organization must work with various entities to obtain permits, connect to the utility system, and perform other activities external to the facility. Some of these steps will end up requiring more time, effort, or money than originally anticipated and may pose barriers that must be overcome.

Generally these barriers fall into two categories: technical and regulatory. Most technical barriers pertain to the local utility's electrical interconnection requirements. Other technical barriers are fuel availability and storage; space limitations; power-quality impacts; fire, safety, and zoning requirements; and operations and maintenance issues. Regulatory barriers pertain mainly to the required permits and approvals, such as air emissions permits, utility standby charges, exit fees, regional transmission charges, and land-use permits.

Often the contractor for the project can be made responsible for overcoming these barriers as they arise. If this seems like a good option, the project team should explore it with the contractor when writing the RFP and reviewing the proposals. The FEMP guide to distributed energy resources offers many tips for resolving any problems that may arise when implementing a renewable power project.

Installing and Operating an On-Site Renewable Generation System

Once the organization's on-site generation system has been designed, it is time to put the contracts in place and begin construction. As with any capital project, it is important to stay involved during the construction to resolve any problems that might arise.

When the construction has been completed, the project team should monitor and verify the system's energy performance. Does everything work as planned? What is the system's actual energy production? If it is not as estimated, what can be done to improve the system's performance? Information about system performance is useful in communicating the benefits of the project to internal and external audiences.

Measurement and validation generally proceed in two steps. The first is the postconstruction evaluation (or commissioning), in which a contractor's work is inspected and the system is tested to make sure that it meets regulatory and design specifications. The second step is monitoring and verifying the system's performance over a longer period, such as the first year of operation (although continuous monitoring is necessary to catch any performance problems that arise). It is important to plan for this stage at the early phases of the project, in order to design a useful data acquisition system.

Finally, all renewable power systems require periodic maintenance in order to perform as intended. The organization must decide whether its staff has the expertise and time to do this or whether it should contract with the equipment vendor or a service company to maintain the system.

On-Site Photovoltaic System

Johnson & Johnson's corporate environmental goals include a goal to reduce its energy-related emissions of carbon dioxide. To help meet these goals, the company opted to purchase renewable power, specifically an on-site solar photovoltaic (PV) system at its Janssen Pharmaceutica facility in Titusville, New Jersey. A state rebate eventually paid for 57% of project costs, and additional federal incentives will allow for accelerated depreciation of the equipment. Even with these subsidies, the project did not rise to the company's minimum rate of return for capital expenditures. The solar PV project had support from senior management, though, because of its positive environmental benefits. This high-level support was vital to project approval. Based on initial data, the 500 kW system will generate about 500,000 kWh per year and can handle about 10% of the facility's load at peak times. Johnson & Johnson is evaluating numerous solar PV projects in addition to the three systems it currently owns.

Chapter 8
Capturing the Benefits of the Purchase

After buying or installing green power, the organization should consider various promotional strategies and marketing to generate measurable, positive publicity and public relations benefits. To maximize the positive publicity, both inside and outside the organization, the purchase of green power should be made part of the organization's comprehensive environmental management efforts. The organization's achievements should be significant and well documented so that claims made to the public are credible.

The Environmental Benefits

When an organization highlights the benefits of its purchase of green power, it is important that it know the quantity of emissions avoided. These emissions can be greenhouse gases (GHGs), primarily carbon dioxide, as well as other significant pollutants that affect the environment and human health, such as sulfur dioxide, nitrogen oxides, and mercury. A buyer of green power can calculate its reduction of emissions and count them toward an environmental or energy goal. To help with these calculations, analysis tools are available from the EPA Green Power Partnership (www.epa.gov/cleanenergy/powerprofiler.htm) and the World Resource Institute's Green Power Market Development Group (www.thegreenpowergroup.org/gpat/).

The concern about climate change, and GHGs in particular, has prompted many organizations to make a GHG emissions inventory. An inventory is a detailed list of emissions by source and type of greenhouse gas, usually expressed in metric tonnes of carbon dioxide equivalent (CO_2e).

An inventory serves many purposes, including

- Identifying opportunities for reduction and managing GHGs.
- Participating in public reporting and voluntary reduction initiatives.
- Participating in mandatory government-reporting programs.
- Trading in GHG emissions markets.
- Providing recognition for early voluntary action.

Using an inventory to record changes in GHG emissions sets the foundation for companies, organizations, and others to benefit from buying green power in future climate change policy frameworks. An inventory also allows organizations to record their emissions information in an official registry with a government agency. Several GHG registry programs have been established to record GHG reductions, including the California Climate Action Registry, Wisconsin's Voluntary Emissions Reduction Registry, the U.S. Department of Energy's 1605b Voluntary Greenhouse Gas Reporting program, and the Regional Greenhouse Gas Registry being developed by the Northeast States for Coordinated Air Use Management.

For more information, see the GHG accounting standards developed by the GHG Protocol Initiative at www.ghgprotocol.org.

Internal Promotion

One of the benefits of buying green power is improving employees' morale. To capitalize on this, companies and organizations often choose to promote their purchase or installation internally using the following methods:

- **Include "energy news" in internal publications.** Internal publications, such as newsletters, are valuable ways of communicating information to an organization's employees, stakeholders, and affiliates and also helps support the organization's mission, growth, and development.
- **Establish a staff adoption and recognition program.** Such a program encourages employees to buy green power through an organization-wide program. A staff adoption program should create incentives, provide information, set milestones for staff purchases over time, and recognize individual achievements.

External Promotion

Strategic external public relations maximize the positive publicity surrounding an organization's purchase of green power. In addition to the public relations benefits, the purchase can motivate additional purchases by the general public, the organization's customers, and its affiliates, thereby extending the impact of the initial purchase.

- **Construct a public relations plan.** Construct a plan to publicize to target audiences the organization's purchase or installation. The plan should include strategies for using existing distribution channels such as e-mail, Web sites, and direct mail to promote the organization and its commitment to renewable energy. An organization can create special print materials and press releases for distribution, and conduct e-mail campaigns that distinguish it as an innovative leader. Retail companies sometimes circulate special offers and coupons and even host events—such as renewable energy celebrations—at stores to attract new customers and communicate the benefits of the organization's green power purchase.

- **Use media contacts and press.** An organization may wish to write a press release describing its purchase, and circulate it to local and national media outlets. The organization can also research and contact local environmental writers and publications to encourage feature stories about the organization and its commitment to improve the environment.

- **Train staff to promote the organization's purchase.** Purchasers can instruct their staff about the details of the organization's purchase and the best ways to highlight it to customers in daily sales interactions. Also teach them how to answer general questions about renewable energy.

- **Take advantage of all opportunities to promote the purchase.** Effective organizations use strategic business engagements and speaking events as well as existing interactions with the public to talk about the organization's environmental commitment and promote its purchase of green power. This may include marketing the organization's purchase on its products and encouraging its suppliers and affiliates to follow its lead and buy green power.

Using Green Power for Promotion and Branding

Hayward Lumber powers part of its manufacturing facility in Santa Maria, California with a 118 kW rooftop photovoltaic system. The PV system, which produces 45% of the facility's electric load, now serves as a brand name—Solar Truss—for the components that are produced at the plant. By branding their trusses, Hayward Lumber is educating contractors and architects that its trusses are built using renewable energy sources.

- **Work with third-party organizations.** Third-party organizations can help provide credibility to green power purchases that meet minimum purchasing benchmarks. These organizations also offer publicity channels that promote renewable energy and highlight environmental commitment. All the organizations sponsoring this guidebook help their partners and companies publicize their achievements in buying green power. Members of the EPA's Green Power Partnership and those who purchase Green-e certified products can also use these logos in their promotional activities.

- **Create marketing partnerships with green-power suppliers.** Offer retail customers the opportunity to sign up for green power, and reward them with benefits such as gift or discount cards, merchandise, or collateral products (e.g., T-shirts, hats) that tout the company's image as an environmental leader.

Chapter 9
Conclusion

Purchasers of electricity can have a significant impact on the way that power is produced, both now and in the future. Businesses, governments, and nonprofits have an unprecedented and increasing range of options for buying green power. In those states that have restructured their electricity markets, retail access allows customers to choose their electricity supplier and, by extension, how their electricity is produced. In regulated markets, utility green-pricing programs enable customers to support the addition of renewable energy to the grid without leaving their current utility. Renewable energy certificates and on-site renewable generation allow organizations everywhere to achieve the benefits of green power. Organizations that act in their own—and society's—best interests can take advantage of the strategies outlined in this guidebook to help move the United States toward a more sustainable energy future.

Chapter 10
Resources for Additional Information

U.S. Department of Energy

- Federal Energy Management Program (FEMP)
  www.eere.energy.gov/femp
- Green Power Network
  www.eere.energy.gov/greenpower
- FEMP Renewable Power Purchasing
  www.eere.energy.gov/femp/technologies/renewable_purchasepower.cfm
- FEMP Distributed Power
  www.eere.energy.gov/femp/technologies/derchp.cfm

U.S. Environmental Protection Agency

- Clean Energy
  www.epa.gov/cleanenergy
- Green Power Partnership
  www.epa.gov/greenpower
- Energy Star
  www.energystar.gov
- Landfill Methane Outreach Program
  www.epa.gov/lmop
- EGRID database
  www.epa.gov/cleanenergy/egrid
- Power Profiler
  www.epa.gov/cleanenergy/powerprofiler.htm

World Resources Institute

- World Resources Institute home page
  www.wri.org
- GHG Protocol Initiative
  www.ghgprotocol.org
- Green Power Market Development Group
  www.thegreenpowergroup.org

Green-e Renewable Energy Certification Program

The Green-e Renewable Energy Certification Program is the nation's leading voluntary certification and verification program, designed to help businesses and households compare and select clean renewable energy options. Green-e sets consumer protection and environmental standards for energy products and verifies that Green-e certified products meet those standards. Energy products that meet the Green-e standards are identified by the Green-e logo.

Certification ensures the quality of renewable energy products. All Green-e-certified products meet stringent requirements for air emissions, energy from new renewable facilities, and truth in advertising. These strict standards are set through a collaborative process with environmentalists, consumer advocates, marketers, and energy experts. Green-e's annual verification process and marketing compliance review ensure that providers meet these standards. By requiring these consumer and environmental safeguards, Green-e builds consumer confidence in renewable energy products, which helps expand the market for high-quality products.

Green-e provides clear information about energy options to enable purchasers to make informed decisions. Green-e works with companies and organizations purchasing certified green power to highlight their purchase and educate consumers about the benefits of buying renewable energy. Green-e also conducts public education and outreach campaigns in regions across the nation to inform consumers about their options and build demand for renewable energy. The Green-e Web site, www.green-e.org, and toll-free number (888-63-GREEN) are widely used resources that allow consumers to compare certified products in any region and to select the superior green power option that meets their needs.

Green-e also identifies products manufactured by companies that buy certified green power, bringing renewable energy to the attention of millions of diverse consumers across the nation. Through Green-e's product labeling initiative, claims such as "Made with Certified Renewable Energy" and "We Buy Certified Renewable Energy" may now appear on consumer products, accompanied by the Green-e logo and Web site. These labels appear on products in grocery stores, carpet labels, and even on bottles of wine in restaurants. The initiative advances renewable electricity use as a new type of environmental performance indicator for consumer products, similar to other consumer labels for recycled products, organic food, fair trade practices, and energy efficiency.

Green-e is a program of the Center for Resource Solutions. For more information, visit www.green-e.org or www.resource-solutions.org.

Additional Resources

Overview

Developing a strategic energy management plan:
ENERGY STAR for business: www.energystar.gov, follow the links to "Business Improvement" then "Guidelines for Energy Management".

Electricity restructuring:
FEMP's restructuring Web site:
pnnl-utilityrestructuring.pnl.gov.

Current state of green power markets:
Bird, Lori, and Blair Swezey. 2003. *Estimates of Renewable Energy Developed to Serve Green Power Markets in the United States*. Golden, CO: National Renewable Energy Laboratory, February (www.eere.energy.gov/greenpower/resources/tables/new_gp_cap.shtml).

Benefits of Green Power

Public support for renewable energy:
Farhar, Barbara C., and Ashley H. Houston. 1996. *Willingness to Pay for Electricity from Renewable Energy*. Golden, CO: National Renewable Energy Laboratory, September.

Motivations for purchasing green power:
Holt, E., R.Wiser, M. Fowlie, R. Mayer, and S. Innes. 2000. *Understanding Non-Residential Demand for Green Power*. Prepared for the American Wind Energy Association and the National Wind Coordinating Committee (www.nationalwind.org/pubs).

Economic development and job creation:
National Wind Coordinating Committee. 2003. *Assessing the Economic Development Impacts of Wind Power*. March (www.nationalwind.org/pubs).

Environmental Law and Policy Center. *Job Jolt: The Economic Impacts of Repowering the Midwest: The Clean Energy Development Plan for the Heartland* (www.repowermidwest.org/Job%20Jolt/JJfinal.pdf).

Environmental benefits:
Serchuck, Adam. 2000. *The Environmental Imperative for Renewable Energy: An Update*. College Park, MD: Renewable Energy Policy Project (REPP), University of Maryland. April (www.repp.org/repp_pubs/articles/envImp/envImp.pdf).

EPA's Global Warming Web site:
www.epa.gov/globalwarming.

Emissions credits:
Wooley, David R. 2000. *A Guide to the Clean Air Act for the Renewable Energy Community*. College Park, MD: Renewable Energy Policy Project (REPP), University of Maryland. Issue Brief no. 15. February (www.repp.org/repp_pubs/articles/issuebr15/caaRen.pdf).

National Wind Coordinating Committee. 2002. *Credit Trading and Wind Power: Issues and Opportunities*. May (www.nationalwind.org/pubs/).

Renewable Energy Certificates (RECs)

Hamrin, Jan, and Meredith Wingate. 2003. *Regulator's Handbook on Tradable Renewable Certificates*. San Francisco: Center for Resource Solutions. May (www.resource-solutions.org/RegulatorHandbook.htm).

EPA's Green Power Locator: provides links to retail and wholesale marketers of renewable energy certificates: www.epa.gov/greenpower/locator.htm.

The Green Power Network lists brokers and wholesale marketers: www.eere.energy.gov/greenpower/markets/certificates.shtml.

Green-e lists certificate marketers and brokers that offer certified products: www.green-e.org.

The World Resources Institute offers a sample REC contract: www.thegreenpowergroup.org/Sample_REC_Contract.doc.

Hanson, Craig, and Vince Van Son. 2003. *Renewable Energy Certificates: An Attractive Means for Corporate Customers to Purchase Renewable Energy*. Washington, DC: World Resources Institute (www.thegreenpowergroup.org/Installment5.pdf).

Utility Green-Pricing Programs

Holt, Edward, and Meredith Holt. 2004. *Green Pricing Resource Guide*. 2nd ed. Washington, DC: American Wind Energy Association.

Lieberman, Dan. 2002. *Green Pricing at Public Utilities: A How-to Guide Based on Lessons Learned to Date*. Center for Resource Solutions and Public Renewables Partnership. October. (www.resource-solutions.org/PRP.htm).

Green Power Product Lists

The Green Power Network maintains lists of products offered in each state: www.eere.energy.gov/greenpower.

The EPA Green Power Partnership supports a Green Power Locator: www.epa.gov/greenpower/locator.htm.

Green-e maintains a list of certified products offered in each state: www.green-e.org/your_e_choices/pyp.html.

On-Site Renewable Generation

FEMP. 2002. *Using Distributed Energy Resources: A How-to Guide for Federal Facility Managers*. Washington, DC: U.S. Department of Energy, Federal Energy Management Program. DOE/GO-102002-1520. May (www.eere.energy.gov/femp/technologies/derchp_resources.cfm).

Massachusetts DOER. 2001. *Renewable Energy & Distributed Generation Guidebook: A Developer's Guide to Regulations, Policies and Programs That Affect Renewable Energy and Distributed Generation Facilities in Massachusetts*. Massachusetts Division of Energy Resources. April (www.state.ma.us/doer/pub_info/guidebook.pdf).

California Energy Commission: www.energy.ca.gov/renewables/index.html.

Pennsylvania Department of Environmental Protection. 2003. *Small Wind Electric Systems: A Pennsylvania Consumer's Guide* (www.dep.state.pa.us/dep/deputate/pollprev/energy/wind/small_wind_pa.pdf).

New York State Energy Research and Development Agency: www.nyserda.org/energyresources/photovoltaics.html and www.nyserda.org/energyresources/wind.html.

Government incentives for renewable energy:

The Database of State Incentives for Renewable Energy includes information about capital cost incentives as well as net-metering laws: www.dsireusa.org.

Clean Energy States Alliance: www.cleanenergystates.org.

The American Wind Energy Association lists states' incentives for small wind installations: www.awea.org, follow links to "Small Wind Systems" then "State by State Information".

Bolinger, Mark, Ryan Wiser, Lew Milford, Michael Stoddard, and Kevin Porter. 2001. *Clean Energy Funds: An Overview of State Support for Renewable Energy*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-47705. April (http://eetd.lbl.gov/ea/EMS/reports/47705.pdf).

Interconnection with the utility grid:

In 2003 the Federal Energy Regulatory Commission (FERC) issued standard procedures and a standard interconnection agreement for the interconnection of generators larger than 20 megawatts. FERC also proposed a rule to apply to the interconnection of small generators no larger than 20 megawatts: www.ferc.gov/industries/electric/indus-act/gi.asp.

California Rule 21: standards for interconnection of distributed energy resources: www.energy.ca.gov/distgen/interconnection/california_requirements.html.

Standards Board of the Institute for Electrical and Electronics Engineers, Inc. (IEEE). Standard 1547: "Standard for Interconnecting Distributed Resources with Electric Power Systems": grouper.ieee.org/groups/scc21/dr_shared.

DOE Distributed Power program: www.eere.energy.gov/distributedpower

FEMP Interconnection and Permitting Guide**:** www.eere.energy.gov/femp/technologies/derchp_ipg.cfm.

Larsen, C., B. Brooks, and T. Starrs. 2000. *Connecting to the Grid: A Guide to PV Interconnection Issues*. 3rd ed. Interstate Renewable Energy Council (http://irecusa.org/connect/library.html).

Measurement and verification of system performance:

FEMP. 2000. *M&V Guidelines: Measurement and Verification for Federal Energy Management Projects, version 2.2*. Section VIII of these guidelines covers renewable energy projects. (www.eere.energy.gov/femp/financing/superespcs_measguide.cfm).

PVWATTS is a calculator to estimate the output from photovoltaic solar installations. The model calculates monthly and annual energy production in kilowatt-hours and monthly savings in dollars. See http://rredc.nrel.gov/solar/calculators/PVWATTS.

For more information about PV systems, see:

American Solar Energy Society: www.ases.org.

Solar Electric Power Association: www.solarelectricpower.org.

Solar Energy Industries Association: www.seia.org.

North Carolina Solar Center: www.ncsc.ncsu.edu.

California Energy Commission. 2000. *Buying a Photovoltaic Solar Electric System: A Consumer Guide*. April (www.energy.ca.gov/reports/500-99-008.PDF).

California Energy Commission. 2001. *A Guide to Photovoltaic (PV) System Design and Installation*. June (www.energy.ca.gov/reports/2001-09-04_500-01-020.PDF).

Renewable energy trade associations:

American Bioenergy Association: www.biomass.org.

American Solar Energy Society: www.ases.org.

American Wind Energy Association: www.awea.org.

Biomass Energy Research Association: www.bera1.org.

Geothermal Energy Association: www.geo-energy.org.

Geothermal Resources Council: www.geothermal.org.

Interstate Renewable Energy Council: www.irecusa.org.

Low Impact Hydropower Institute: www.lowimpacthydro.org.

National Hydropower Association: www.hydro.org.

Solar Electric Power Association: www.solarelectricpower.org.

Solar Energy Industries Association: www.seia.org.

Utility Wind Interest Group: www.uwig.org.

Windustry: www.windustry.com.

On-site renewable generation financial analysis tools:

Each of the many available tools offers different features, which should be examined closely to determine whether they are appropriate to the particular situation.

ProForm
Developer: Lawrence Berkeley National Laboratory
Allows an integrated environmental and financial prefeasibility analysis of on-site renewable energy and energy efficiency projects. http://poet.lbl.gov/Proform

RETscreen International
Developer: Natural Resources Canada's CANMET Energy Diversification
Research Laboratory (CEDRL)
Assesses the economics of various renewable energy installations. www.retscreen.net

RETFinance
Developer: Energy Analysis Team at NREL
Simulates a 30-year nominal dollar cash flow for renewable projects, including earnings, debt payments, levelized cost-of-electricity, after-tax internal rate of return, and debt service coverage ratio (net operating income divided by total debt service). http://analysis.nrel.gov/retfinance

Clean Power Estimator
Developer: Clean Power Research
Offers a quick cost-benefit analysis for photovoltaics, solar thermal, wind, and energy efficiency for both residential and commercial buildings.
www.clean-power.com/software.ht.
A version for California facilities is offered by the CEC.
www.consumerenergycenter.org/renewable/estimator.

Federal Renewable Energy Screening Application (FRESA)
Developer: U.S. Department of Energy, Energy Efficiency and Renewable Energy
Compares opportunities for renewables and conservation at federal facilities.
www.eere.energy.gov/femp/information/download_software.cfm

Hybrid Optimization Model for Electric Renewables (HOMER)
Developer: NREL
Compares the cost-effectiveness of off-grid renewables with grid extensions or stand-alone generators.
www.nrel.gov/homer.

Real Options Analysis Center
Developer: NREL
Provides online models for the valuation of renewable energy R&D and the valuation of distributed generation assets.
www.nrel.gov/realoptions

FATE-2P (Financial Analysis Tool for Electric Energy Project)
Developer: NREL
A power plant project finance model for calculating the cost of energy or the internal rate of return for alternative energy projects.

Greenhouse Gas Resources

Hanson, Craig, and Janet Ranganathan. 2003. *Corporate Greenhouse Gas Emissions Inventories: Accounting for the Climate Benefits of Green Power.* Washington, DC: World Resources Institute (www.thegreenpowergroup.org/Installment3.pdf).

U.S. Department of Energy's voluntary GHG registry: www.eia.doe.gov/oiaf/1605/frntvrgg.html.

U.S. Environmental Protection Agency's Climate Leaders, a voluntary government-industry partnership: www.epa.gov/climateleaders.

World Wildlife Fund's (WWF) Climate Savers: www.worldwildlife.org/climate/projects/climate_savers.cfm.

Climate Neutral Network: www.climateneutral.com.

States that have or are developing climate registries:

The California Energy Commission has summarized state activities related to greenhouse gas inventories www.energy.ca.gov/global_climate_change/summary.html.

The California Climate Action Registry: www.climateregistry.org.

Wisconsin Voluntary Emission Reductions Registry Advisory Committee: www.dnr.state.wi.us/org/aw/air/hot/climchgcom/.

New Hampshire: www.des.state.nh.us/ard/climatechange/ghgr.htm

Glossary

This glossary defines some of the important terms used in this guide. More definitions can be found at www.epa.gov/cleanenergy/glossary.htm.

Annual consumption. Annual consumption refers to the amount of electricity used by a consumer in one year and is typically measured in kilowatt-hours (kWh). This information can be acquired from your electricity bill or by contacting your energy provider.

Carbon dioxide. Burning fossil fuels releases into the atmosphere carbon that has been stored underground for millions of years. During the combustion process, the carbon in these fossil fuels is transformed into carbon dioxide, the predominant gas contributing to the greenhouse effect. Increases in the emissions of carbon dioxide and other gases, such as methane, due to the burning of fossil fuels and other human endeavors, accelerate heat-trapping processes in the atmosphere, gradually raising average temperatures worldwide. Carbon dioxide is absorbed and released at nearly equal rates by natural processes on the earth, an equilibrium that is disrupted when large amounts of carbon dioxide are released into the atmosphere by human activities, such as the burning of fossil fuels.

Combined heat and power (CHP). Combined heat and power (CHP) is an electricity generation technology, also known as *cogeneration*, that recovers waste heat from the electric generation process to produce simultaneously other forms of useful energy, such as usable heat or steam. On average, two-thirds of the input energy used to make electricity is lost as waste heat. In contrast, CHP systems are capable of converting more than 70 percent of the fuel into usable energy.

Commodity electricity. Commodity electricity is generic electricity not associated with a particular power generation source.

Competitive markets. Until recently, most consumers received generation, transmission, and distribution services from one local utility company. As a regulated monopoly, the utility was given an exclusive franchise to provide electricity to consumers in a particular community. Rates were set, and consumers had little choice but to pay the rate for their area. In recent years, however, many states have restructured their electricity industry and are now allowing consumers to choose from among competing electricity suppliers.

In states permitting retail competition, sellers of electricity obtain power by contracting with various generation sources and setting their own price. Consumers in these states have the opportunity to choose their energy provider and purchase products based on the price or type of power supplied to their home or business. Some consumers are exercising this choice and switching to accredited "green power" resources. In states that have not restructured their electricity markets, consumers interested in purchasing renewable energy now have the option to participate in green-pricing programs offered by their local utility.

Conventional power. Conventional power is power produced from nonrenewable fuels such as coal, oil, natural gas, and nuclear fuels. These fuels are a finite resource that cannot be replenished once they have been extracted and used.

Distributed generation. Distributed generation refers to small, modular, decentralized, grid-connected, or off-grid energy systems located in or near the place where energy is used.

Electricity supplier. As states restructure their electricity markets, more and more customers will be able to choose from a range of energy suppliers that market different types of power products, including green power from renewable energy. Restructured local utilities offer electricity products generated exclusively from renewable resources or, more frequently, electricity produced from a combination of fossil and renewable resources. In states without restructured electricity markets, local utilities may offer green-pricing programs, in which customers may elect to have their utility generate a portion of their power from renewable sources.

Energy efficiency. Energy efficiency refers to products or systems using less energy to do the same or a better job than conventional products or systems can. Energy efficiency saves energy, saves money on utility bills, and helps protect the environment by reducing the amount of electricity (and associated environmental impacts) that needs to be generated.

Fossil fuels. Fossil fuels are the United States' principal source of electricity. The popularity of these fuels is due largely to their low cost. Fossil fuels come in three main forms: coal, oil, and natural gas. All three were formed many hundreds of millions of years ago before the time of the dinosaurs, hence the name *fossil fuels*. Because fossil fuels are a finite resource and cannot be replenished once they have been extracted and burned, they are not considered renewable.

Global climate change. For most of human history, changes in the earth's climate resulted from natural causes that took place over thousands of years. But today, human activities are beginning to affect our climate in serious and immediate ways by rapidly adding greenhouse gases to the atmosphere. These gases trap heat close to the earth that would otherwise escape into space, intensifying a natural phenomenon called the *greenhouse effect*. Over the next century, scientists project that global temperatures will rise two to six degrees Fahrenheit as a result of rising concentrations of greenhouse gases. Scientists also believe that this rate of global warming will be unprecedented compared with that of the past 10,000 years. Global warming could result in a rise in sea levels, changes in patterns of precipitation, more variable weather, and many other consequences. These changes threaten our health, agriculture, water resources, forests, wildlife, and coastal areas. For more information on the science and impacts of global climate change, visit the EPA's Global Warming Web site (www.epa.gov/globalwarming).

Greenhouse effect. The greenhouse effect is produced as greenhouse gases allow incoming solar radiation to pass through the earth's atmosphere, while preventing part of the outgoing infrared radiation from the earth's surface and lower atmosphere from escaping into outer space. This process occurs naturally and has kept the earth's temperature about 59 degrees Fahrenheit warmer than it would otherwise be. Current life on the earth could not be sustained without the natural greenhouse effect.

Greenhouse gases (GHG). Gases in the earth's atmosphere produce the greenhouse effect. Changes in the concentration of certain greenhouse gases, due to human activities such as the burning of fossil fuels, increase the risk of global climate change. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, halogenated fluorocarbons, ozone, perfluorinate carbons, and hydrofluorocarbons.

Green power. Electricity that is generated from renewable energy sources is often marketed as "green power," a term that implies a smaller environmental impact from electricity generation. The resources that qualify as green power vary depending on the state or organization. For more details, see chapter 2.

Green power marketers. Energy suppliers operating in states that permit retail competition in the electricity markets are usually referred to as *green power marketers*. This term can also include utilities that offer green power options under what are typically referred to as *green-pricing programs*.

Green power products. Green power products refer to electricity generated exclusively from renewable resources or from a combination of fossil and renewable resources.

Green pricing. Green pricing is an optional service offered by regulated utilities to allow customers to support a greater level of utility investment in renewable energy by paying a premium on their electric bill. Usually green pricing is offered in areas that do not allow retail competition.

Interval meter. An interval meter is an electricity meter that measures a facility's energy usage in short increments (typically 15 minutes). These meters are useful for determining electricity demand patterns and participating in real-time pricing programs.

Kilowatt-hour (kWh). A kilowatt-hour is the basic unit for measuring the generation and consumption of electrical energy. A *megawatt-hour (MWh)* of electricity is equal to 1,000 kilowatt-hours. A *kilowatt* and a *megawatt* are units of generation capacity.

Low-impact hydropower. Low-impact hydropower is hydroelectric power generated with fewer environmental impacts, by meeting criteria such as minimum river flows, water quality, fish passage, and watershed protection. These hydropower facilities often operate in a "run of the river" mode, in which little or no water is stored in a reservoir.

Net metering. Net metering is a method of crediting customers for electricity that they generate on-site. Customers generating their own electricity offset what they would have purchased from their utility. If they generate more than they use in a billing period, their electric meter turns backward to indicate their net excess generation. Depending on the individual state or utility rules, the net excess generation may be credited to their account (in many cases at the retail price), carried over to a future billing period, or ignored.

New renewable generation. New renewable generation facilities are those built in the recent past or will be built to meet the growing market demand for green power. For Green-e certification, new generation must have come online since the late 1990s (depending on the region; see the Green-e Web site for more details).

On-site renewable generation. On-site renewable generation refers to electricity generated by renewable resources using a system or device located at the site where the power is used.

Peak demand. Peak demand is the maximum power consumption for a facility, measured over a short time period such as 15 minutes or an hour.

Power marketer. A power marketer is an entity that buys and sells power generated by others. A green power marketer is an electricity supplier that offers a green power product.

Renewable electricity. Renewable electricity is power generated from renewable resources and delivered through the power grid to end users.

Renewable energy certificate (REC). A renewable energy certificate (REC), also known as a *green tag* or *tradable renewable certificate*, represents the environmental, social, and other positive attributes of power generated by renewable resources. For example, RECs may represent the emissions avoided by renewable power generation compared with those of conventional sources. RECs can be purchased separately from electricity service.

Renewable energy resources. Renewable energy sources, such as wind, solar, geothermal, hydropower, and various forms of biomass, are continuously replenished on the earth. Some definitions also include municipal solid waste as a renewable resource.

Renewable portfolio standard (RPS). A renewable portfolio standard (RPS) is a regulatory mandate or target stating that a minimum percentage or amount of each electricity supplier's resource portfolio must come from renewable energy.

Appendix A
Green Power Considerations for Federal Agencies

Purchasing green power means making a difference by changing the way we select basic commodities. For the federal government, the largest consumer of electricity in the United States with an annual electricity bill of approximately $3.5 billion, the ability to make a difference is enormous. This appendix discusses considerations specific to federal agencies that buy green power.

When green power first became available, federal agencies were uncertain about what authority they could use to justify paying a premium for these products. Now, however, this uncertainty has largely been dispelled, for several reasons. First, Executive Order 13123 (see text box below) clarifies the federal government's interest in renewable energy by directing agencies to "strive to expand the use of renewable energy within its facilities and in its activities by . . . purchasing electricity from renewable energy sources." Second, as directed by Executive Order 13123, through a collaborative process, the Secretary of Energy set a goal for the federal government to meet the equivalent of 2.5 percent of its facilities' electricity consumption with new renewable energy sources by 2005.[1] Finally, the authority for purchasing renewable energy has been incorporated into the Federal Acquisition Regulations (FAR, subpart 23.2), carrying the force of law (see www.arnet.gov/far).

Executive Order 13123

Sec. 204. Renewable Energy. Each agency shall strive to expand the use of renewable energy within its facilities and in its activities by implementing renewable energy projects and by purchasing electricity from renewable energy sources.

Sec. 301. Annual Budget Submission. Each agency's budget submission to OMB shall specifically request funding necessary to achieve the goals of this order.

Sec. 404. Electricity Use. To advance the greenhouse gas and renewable energy goals of this order, and reduce source energy use, each agency shall strive to use electricity from clean, efficient, and renewable energy sources.

(b) Reduced Greenhouse Gas Intensity of Electric Power....Agencies shall consider the greenhouse gas intensity of the source of the electricity and strive to minimize the greenhouse gas intensity of purchased electricity.

(c) Purchasing Electricity from Renewable Energy Sources.

(1) Each agency shall evaluate its current use of electricity from renewable energy sources and report this level in its annual report to the President. Based on this review, each agency should adopt policies and pursue projects that increase the use of such electricity. Agencies should include provisions for the purchase of electricity from renewable energy sources as a component of their requests for bids whenever procuring electricity. Agencies may use savings from energy efficiency projects to pay additional incremental costs of electricity from renewable energy sources.

Sec. 406(c) Retention of Savings and Rebates. Agencies granted statutory authority to retain a portion of savings generated from efficient energy and water management are encouraged to permit the retention of the savings at the facility or site where the savings occur to provide greater incentive for that facility and its site managers to undertake more energy management initiatives, invest in renewable energy systems, and purchase electricity from renewable energy sources.

Sec. 605. Amendments to Federal Regulations. The Federal Acquisition Regulation and other Federal regulations shall be amended to reflect changes made by this order, including an amendment to facilitate agency purchases of electricity from renewable energy sources.

[1] New renewable energy covers any renewable energy acquired by the federal government after 1990 (www.eere.energy.gov/femp/technologies/renewable_fedrequire.cfm).

As a result of these developments, a number of agencies have successfully bought green power in most regions of the country. These purchases account for approximately 50 percent of the total federal renewable energy use, with the remainder consisting of on-site renewable power, thermal generation, and biofuels (summarized in table A-1). Considering all sources, as of July 2004 the federal government had fulfilled more than 80 percent of its 2005 renewable energy goal. By reading this guidebook and taking advantage of the technical support provided by the Department of Energy's (DOE) Federal Energy Management Program (FEMP), energy managers are taking an important step in helping the federal government achieve its renewable usage goals.

Agencies that are interested in participating in procurements run by the General Services Administration (GSA), the Defense Energy Support Center (DESC), or the Western Area Power Administration (Western) should read the section "Procurement Approaches to Renewable Electricity and Certificates" in this appendix.

Federal Definitions of Renewable Energy

In order to meet the federal 2005 renewable use goal, Executive Order 13123 (sec. 710) and FAR subpart 2.1 define renewable energy as "energy produced by solar, wind, geothermal, and biomass power." DOE's definition of biomass resources, as defined under the Biomass Research and Development Act of 2000, is "organic matter available on a renewable or recurring basis, including agricultural crops and trees, wood and wood wastes and residues, plants (including aquatic plants), grasses, residues, fibers, and animal wastes, municipal wastes, and other waste materials."

FEMP provides guidance on renewable resource definitions and other issues relating to Executive Order 13123's renewable use goal on its Web site (www.eere.energy.gov/femp/technologies/renewable_energy.cfm). Note that FEMP guidance is subject to change.

Table A-1: Federal Renewable Technologies and Purchases, July 2004

Source	Annual Energy Contribution (GWh)
Biomass fuels	106
Biomass power	92
Biomass thermal	108
Green power purchases	668
Ground-source heat pump	179
Photovoltaics	28
Solar thermal	10
Wind	19
Total	**1210**

Source: DOE/FEMP.

Federal Motivations for Green Power Purchases

Owing to the large volume of electricity consumed by the federal government, even a slightly greater percentage of green power can have a large benefit for the environment and the overall green power market. In addition to the benefits discussed earlier in this guidebook, green power purchases by federal agencies provide benefits specific to federal customers.

Benefits accruing directly to a federal agency from a renewable energy purchase include

- **Compliance with federal goals.** Executive Order 13123 and the resulting federal renewable energy directive have three energy management goals: energy efficiency, greenhouse gas reduction, and the use of renewable energy. Purchasing green power or installing on-site generation can help an agency meet all three of these goals.
- **Increased visibility.** Presidential awards are given to those agency energy management teams that strive to comply with Executive Order 13123. Energy scorecards for each agency are tallied to gauge the degree of compliance. Members of the EPA's Green Power Partnership also are eligible for awards.
- **Accomplishment of an agency's organizational mission.** Many in the federal government understand the government's overall mission to include a commitment to environmental protection. Beyond that general obligation, individual agencies, such as the EPA, have the specific mission of protecting the environment. Renewable energy purchases are one way to help fulfill both goals.
- **Demonstrate responsiveness and leadership.** The purchase of renewable energy represents a clear demonstration of the agency's responsiveness to its customers (or citizens), the majority of whom, according to several surveys, favor renewable energy. The federal govern-

ment has shown that it can be a leader in the area of green power and renewable energy.

Social benefits of federal purchases include the following:

- **National security.** National security is one of the principal responsibilities of the federal government. By purchasing domestically produced renewable energy, all federal agencies can contribute to the nation's energy security. Because of the special role of government facilities in national security, the use of distributed, on-site power generation resources at these facilities enhances the country's overall security.

- **Market transformation.** Given the size of the federal government's utility bill, significant purchases of green power by federal agencies would stimulate the overall green power market. A strong federal demand would demonstrate that switching to renewable energy was a national priority, would call attention to green power's societal and customer benefits, might increase the availability of renewable power products, and might help reduce their cost. The size of the federal government amplifies any benefits resulting from a purchase of green power.

Sources of and Limits to the Federal Authority to Purchase Green Power

Executive Order 13123

Executive Order 13123 provides the fundamental authority for federal agencies to buy green power. The goals of this order have been incorporated into the FAR.

FAR Part 23

FAR part 23 seeks to minimize the environmental impacts of federal purchases. Subpart 23.2 addresses energy and water efficiency and renewable energy and has been modified to incorporate much of Executive Order 13123. This subpart states, "The Government's policy is to acquire supplies and services that promote energy and water efficiency, advance the use of renewable energy products, and help foster markets for emerging technologies." Subpart 23.7 directs agencies to contract for environmentally preferable and energy-efficient products and services. "Environmentally preferable" is defined by FAR subpart 2.101 to mean "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product or service."

Cost Minimization and Best Value

The FAR has traditionally focused on minimizing the government's costs by strongly favoring the procurement of the least expensive goods and services, often leaving contracting officers little room to consider value. Procurement reform during the 1990s, however, more closely aligned federal acquisition procedures with the commercial sector's practices through a stated preference for commercial products and the adoption of commercial business practices.

In addition, the traditional focus on least cost procurement has shifted to obtaining the best value (FAR part 1.102[a]). In determining best value, contracting officers can consider an array of factors besides cost, such as environmental and energy efficiency (FAR part 8.404[b][2]). As formally defined in the FAR (part 2.101), best value means "the expected outcome of an acquisition that, in the Government's estimation, provides the greatest overall benefit in response to the requirement."

Specification of Requirements

Part 11 of the FAR, "Describing Agency Needs," states that environmental objectives, including the purchase of products and services that use renewable energy technologies, must be considered when specifying requirements (FAR part 11.002[d]). Requirements for renewable energy should be specific enough to limit the number of factors in competing offers to be evaluated but general enough so as not to jeopardize the product's status as a "commercial item." In general, as the requirements become more specifically defined, the importance of price relative to other considerations increases (FAR part 15.101).

Commercial Items

In restructured electricity markets, the most direct path to a renewable energy purchase is to make use of the "commercial items" provisions in FAR part 12. Commercial items are broadly defined as goods and services sold competitively in the commercial marketplace in substantial quantities (FAR subpart 2.101). Since an active competitive market reduces procurement risks, agencies are strongly encouraged to favor the purchase of commercial items, through both specific language to that effect and the authorization to use less stringent acquisition procedures.

With large volumes being commercially traded in public markets each day, electricity is undisputed as a standard commercial item. But as a specific type of electricity, renewable

energy's status as a commercial item is slightly less certain. Support for such a designation is aided by the ongoing development of active renewable energy exchanges in which commercial entities buy and sell renewable energy in large quantities.

Even in the absence of an active renewable energy market, agencies may specify a requirement for electricity (the standard commercial item) generated from renewable resources (a specification in addition to the standard commercial item). In most cases, the favorable contracting procedures afforded to commercial items would still be applicable. While the boundary between what is and is not considered a commercial item is often case specific, in general an agency should be wary of specifying any requirement beyond what is currently commercially available.

In addition, certification efforts by state and nongovernmental organizations are helping establish renewable energy as a commercial item by establishing a brand name. Third-party certification provides additional value to the federal government because of functions such as verification and annual audits to ensure no double counting. When buying green power for federal agencies, the GSA and DESC routinely use the commercial item designation and require third-party verification.

Innovative Purchase Opportunities

Even though the procurement of green power has become common enough that it is generally not "innovative," in some situations the methods just outlined do not apply, and so innovative methods are needed to implement a purchase. The Federal Acquisition Streamlining Act of 1994 and the Federal Acquisition Reform Act of 1996 encourage contracting officers to take initiative and pursue opportunities that they believe to be in the best interests of the government (FAR 1.102[d]).

Procurement Approaches to Renewable Electricity and Certificates

Restructured/Competitive Markets

In a competitive market, agencies must use competitive acquisition procedures to "shop" for renewable energy from a variety of providers. Since an agency will be evaluating competing offers, normal solicitation procedures must be followed. Federal agencies should follow one of two solicitation approaches: using designated contracting agencies, such as the GSA, the DESC, or, in some cases, Western; or serving as the contracting agency themselves. Although serving as the contracting agency offers more control and flexibility, the designated contracting agencies have gained significant expertise in the area of competitive electricity power procurement, including renewables.

Fully Regulated Markets

Where retail competition is not available, federal agencies may be able to buy green power through a green-pricing program offered by their local utility. If such a program exists, agencies should find out the specific enrollment or sign-up procedures. If a GSA areawide contract (AWC) is already in place with this utility, the agency should complete the utility's green-pricing contract, as well as the AWC Exhibit A contract. A competitive solicitation is not required, since it is a utility service.

Renewable Energy Certificates

Federal agencies can buy green power through renewable energy certificates throughout the country and in some foreign locations. Since a variety of suppliers offer RECs, normal solicitation procedures must be followed. Both GSA and DESC have experience with REC procurements.

Using GSA or DESC

GSA Power Procurement Services

GSA has assisted many federal agencies in the procurement of green power, and its ability to aggregate renewable requirements for many agencies may result in lower prices.

In restructured electricity markets, GSA helps identify federal facilities that use large amounts of electricity in a manner that is regarded favorably by the competitive energy service providers. For these customers, GSA seeks specific prices for those facilities and works with the facility managers to devise strategies that may result in lower long-term electricity prices in the restructured marketplace. Using these strategies, GSA has also made significant progress in making renewable energy available at competitive market prices for both renewable electricity and REC products. In addition, GSA is developing a variable-priced REC product that may provide additional financial value to purchasers.

One of the easier ways for federal agencies to buy green power is through the GSA's federal supply schedules (FSS), multiple award schedules. Green power and renewable energy have been added to the federal supply schedule under three different special item numbers (SINs). SIN 871-204 addresses "Managing the Procurement and Use of Electricity," which includes electricity from both renewable and nonrenewable sources. SIN 871-203 addresses "Managing the Procurement and Use of Natural Gas," which includes gas from both renewable and nonrenewable sources. SIN 871-299 covers

New Products/Services. The last supply schedule would be applicable to on-site generation resources that use renewably generated methane gas (such as landfill gas). Renewable energy certificates are also being added to the schedule under SIN 871-204 and SIN 871-299.

Supply schedules have several features that make them particularly well suited to serve the needs of those buying electricity in a restructured market:

- Multiple award schedules (MAS) list competing contractors offering comparable products and services. MAS contracts are awarded to all companies offering commercial items whose price has been determined by the GSA to be fair. The use of MAS is considered a competitive procedure under FAR 6.102[d][3].
- Maximum order limitations have been removed and replaced with maximum order thresholds, beyond which an agency is required to seek a price reduction from the contractor (FAR 8.404[3]).
- MAS contracts are priced on a most-favored commercial customer basis, and a price reduction clause requires the contractor to lower the agency's price in accordance with any corresponding price reductions to its most-favored commercial customer.

For the latest information on Federal Supply Schedules, go to www.gsa.gov/energyservices.

For details on the schedules just described, go to www.gsaelibrary.gsa.gov and search for the special item numbers listed above.

DESC Power Procurement Services

Under the DESC Electricity Program, solicitations may be issued for competitive power and/or RECs in states that have approved and implemented deregulation/restructuring and for RECs in states that have not implemented retail access.

DESC:

- Procures electricity for Department of Defense and federal civilian activities.
- Uses aggregation to attract market interest without customer cross-subsidization.
- Works with customers to identify risk preferences and risk-mitigation plans.
- Tailors each solicitation to market conditions and customer requirements.
- Conducts "best value" acquisitions.
- Competitively buys RECs in accordance with federal acquisition regulations.
- Contracts for Economic Load Response Services.
- Uses various pricing methods: fixed price, index, and Locational Marginal Pricing.
- Has more than six years of experience procuring power for the federal government.
- Performs contract administration functions.

DESC's program uses commercial practices for its solicitations and procurement strategy, which has been central to successfully engaging the market. In addition, DESC's program is flexible enough to support unusual and/or "out of the box" customer requests and requirements while complying fully with applicable procurement regulations. To view ongoing DESC solicitations or to find contact information for DESC's electricity acquisition team, go to www.desc.dla.mil.

Western Green Power Products

Western offers two types of renewable products to federal agencies. Facilities located in Western's 15-state western service territory can buy renewable electricity directly from Western even if they are not currently Western allocation customers. Regardless of location, federal agencies can purchase renewable energy certificates[2] from Western. For more information about these programs, see the Western's Web site at www.wapa.gov/powerm/pmrenpro.htm.

Agency Procurement

If an agency does not deem it advantageous to request assistance from the GSA, DESC, or Western, it may contract separately for electric service. In this case, the purchase should meet the requirements of FAR part 12 as described in the section "Commercial Items."

[2] These certificates are a type of REC but cannot be traded because they are available only to federal customers.

Federal Assistance for On-Site Renewable Generation Projects

On-site renewable generation projects face different issues than do power purchases, which may hinder their implementation. To help federal agencies tap the renewable resources that are available at their facilities, FEMP offers several programs to assist with on-site generation projects.

Renewable Resource Assessment

To help facility managers assess the quality of renewable energy resources at their location, FEMP is working with resource assessment specialists to draw renewable resource maps for several different renewable energy technologies (available on FEMP's Web site).

The maps show where each renewable technology is cost-effective for federal facilities under differing assumptions about electricity prices and renewable system prices. For example, the maps for solar water heating indicate that at current electricity rates, more than 60 percent of the federal facilities in the nation could install a cost-effective solar system, whereas at electric utility rates of $0.10/kWh or more, solar water-heating systems would be cost-effective for almost any kind of federal facility.

Design Assistance and Training

FEMP can also help design renewable energy projects, especially those designated as Federal Energy Saver Showcases. This design assistance includes reviewing plans and specifications, developing product specifications, sizing systems, and drawing up guidelines for a project's costs. Some services are available on a for-fee basis.

FEMP also offers two renewable-energy training courses:

- "Implementing Renewable Energy Projects" is an overview of the technologies, covering costs and other factors to consider when selecting a system.
- "Design Strategies for Low-Energy, Sustainable, Secure Buildings" focuses on whole-building designs that integrate daylighting, energy-efficient equipment, and passive solar strategies for new federal buildings.

Funding Assistance

Financing can be a problem when appropriations for new projects are limited. Once a year, FEMP announces a "call for projects," in which federal agencies participate in a competitive selection process for technical assistance on their renewable energy projects. This funding is not for system purchases, but FEMP does help some project teams acquire additional project financing if needed.

In its annual Distributed Energy Resources (DER) call for projects, FEMP offers funds for technical assistance. Both on-grid and off-grid renewable energy systems qualify as DER technologies.

Agencies also may participate in FEMP's alternative financing programs, through which the contractor pays the up-front costs of an energy efficiency or renewable energy project and is repaid over the term of the contract from the agency's guaranteed energy cost savings. Agencies can obtain financing for biomass fuels, geothermal heat pumps, parabolic-trough solar collectors, and PV systems through these contracting vehicles.

Facilitated Projects

FEMP also encourages agencies to facilitate large projects that serve the needs of federal agency customers and that count toward the federal renewable energy goal. An example is a large renewable energy project on the tribal land of Native Americans served by the Bureau of Indian Affairs. Currently, the federal government has implemented 2 GWh of facilitated renewable energy projects, and about 740 GWh are pending.

Facilities in western states should contact the Bureau of Land Management (BLM) about opportunities to collaborate on a facilitated renewable energy project on federal land. FEMP and BLM recently identified those federal lands with the best potential for renewable energy projects (this study is available from FEMP's Web site). Because these projects are usually much larger than on-site projects, their contribution to the federal goal can be significant. However, facilitated projects do not require the direct federal purchase of renewables and therefore may be subject to different treatment in the future under the renewable purchase goals.

Key Elements of a Successful Procurement or On-site Installation

Based on several years of experience buying green power and installing on-site renewable energy systems, certain lessons for federal agencies have emerged.

Stakeholder Involvement

Green power advocates must get agreement in advance from stakeholders such as comptrollers, energy managers, and key decision makers. The stakeholders must participate in the

decision process and make reasoned, balanced decisions. It is important to be honest and clear about the project's renewable sources and benefits.

Cost Control

Executive Order 13123 specifically allows the savings from energy efficiency to be used to pay for renewable energy. Agencies are encouraged to consider using some of the savings from Energy Savings Performance Contracts (ESPC) or Utility Energy Service Contracts (UESC) to buy renewable power. Buying RECs is generally the least expensive way to purchase green power, but agencies should consider making at least a small purchase through their local utility if they have a program. Agencies should submit a budget request to cover any remaining cost premium (per E.O. 13123, sec. 301).

Developing an Effective Solicitation

An agency's electricity consumption data should be part of any RFP and are required by the GSA, DESC, and Western when they help with the procurement. The purchasing agency should notify renewable power suppliers of the RFP and hold a preproposal meeting with prospective suppliers if the procurement is not standard.

Load Aggregation

Combining several facilities into one acquisition can lead to big purchases, but it is best to target these aggregation efforts only to big users. Trying to aggregate many smaller users can be difficult. It also is best to keep the procurement simple.

Supplier Relations

Utility green pricing should be seen as a partnership in which the utility and the federal purchaser work together to construct a program that meets both their needs. Investor-owned utilities are usually not able to launch their own green power programs without PUC approval. However, a large federal customer could help persuade a utility to develop a new program that would then be made available to other customers. For all electricity suppliers, federal agencies should consider requesting a customized product, in order to take advantage of large purchasing volumes.

Capturing the Benefits of the Purchase

After successfully completing a green power purchase, a federal agency usually wants to publicize its efforts. In addition to the publicity messages available to other institutions, federal agencies can spread the word that the agency is working to fulfill its part of the federal renewable energy goal. Agencies with exemplary energy management programs are eligible for FEMP awards, which enhance an agency's image both inside and outside the government.

Federal agencies are required to report annually on their progress toward meeting their energy management goals. FEMP has published guidelines for counting green power purchases and on-site renewable energy toward an agency's energy management goals (www.eere.energy.gov/femp/technologies/renewable_fedrequire.cfm).

Information for Potential Suppliers to the Federal Government

All federal government procurements are made competitively unless there is a compelling reason for a sole-source contract. FEMP maintains a renewable supplier list used for renewable electricity procurement notifications. Renewable energy suppliers should contact Chandra Shah, listed in the resources section of this appendix, to be added to this list. The GSA (Ken Shutika) and the DESC (John Nelson) also maintain notification lists, which are important because the GSA and DESC make most of the electricity and renewable procurements for federal sites.

Prospective suppliers are asked to provide information about their company such as completed, in progress, and planned renewable projects (type, location, size, third-party certification, etc). Suppliers also should include additional information about any projects that they believe justify a sole-source contract.

Summary of Green Power Opportunities for the Federal Government

The benefits of renewable energy are enormous, and as the nation's largest purchaser of electricity, the federal government can have a significant impact on the way that power is produced now and in the future. Federal agencies already have an unprecedented and growing range of options for purchasing renewable energy, and Executive Order 13123 directs federal agencies to increase their use of renewable energy. With more emphasis on "best value" purchasing and the explicit consideration of environmental characteristics, contracting officers now have more options than ever before to buy renewable energy. Acting in the government's—and society's—best interests, federal agencies can take advantage of

the strategies outlined in this guidebook to help move the United States toward a more sustainable energy future.

Federal Resources for Green Power Information

For federal agencies buying green power, assistance is available from the following federal agencies and national labs:

DOE Regional Office FEMP representative:
www.eere.energy.gov/femp/about/regionalfemp.cfm.

Green Power Network:
www.eere.energy.gov/greenpower.

FEMP Web sites:

Renewable energy: www.eere.energy.gov/femp/technologies/renewable_energy.cfm.

Renewable purchasing: www.eere.energy.gov/femp/technologies/renewable_purchasepower.cfm.

Design assistance: www.eere.energy.gov/femp/services/projectassistance.cfm.

Training: www.eere.energy.gov/femp/technologies/renewable_training.cfm.

Financing:
www.eere.energy.gov/femp/services/project_facilitation.cfm.

For assistance with program resources:

Department of Energy, Federal Energy Management Program
David McAndrew, Renewable Purchasing (202) 586-7722
Anne Sprunt Crawley, Technical Assistance (202) 586-1505

For assistance issuing solicitations:

General Services Administration
Ken Shutika (202) 260-9713
ken.shutika@gsa.gov

Defense Energy Support Center
John Nelson (703) 767-8669
john.nelson@dla.mil

Western Area Power Administration's Federal Renewable Program
www.wapa.gov/powerm/pmrenpro.htm
Mike Cowan (720) 962-7245
cowan@wapa.gov

For technical assistance, including market intelligence, market rules, and the development of requirements and statements of work, contact

Lawrence Berkeley National Laboratory
William Golove (510) 486-5229
WHGolove@lbl.gov

National Renewable Energy Laboratory
Chandra Shah (303) 384-7557
chandra_shah@nrel.gov

For more information or assistance in developing a plan to enhance the security of federal facilities through the use of renewable energy, contact

John Thornton
Energy Assurance R&D Coordinator
homelandsecuritycoordinator@nrel.gov (303) 384-6469

Nancy Carlisle
NREL/FEMP
nancy_Carlisle@nrel.gov 303-384-7509

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Guide to Purchasing Green Power

Renewable Electricity, Renewable Energy Certificates, and On-Site Renewable Generation

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