Guide to Purchasing Green Power

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

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

EPA GREEN POWER PARTNERSHIP

WORLD RESOURCES INSTITUTE

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Summary

This *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 reduce the environmental impact of their electricity use.

First published in 2004, the *Guide to Purchasing Green Power* provides an overview of green power markets and describes the necessary steps to buy green power. The 2010 version represents the first major update to the guide and includes new market information and terminology, case studies, an updated additional resources section, and new resources for Federal agencies to use when planning on-site renewable projects or purchasing 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 conventional energy sources. This section also summarizes recent changes in electricity markets and the current availability and use of green power sources.

Chapter 2 defines green power.

Chapter 3 summarizes the benefits and costs of purchasing green power.

Chapter 4 defines three options for purchasing green power products: renewable electricity, renewable energy certificates, and on-site renewable generation.

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

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 green power system: screening the technologies best suited to the purchaser's site, obtaining technical and financial resources and 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 Green Power Market Development Group of the World Resources Institute (WRI), and the Green-e Energy Certification Program administered by the Center for Resource Solutions—worked together to write this purchasing guide.

The guide also includes a *glossary* of terms commonly used in the green power field.

Finally, the *appendix* 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, electricity is most often generated using fossil or nuclear fuels—forms of power generation that can have detrimental effects on human health and the environment through air emissions and other problems. Despite advances in pollution controls over the last 30 years, this conventional power generation is still the nation's single largest source of industrial air pollution and is a major contributor to greenhouse gas emissions.

Electricity markets now offer cleaner ways of producing power, however, and give many consumers the ability to choose how their power is generated. One of these choices is power from renewable sources, or "green power."

In some parts of the United States, consumers can buy green power from the provider of their electricity. All consumers can buy green power in the form of renewable energy certificates (RECs), which are available nationally regardless of whether a customer's local electricity provider offers a green power product.

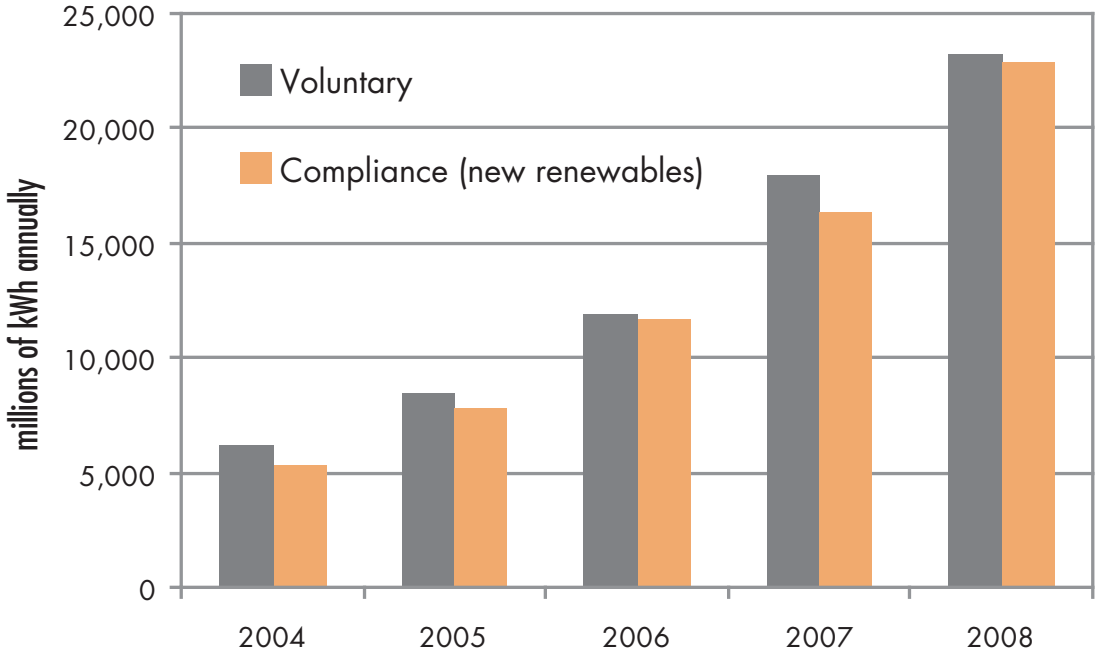
While no form of electric power generation is completely benign, electricity generated from renewable resources such as solar, wind, geothermal, small and low-impact hydropower, and biomass has proved to be environmentally preferable to electricity generated from conventional sources such as coal, oil,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

According to the U.S. Environmental Protection Agency (EPA), on average, replacing each kilowatt-hour (kWh) of traditional power with renewable power avoids the emission of more than one pound of carbon dioxide. Because of the sheer quantities of electricity involved nationwide, consumers have enormous influence to reduce environmental impacts from conventional power generation. If the typical commercial building switched to 100 percent renewable electricity, the use of green power would have the equivalent environmental impact of avoiding the carbon dioxide emissions of nearly 28 vehicles each year.

A wide range of organizations purchase green power, including: federal, state, and local governments; universities; businesses; nonprofit organizations; and individual consumers. By purchasing green power, these organizations are helping the environment and meeting their own goals, such as financial benefits, public relations benefits, and even national security benefits. In 2008, renewable electricity generation in the United States (excluding hydropower) equaled nearly 124 million megawatt-hours (124 billion kilowatt-hours)—enough to meet the annual electricity needs of nearly 12 million average U.S. homes.

Many states already require utilities to supply some of their electricity from renewable sources. These state mandates (known as "compliance" markets) require a percentage of the utility's power mix to come from renewable sources, so that utility customers will "green" their power mix somewhat without taking any conscious action. Voluntary purchases, however, are still an important strategy for organizations that want to buy most or all their power from renewable sources or want to promote innovative development of green power. Voluntary green power purchases have played an important role in driving development of the market (see Figure 1) and are expected to be an important part of the market for the foreseeable future.

Figure 1. Comparison of voluntary and compliance markets for renewable energy, 2004–2008



Note: "New" renewable resources generally refer to renewable facilities that began operation in 1997 or later.

Source: Bird, Lori, Claire Kreycik, and Barry Friedman. 2009. *Green Power Marketing in the United States: A Status Report (2008 Data).* Golden, CO: National Renewable Energy Laboratory.

Leading organizations are finding that using green power is an effective part of a strategic energy management plan. Successful energy management plans are based on a "portfolio analysis" that considers options such as energy efficiency, load management, power purchases, on-site generation, and non-electric (thermal) energy needs. As with any investment portfolio, the best mix of these options depends on the organization's goals, the cost of various alternatives, and external market conditions.

While voluntary purchases of green power are becoming more common practice in today's electricity markets, these markets offer a wide range of choices. This 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 is 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. 19)
- How should an organization choose a green power product? (p. 15)
- What are the best ways of buying green power? (p. 18)
- What are the steps to installing on-site renewable generation? (p. 24)
- How do I communicate my green power purchase to stakeholders? (p. 30)

Chapter 2
Green Power Defined

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 types of power, from solar photovoltaic systems to wind turbines to fuel cells for automobiles.

In this guide, green power refers specifically to electricity generated from a subset of renewable resources, including solar, wind, geothermal, biogas, biomass, and low-impact hydroelectric sources. These electricity sources are derived from natural resources that replenish themselves over short periods of time, including the sun, wind, moving water, organic plant and waste material (biomass), and the Earth's heat (geothermal).

Note that the terms green power, environmentally preferable, clean power, 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, Resources for Additional Information.

Helping Consumers Identify Green Power

To help consumers more easily identify green power products, the "Green-e Energy" certification program has coordinated the development of market-based, consensus definitions for environmentally preferable renewable electricity and renewable energy certificates (RECs). The Green-e Energy program, administered by the nonprofit Center for Resource Solutions, certifies and verifies renewable energy products offered in competitive electricity markets, sold in utility green pricing programs, and sold in national markets for RECs. Further details about Green-e Energy certification are available from the Green-e Web site listed in Chapter 10.

Chapter 3
The Benefits and Costs of Green Power

The Benefits

Green power can offer organizations a variety of environmental, financial, stakeholder relations, economic development, and national security benefits. This Guide is designed to help buyers navigate the costs, contracting challenges, and public relations risks.

Environmental

- **Reduce environmental impacts.** Conventional electricity generation is a significant source of greenhouse gas emissions as well as the single largest industrial source of air pollution in the U.S. The emissions from conventional electricity generation contribute to a number of serious environmental problems, including acid rain, fine particulate pollution, and climate change. Green power generates less pollution than conventional power and produces no net increase in greenhouse gas emissions, helping protect human health and the environment.

Financial

- **Provide a hedge against risks posed by:**
  - **Electricity price volatility.** Purchasing electricity generated by renewable energy sources may provide the buyer protection against unstable or rising fossil fuel prices, for example through long-term, fixed-price supply contracts directly with developers or generators. Organizations can also encourage stable electricity prices by supporting new renewable power resources on the local grid, thereby diversifying the energy mix with resources that are not subject to the rise and fall of fuel costs.
  - **Fuel supply disruptions.** On-site renewable generation can reduce the risk of disruptions in fuel supplies, like natural gas, resulting from transportation difficulties or international conflict.
  - **Additional environmental regulation.** To address global climate change and regional air quality issues, federal and state regulations could effectively increase the price of conventional electricity, making green power financially more attractive.

Price Stability of Green Power

Unlike power generated from fossil fuels, some green power products are not subject to the impact of volatile fuel prices. For this reason, companies like IBM and Advanced Micro Devices (AMD) use green power to hedge against energy cost variability.

In 2001, the energy managers at IBM's Austin, Texas, facility were able to lock in power rates by signing up for Austin Energy's GreenChoice® program. With 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, 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. When the fuel charge increased again in 2004, IBM saved more than $60,000.

Similarly, AMD saw significant cost savings after its first purchase of renewable energy in 2000 from Austin Energy. Shortly after AMD's purchase, natural gas prices soared and became more costly than the fixed green power premium. By 2001, AMD saved approximately $100,000 and, in response, doubled the company's green power purchase for the following year. In 2009, AMD purchased nearly 74 million kilowatt-hours of green power annually, which supplies 100 percent of its Austin facility's energy needs.

Stakeholder Relations

- **Meet organizational environmental objectives.** Reducing an organization's environmental impact is one of the main motivations for buying green power and is often important to stakeholders. For example, buying green power can help reduce greenhouse gas emissions from electricity consumption. If an organization is interested in creating a third-party certified environmental management system (e.g., ISO-14001 certification for environmental performance) or is conducting an organization-wide inventory of its greenhouse gas emissions, a program for reducing 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, Resources for Additional Information, for details.

- **Generate positive publicity.** Buying green power affords an opportunity for and builds on existing public recognition and public relations activities. Companies that are in the public eye need to be responsive to the concerns of environmentally conscious customers, shareholders, regulators, and other constituents. Programs promoting green power, such as EPA's Green Power Partnership or Green-e Marketplace, provide assistance in reaching broad audiences to convey the benefits of green power purchases.

Green Power's Role in Overall Environmental Strategy

A recent survey of corporate participants in the Green-e Marketplace program indicates that most companies view their renewable energy purchases as part of a larger commitment to environmental sustainability.

- 75 percent said support of renewable energy was part of a multi-pronged corporate environmental strategy.
- 70 percent differentiate their company as an environmental leader by supporting renewable energy.
- 45 percent of respondents indicated that developing an environmentally friendly brand was very important.

A Web link to the full survey is provided in Chapter 10, Resources for Additional Information.

- **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 Collaborative, 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." 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 Marketplace program can display the Green-e logo on their product packaging to indicate a commitment to using 100 percent green power in the manufacturing of the product. Many companies are also finding that producing their products with green power gives them an advantage in selling to their business customers who are trying to "green" their supply chain.

Demonstrating Community Leadership: City of Bellingham, Washington

By a unanimous city council vote in mid-2006, Bellingham, Washington, took a leadership role in promoting renewable energy by choosing to purchase 100 percent green power for all electricity used in city-owned facilities. From September 2006 through Earth Day 2007, the city partnered with the local utility's green power program and a local nonprofit organization to conduct the "Bellingham Green Power Community Challenge." The goal of the challenge was to increase green power purchasing among the city's residents and businesses to meet at least two percent of the citywide electric load. Bellingham's results have far exceeded original challenge goals. To date, the green power annually purchased by more than 2,680 households, 125 businesses, and five large volume purchasers totals 82.8 million kilowatt-hours of renewable energy certificates (RECs) and represents approximately 12 percent of the community's total yearly electricity use. The community's purchase resulted in EPA recognizing Bellingham as the first EPA Green Power Community in Washington State.

Economic Development and National Security

- **Stimulate economies.** Manufacturing, installing, and operating renewable resources in the United States requires a clean energy workforce. By purchasing green power, an organization can help create new, domestic jobs. These high-quality, often well-paying, jobs help grow the local economy. Renewable power facilities can also increase a local tax base and can provide income for farmers and rural communities through landowner lease payments. The renewable energy industry is an important growth sector that can simultaneously boost the nation's economy while meeting the nation's energy challenges.

- **Increase fuel diversity.** Green power diversifies the nation's electricity portfolio—a good way to manage risk—and, because renewable resources are indigenous,

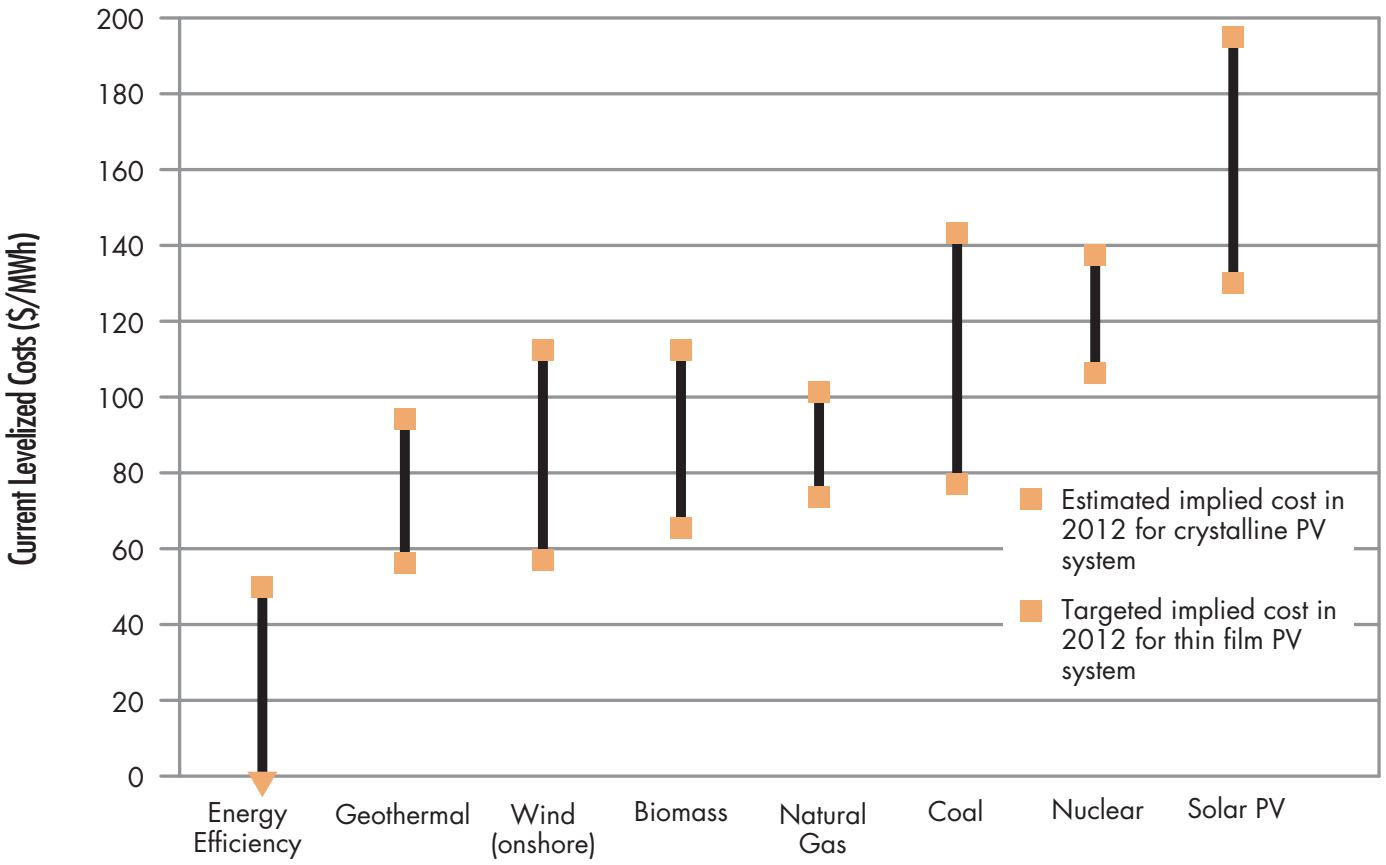
green power reduces the country's dependence on imported fuels.

- **Reduce infrastructure vulnerability.** The distributed nature of renewable resources allows for the distributed generation of renewable energy, thus, reducing the country's reliance on a vulnerable, centralized electricity infrastructure.
- **Economies of Scale.** Most renewable energy technologies are manufactured on assembly lines, where mass production can reduce costs. By purchasing green power, organizations can help build demand, which in turn could lead to lower production costs and potentially lower prices.

The Costs

Green power can be priced differently than standard power sources. It has usually been more expensive than conventional electricity sources, largely due to the relative newness of renewable technologies and their gradual diffusion into mainstream markets, compared with conventional electricity. Chapter 6, Procuring Renewable Electricity and Renewable Energy Certificates, suggests ways of minimizing these costs in conjunction with a procurement plan. Nonetheless, the cost of green power is continuing to fall as growing demand drives the expansion of manufacturing facilities and reduces production costs. Figure 2 illustrates the levelized costs of renewable and fossil fuel technologies, showing that several green power technologies are now cost-competitive with conventional sources.

Figure 2. Levelized cost of new power generation technologies in 2008



Note: Costs have been levelized over the lifetime of the technology and include construction, fuel, and operation and maintenance costs. The bars represent typical cost ranges at average capacity factors for each technology.

Source: Lazard. February 2009. Levelized Cost of Energy Analysis, Version 3.0.

<blog.cleanenergy.org/files/2009/04/lazard2009_levelizedcostofenergy.pdf> .

The actual price for green power depends on a number of factors, including the availability and quality of the resource, manufacturing capacity and world demand for the technology, the availability of subsidies to encourage green power, and the quantity purchased 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. Since 2000, the average price premium has dropped at an average annual rate of eight percent (see Figure 3).

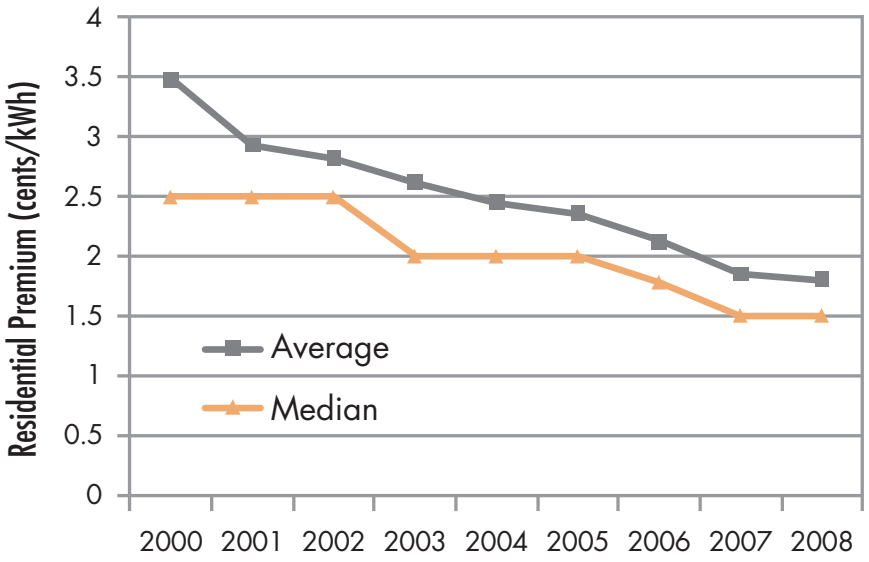
Contracting Challenges

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 might 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, Procuring Renewable Electricity and Renewable Energy Certificates, 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 might regard the purchase of green power as a token effort or "greenwashing." Organizations can improve the credibility of their green power purchase by buying green power as part of a broader environmental management program and by working with third-party organizations for independent auditing, certification, endorsement, and minimum purchasing benchmarks.

Figure 3. Trends in utility green pricing premiums, 2000–2008



Source: Bird, Lori, Claire Kreycik, and Barry Friedman. 2009. *Green Power Marketing in the United States: A Status Report (2008 Data).* Golden, CO: National Renewable Energy Laboratory.

Chapter 4
Options for Purchasing Green Power

Green power can be procured several different ways. The main distinction among the options is the type of supplier and where the electricity generation equipment is located: on the electric grid or at the facility. For electricity delivered over the power grid, the status of utility restructuring in that state will determine whether an organization is limited to buying green power from its local distribution utility or whether it can choose among competitive power suppliers. 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 green power, the resources available at that site (e.g., solar, wind, biomass) are the main factors determining a project's feasibility.

The range of supply options in the market provides considerable flexibility to green power buyers. Organizations are able to consider factors such as price, specific green power generation resource (e.g., wind versus solar), ease of procurement, and the location and year of the generating facility in their purchasing decisions. By considering these issues, buyers may be able to choose a specific type of green power product or mix and match green power products to meet their desired goals.

Renewable Electricity Products

Customers in many states have the ability to purchase a green power product directly from their electricity provider. In regulated electricity markets, customers may be able to buy a *green pricing* product from their local utility. Green pricing is an optional service offered by regulated entities to allow customers to support a greater level of utility investment in renewable energy by paying a premium on their electric bill. In competitive electricity markets, customers can switch electricity service providers if their current provider does not offer a green pricing product. In this market, the customer can purchase a *green marketing* product from a provider other than their local utility. Again, a green marketing customer pays a small premium in exchange for electricity generated from green power resources.

Most renewable electricity products (i.e., green pricing or green marketing products) are one of three types:

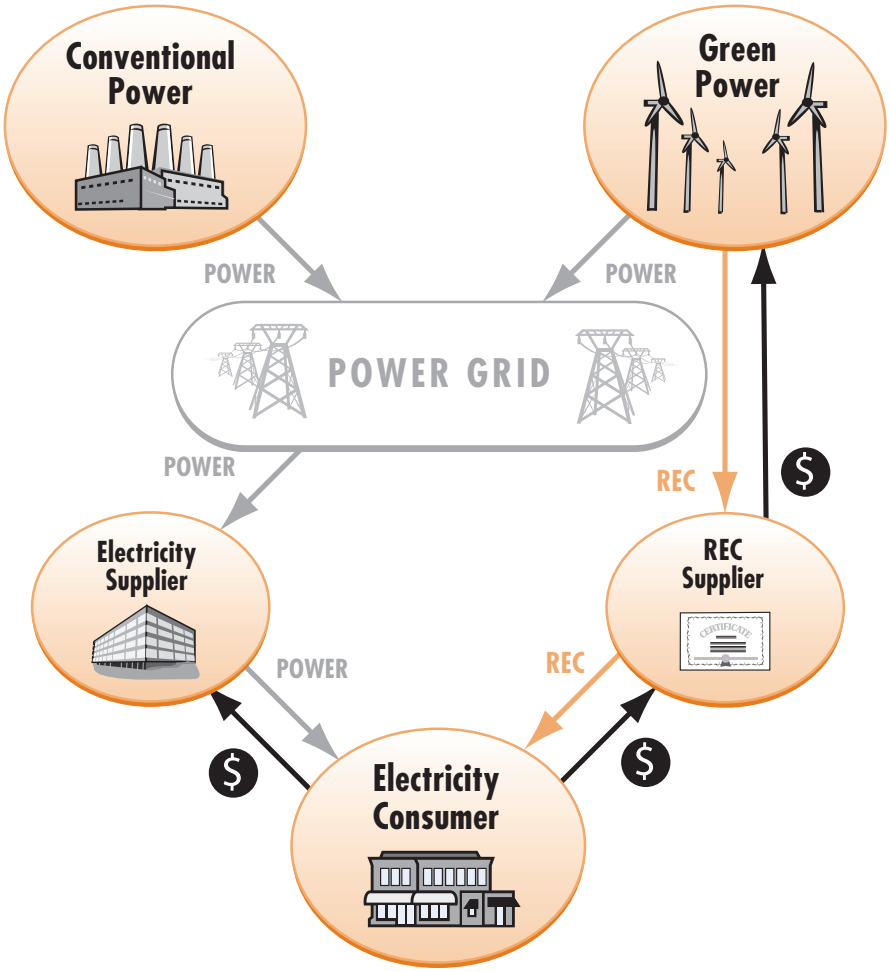
- **Fixed energy quantity block.** A block is a quantity of 100 percent renewable electricity, often 100 kilowatt-hours (kWh), offered for a fixed monthly price. The price is often expressed as a price premium above the price of conventional power. Customers usually may sign up for as many blocks as 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 green power to supply a fixed percentage of their monthly electricity use. In practice, this usually results in the purchase of blended green 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 use and the percentage of green power chosen.

- **Long-term fixed price contracts.** Buying a portion of the output of a renewable energy project in a long-term contract can help a project developer secure financing, while giving the end-user a stable electricity contract. This model has been used with several government and academic institutions. WRI's Green Power Market Development Group is exploring this model for commercial users.

Some renewable electricity products require a fixed monthly fee to support a given amount of renewable generation capacity. Others require contributing to a green power 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 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, Procuring Renewable Electricity and Renewable

Figure 4. Renewable energy certificate (REC) transaction path in a voluntary green power market



Note: Figure 4 is not intended to represent a comprehensive view of all the possible ways a REC can be traded and used.

Energy Certificates, provides more details about implementing a renewable electricity purchase.

Renewable Energy Certificates

Renewable energy certificates (RECs), also known as "green tags," "green certificates," and "renewable energy credits," are tradable instruments that can be used to meet voluntary renewable energy targets as well as to meet compliance requirements for renewable energy policies. A REC is a certificate that represents the generation of one megawatt-hour (MWh) of electricity from an eligible source of renewable energy. Each REC denotes the underlying generation energy source, location of the generation, and year of generation (a.k.a. "vintage"), environmental emissions, and other characteristics associated with the generator. RECs represent a claim to the environmental attributes associated with renewable energy generation, but purchasers should nevertheless ensure that their contracts are explicit about which environmental attributes are conveyed to them. Figure 4 (above) illustrates the REC transaction path.

RECs may be sold "bundled"—paired by the electric service provider with grid electricity delivered to the buyer—or "unbundled" from electricity as a stand-alone product and paired by the buyer with its grid electricity purchase. RECs combined with plain grid electricity are functionally equivalent to green power purchases from a local utility, no matter where the REC may be sourced. Purchasers of RECs may make claims about their purchase of green power similar to purchasers of renewable electricity products.

Because RECs are not tied to the physical delivery of electrons, they allow organizations to purchase green power from

suppliers other than their local electricity provider. RECs help overcome a major barrier to renewable facility development—the fact that the best renewable resources may not be located close to population centers. The sale of RECs allows these more remote facilities to benefit from support for green power.

Unlike electricity, RECs do not need to be scheduled on a transmission system, and they can be used at a different time than the moment of generation. Certificate tracking systems have been established in different states or regions to issue and record the exchange of RECs, making REC markets even more accessible.

Customers do not need to switch from their current electricity supplier to purchase RECs, and they can buy RECs based on a fixed amount of electricity rather than on their daily or monthly load profile. Because RECs are independent of the customer's electricity use, load profile, and the delivery of electricity, they provide greater flexibility than purchasing bundled RECs and electricity from a utility. While RECs offer increased contracting convenience, they do not provide the same protection against price volatility as long-term contracts.

The price for voluntary RECs can be lower than the premiums 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; 3) the supplier is not responsible for meeting the purchaser's electricity needs on a real-time basis.; and 4) REC prices reflect greater competition because RECs are fungible in a voluntary market. To the extent that electricity providers are also sourcing their green power products from purchased RECs, however, the premium that they would charge might not differ greatly from the cost of the unbundled RECs that organizations can buy.

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 or soon-to-be-built renewable electricity 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. Nevertheless, even though they are paying upfront for future RECs, buyers cannot make environmental claims against those RECs until they are generated. A risk of this approach is that the facility might not be constructed or could be destroyed by a natural disaster after construction, 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 green power thus eliminating the need to buy green power for different facilities through multiple suppliers. Chapter 6, Procuring Renewable Electricity and Renewable Energy Certificates, provides more details about purchasing RECs.

Business and organization purchases of different green power product types is shown in Figure 5, but on-site renewable generation is not included because equivalent data are not available.

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

Figure 5. Nonresidential green power sales by product type, 2008 (millions of kWh)

Green Pricing	Green Marketing	REC Markets	Total
2,100	1,200	15,400	18,700

Note: Nonresidential customers refer to business and institutional customers. Data for on-site renewable generation are not available.

Source: Bird, Lori, Claire Kreycik, and Barry Friedman. 2009. *Green Power Marketing in the United States: A Status Report (2008 Data)*. Golden, CO: National Renewable Energy Laboratory.

price volatility, as well as a visible demonstration of environmental commitment. It is important to note that selling RECs from an on-site facility negates the system owner's claim to using a corresponding amount of renewable electricity generated on site because the REC buyer is buying that claim specifically and contractually. In order to claim the zero greenhouse gas emissions from electricity generated on-site, the RECs would need to be retired and not sold to a third party. In many states, excess 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 can improve the financial return for on-site renewable power systems, although net metering is often limited to small installations. For example, the state of California limits on-site generation systems to 1 megawatt (MW) (10 MW for up to three biogas digesters) and the aggregated on-site systems' capacity may not produce more than 2.5 percent of a utility's peak demand.

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.** Solar systems can be configured to almost any size from a few kilowatts up to several megawatts. On-site photovoltaic (PV) systems may be situated on schools, homes, community facilities, and commercial buildings. They can be integrated into a building, displacing other building material costs, such as for roofing shingles or car park shading.

- **Wind.** Wind turbines vary in size. A typical small unit provides 100 kilowatt (KW) or less, 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 1 acre of land per turbine and wind speeds that average 15 mph at a 150-foot height. In addition, placing turbines in urban areas is inadvisable because nearby buildings may create wind turbulence that can disrupt the turbines' performance.

- **Landfill and sewage methane gas.** Methane gas derived from landfills or sewage treatment plants can 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 technologies. 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.

In this era of power reliability problems and national security concerns, domestic, 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 can be modular and used on a small scale, the on-site gen-

On-site Generation: BMW Manufacturing Company

Automaker 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, in 2003 BMW converted four turbines that previously ran on purchased natural gas. In 2009, BMW replaced the original four turbines with two new highly efficient turbines that will increase the electrical output from 14 percent to almost 30 percent. By recovering the waste heat from the turbines, the 11-megawatt combined heat and power project satisfies more than 60 percent of the facility's thermal needs, as well as nearly 20 percent of its electricity use. To date, the project has saved the automaker an average of more than $5 million each year in energy costs. The new turbines installed in 2009 should return an additional average annual cost savings of up to $2 million. With the success of its landfill gas project, the facility is exploring on-site wind and has completed a study of the site's wind speed and direction. For more on-site examples, see Chapter 10, Resources for Additional Information.

eration system can be designed to enhance the redundancy and diversity of a facility's energy supply.

On-site renewable generation typically has higher capital costs and lower operating costs compared with installing fossil-fueled generation. Although these costs can 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 sustaining a commitment to renewable power easier. Additionally, there are new financing models for on-site generation being developed to lower the upfront capital investment, such as the solar power purchase agreement (SPPA).

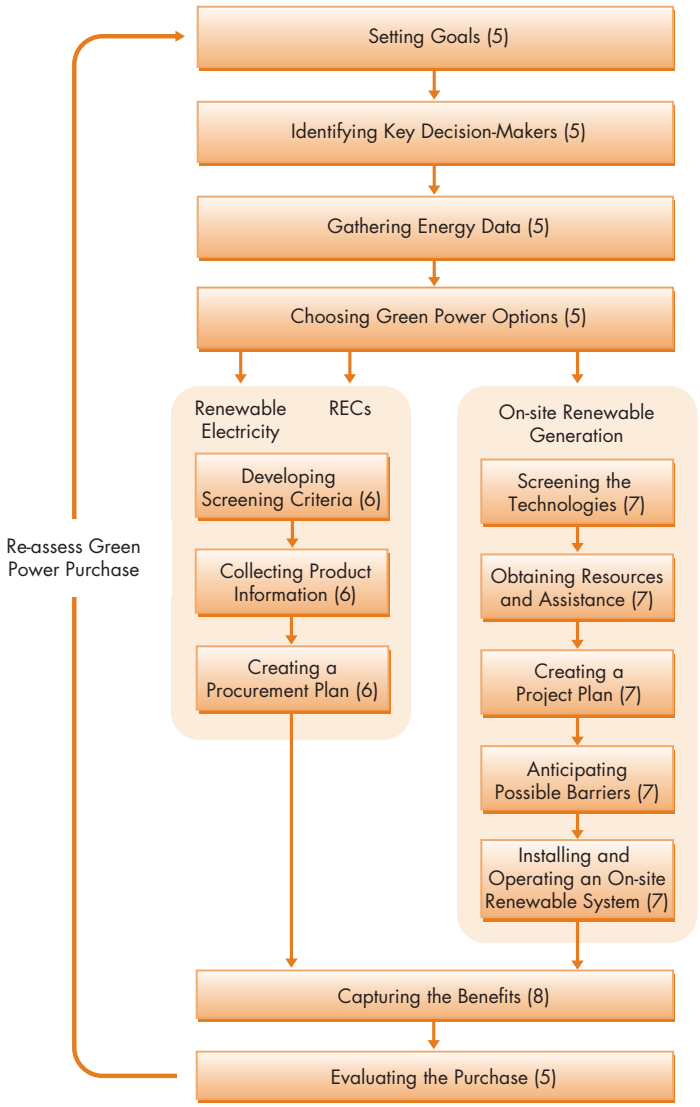
An organization that installs its own generation capability may have problems with the requirements for connecting to the utility distribution system, commonly referred to as interconnection. Interconnection rules designed for large generators often are unnecessarily burdensome for small generators. Increasingly, however, state interconnection rules are being standardized and simplified for smaller generators. In addition, national standards have been issued by the Federal Energy Regulatory Commission (FERC) that may ease interconnection in special cases. Chapter 7, Planning an On-site Renewable Generation Project, provides more details about procuring an on-site renewable generation system. Customers considering on-site generation should check with their local utility or with the state utility commission about interconnection rules. Chapter 10, Resources for Additional Information, provides more sources of information about utility interconnection.

Chapter 5
Steps to Purchasing Green Power

To buy green power, an organization first should determine what green power products will help fulfill its electricity needs and decide how to procure those products. Figure 6 illustrates 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 (renewable energy certificates [RECs] and utility-supplied) and on-site renewable generation. These steps are explained in later chapters of this guide.

Figure 6. Steps to a successful green power project



Setting Goals

The first step in any type of green power purchase is to set goals about what the objectives are for purchasing green power, considering the following questions at a minimum:

- Why is the organization considering green power?
- What does the organization hope to get from it?
- What selection criteria are important to the organization?
- Are independent certification and verification important to the organization?

These questions are best considered as part of the organization's overall energy or environmental management process. Such a process is an ongoing effort to improve the energy and environmental performance of the organization, usually driven by goals set by the organization's top-level leaders. The goals for a specific purchase of green power then flow from, and are greatly informed by, these overall goals.

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. All of their interests and concerns must be addressed early in the planning process. Experience has demonstrated that not doing so often leads to disagreements later in the process. Because buying green power is ultimately a financial decision, it is very important to have

the chief financial officer involved in and supportive of the decision. In addition, other departments, such as marketing or environment, health, and safety, may also contribute funds to help pay for green power.

Designating a contact person who can draw on expertise from throughout the organization is an important step. The departments 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 many cases, the greatest advocate of buying green power is an executive such as a chief executive officer 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.

Gathering Energy Data

The organization considering green power should take an inventory of its energy use, including electricity and thermal. Its annual electricity use can be calculated from the utility bills for each facility or business unit and for the entire organization. These data will help: 1) compare the organization's energy performance against peer facilities' energy performance and understand energy use patterns and trends; 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. Each organization should study its consumption data over the past year before specifying its requirements in order to have a complete and accurate picture of energy use. 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, and combined heat and 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 have saved enough money from energy efficiency upgrades to enable them to pay for their green power purchases.

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> offers simple energy-saving tips and a directory of energy services companies to provide additional assistance, such as a facility energy audit.

Calculating an organization's annual electricity use can determine the quantity of emissions associated with that use and help estimate the emissions that could be prevented by buying green power. EPA offers an online tool to help estimate emissions from an organization's current conventional electricity use at <www.epa.gov/cleanenergy/powerprofiler.htm>.

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 typically 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. There are new financing models being developed to help overcome the upfront financial barriers to on-site generation. These models are discussed in more detail in Chapter 7, Planning an On-site Renewable Generation Project.

Renewable electricity purchases and RECs usually 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 that wants to manage fuel price risk might be more interested in buying fixed-price renewable electricity. An organization that finds the reliability of its power supply to be most important might 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 electricity needs and purchase RECs to match the remainder of its electricity use. Likewise, organizations with facilities in multiple locations must determine whether to procure green power from one provider for all sites, or whether to procure green power from multiple providers based on unique options that might be available to an individual site. Organizations with facilities in multiple locations must also select the appropriate green power product for each site.

The green power options available to an organization are determined partly by the electricity market structure in the

Using Energy Efficiency Savings to Purchase Green Power: University of Pennsylvania

The University of Pennsylvania is funding its sizeable wind power purchase with savings achieved through energy conservation. Over the past few years, the university reduced peak electricity demand by 15 percent. This reduction enabled the university to purchase nearly 193 million kilowatt-hours of wind-generated renewable energy certificates (RECs), an amount equivalent to 46 percent of its total campus electricity use. Penn's long-term commitment to buying green power helps support development of new wind generation facilities, including a 12-turbine, 20-megawatt Pennsylvania wind farm.

state in which the facility is located. Each state has different rules governing power marketers, and the level of competition varies among the states. Large electricity purchasers might be able to work with their local utility or electricity provider to tailor a product to meet their needs.

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.

Finding Green Power Suppliers

- Organizations with facilities in several states should use a national locator such as EPA's Green Power Locator <www.epa.gov/greenpower/pubs/gplocator.htm> or the Green-e Energy "Find Renewable Energy" locator <www.green-e.org/buy>. The latter is also useful for locating certified products.
- Many state governments, often the public utilities commission, maintain a list of power marketers offering green power products in the state, especially if state electricity markets have been restructured.
- 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 Chapter 10 for more resources.

When considering green power options, it is useful to consider the motivations of other green power purchasers. A 2008 survey of corporations by the World Resources Institute (WRI) and the Climate Group found that the top criteria against which companies evaluate low-carbon technology projects include:

- **Financial metrics.** The return on investment (ROI) of projects is of paramount importance.
- **Marketing value.** The ability of projects to improve a company's brand value or image is a key factor in decision-making.
- **Carbon dioxide (CO_2) benefit.** The extent to which projects can help companies reach their emission reduction goals is also a factor they considered.

The key conclusion from the WRI-Climate Group survey is that low-carbon technology projects must be able to compete financially with non-renewable related projects in order to be funded.

It is also important to anticipate barriers to making a purchase, so that the process can be structured to overcome these barriers. The same WRI-Climate Group survey found that the most common barriers to wider investment and greater deployment of low-carbon technologies include:

- Cost of the technology.
- Insufficient financial performance.
- Availability of financing.
- Lack of staff capacity and knowledge.
- Inadequate baseline energy data against which to demonstrate improved performance.
- Lack of a streamlined decision-making process.

Evaluating the Purchase

Once the green power purchase has been implemented, it is important to collect information and evaluate how well the purchase achieved the purchase's preliminary goals. Areas of evaluation could include:

- How well the procurement process worked.
- Whether the vendors delivered what was expected.
- Whether the green power purchase is providing protection against rising fossil fuel prices.

- How well the organization promoted its green power commitment.
- How well the organization educated employees about the green power commitment.
- Whether the green power purchase is helping the organization meet its corporate or institutional goals related to environmental improvement and sustainability.

Additional evaluation factors apply for on-site generation systems, such as how much energy the system is producing (both initially and over time), how the system operation and maintenance costs compare to expected, and whether output is being appropriately reported to tracking systems for the issuance of RECs that the owner will use to substantiate its renewable electricity use claims.

Chapter 6
Procuring Renewable Electricity and Renewable Energy Certificates

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

Developing Criteria for Screening Suppliers and Products

The following criteria might be helpful when screening suppliers and products:

- **Reputation**. A supplier's reputation is influenced by factors such as how well it honors its commitments, how easy it is to work with, its list of clients, 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 might have information about the supplier.

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

- **Location.** If buying green power from a local supplier is important, call the supplier and find out where its renewable generation is 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 and types of resources. 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.

- **Environmental performance.** Assessing a supplier's environmental performance can be useful. Organizations should review the supplier's annual financial or environmental report, examine its other electricity products, and review its other business activities.

For renewable electricity products, consider the following additional criteria:

- **Price.** When considering price, organizations should make sure they are comparing apples to apples. Prices might reflect different types of products, so it is essential that organizations understand how products under consideration might differ. For example, renewable electricity products might quote total price per kilowatt-hour for electricity including the green attributes, which can be compared to the standard electricity price, but other products, such as renewable energy certificates (RECs) and many utility green pricing products, quote only the incremental cost of green power, which must be added to standard electricity rates. Furthermore, prices might be fixed or escalate over time, or can vary according to a price index such as the wholesale price of electricity. Finally, the purchase of some utility green power products might offer an exemption from variable fuel charges or environmental taxes, which should be factored into the ultimate price.

- **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 bundled products, an organization can still calculate the percentage of its electricity use served by renewable power.

- **Percentage of new or incremental renewable sources.** Many experts argue that only new generation provides incremental environmental benefits. "New" renewable resources generally refer to renewable facilities that began operation in 1997 or later, which is when the voluntary market for green power began to grow. Besides the direct impact of purchases from new renewable sources, these purchases also help create the demand necessary for constructing additional renewable resources.

In states that have adopted a renewable portfolio standard (RPS), electricity providers are required to include a minimum 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. In other words, an organization should purchase a renewable electricity product that is not already being used to satisfy a RPS mandate or goal imposed on a utility nor is the renewable electricity product included in the utility's standard electricity service.

- **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. Wind, solar, and geothermal power usually are the most environmentally preferable energy sources. Each is renewable and nonpolluting, with limited 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 smog-forming pollutants; and burning municipal solid waste may release heavy metals and other toxins into the environment. Municipal solid waste may also include nonrenewable materials derived from fossil fuels, such as tires and plastics, which when burned release carbon dioxide into the air. 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.

  Renewable energy resources also have different associated costs. For instance, a green power product generated from a resource that is scarce in one part of the country will be more expensive than purchasing the same resource-derived product from another part of the country.

- **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 might also offer greater price stability as well as provide better support to new renewable energy projects. 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. Before entering into a long-term contract, however, buyers should take into consideration potential policy changes (most notably, a carbon cap-and-trade program) that impact future environmental claims for purchasing green power.

- **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. By purchasing a product that has met specific environmental and consumer protection guidelines adopted by the certifying organization, a purchaser will be better positioned to address stakeholder questions about purchase quality and credibility. Visit <www.green-e.org> for more information about certification and verification.

- **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 outside of the purchaser's region. For example, purchasing RECs from a state in which fossil fuel comprises more of the electric generation mix may provide greater environmental benefit than purchasing RECs from a state in which 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 sellers have generated or purchased enough renewable energy to match their sales commitments. Visit <www.green-e.org> for additional information about third-party certification and verification.

generation is plentiful; RECs, therefore, do not necessarily represent a uniform set of environmental impacts or attributes. As a reporting convention, EPA allows Climate Leader Partners to claim emission reductions based on the regional average emissions rate for where the REC was generated. Regional average emissions rates can be found by visiting EPA's Emissions and Generation Resource Integrated Database (eGRID) at <www.epa.gov/egrid>. Further guidance can be found in Chapter 10, Resources for Additional Information.

- **Specific generation facility.** Some green power providers generate their power at a specific site, such as a nearby wind farm, rather than offering green power from a mix of different resources. These products, such as the annual output of one particular wind turbine, are sometimes preferred by customers because such products offer a closer sense of connection between a purchase and a specific environmentally beneficial 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 Energy, which can provide information about the products they have certified to meet minimum environmental standards.

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

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 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 a variable 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 a fixed quantity, a fixed amount of money, 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

The procurement plan should discuss cost. Cost has traditionally been the primary concern with green power, but there are an increasing number of financing models for purchasing green power that result in a cost benefit over the long-run. Negotiating the right contract can have a big effect on the financial costs and benefits of buying green power.

Price Hedging With Renewables

Southern New Hampshire University (SNHU) has found an innovative financial arrangement to stabilize its energy budget while also reducing its carbon emissions. The university has entered into a 15-year renewable energy hedge agreement with wind farm owner, Iberdrola Renewables. The hedge is structured as a contract-for-differences financial swap under which the parties agreed to a strike price and duration for the agreement. SNHU continues to buy power from its current supplier, and Iberdrola Renewables continues to sell into the local electricity spot market. The energy sales are then analyzed. If the sales income received by Iberdrola Renewables is greater than the strike price, Iberdrola Renewables pays SNHU the difference between the income and strike price. If the income is less that the strike price, then SNHU pays Iberdrola Renewables the difference. The hedge has stabilized the cost of the 15-million kWh of electricity used by the university annually. If energy costs increase even modestly over the 15 years, SNHU could save an average of $1.2 million per year for both electricity and natural gas.

Several strategies are available to help minimize and manage the extra cost of green power:

- **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.

- **Buy green power for only part of the organization's electricity use.** Green power does not have to be used for all electricity consumption. For example, the organization might buy green power for just 5 or 10 percent of its electricity use. Buying 10 percent green power may add less than 1 percent to the organization's electricity bill. Alternatively, some renewable electricity products cost less because they contain less than 100 percent green power or offer lower-percentage options.

- **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) might offer greater flexibility in the future but also might cost more. But a longer contract (e.g., 10+ years) 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.

- **Use a contract for difference.** A contract for difference (CFD) is a financial agreement that allows renewable power suppliers and purchasers to lock in stable power prices and revenues by agreeing to pay the difference between the actual power price and an agreed-upon benchmark or "strike" price. CFDs have tended to be used most often for government and college and university customers. Consult with your auditor to understand any associated accounting issues. To learn more about the CFD model, visit <www.epa.gov/grnpower/events/mar31_webinar.htm>.

- **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.

- **Use savings from competitive choices.** Competitive choices of either green power or commodity electricity can 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.

Procurement Methods

Organizations can purchase green power in several different ways, depending on the options available as well as the organization's 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 the Appendix.

- **Call several sellers.** An organization can keep the procurement process relatively simple by calling a few green power providers—either REC marketers, utilities, or other electricity providers that may be available to them. An off-the-shelf product may meet its needs. If the organization wants something different, it can ask for an informal 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 might be willing to tailor something to its needs.

- **Negotiate with the utility.** Buying power is simple, though the choices are fewer, if the organization is served by a single utility in a regulated market. 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.

- **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 might 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. RFPs can also be more formal, casting a wider net through a broadly advertised solicitation. The latter requires more effort to prepare and evaluate responses. Government agencies must follow the procurement rules governing their agency.

  A two-step process is possible as well, in which the organization first issues a request for information (RFI) and, based on the responses, sends a more detailed RFP to those suppliers that meet its general qualifications. The RFI 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 might lower the cost but probably will require longer-term purchase commitment. Buyers will still need to work with a retail supplier to integrate the wholesale contracts, so active engagement with your preferred retail supplier will be important. In addition, for RECs there have been instances where market-setting purchasers using the RFP process have yielded higher prices in the short term due to the large purchase size. In this case, buyers planning to make a large purchase may elect not to issue a public RFP but rather contact specific suppliers individually in the market.

  EPA's Green Power Partnership offers assistance to partners putting together a green power purchase RFP, and the Department of Energy's (DOE's) Federal Energy Management Program (FEMP) provides the same service for federal agencies. For RECs, the DOE Green Power Network maintains an online listing of green power RFPs that can be used as models at <apps3.eere.energy.gov/greenpower/financial/>.

- **Use an electronic auction.** Electronic auction platforms (also known as electronic procurement or "e-procurement") allow for real-time transparent bidding and "reverse auctions" to drive bid prices lower than might be achieved otherwise. Initially used in the 1990s by pools of buyers in retail markets that allowed for direct access competition, these electronic auction mechanisms are being tried with varying degrees of success by utilities and large customers and can offer a new forum for renewable energy transactions.

  Online auctions can provide significant price transparency and control that the paper-based RFP process does not always provide. With the reverse auction approach, price quotes are delivered in real-time via a Web-based

Using an RFP versus an RFI

An RFI may be a productive way to engage suppliers about innovative, new purchasing strategies. Suppliers might not want to respond to an RFP if the request is not "cookie cutter," as they know there would have to be significant negotiations once the winner is selected that could require changes to their costs while being locked into a pricing commitment. To ensure broad participation and validate interest from the market about new purchasing ideas, an RFI can provide important information to purchasers. Based on the results of the RFI, you can either proceed directly to negotiating with a particular vendor or refine your procurement goals in order to issue a detailed RFP that will have a better chance of multiple qualified bidders.

platform, which results in dynamic bidding and helps achieve rapid downward price pressure that is not normally achieved using conventional paper-based bidding and procurement. Buyers (currently, utilities) can either award contracts to the suppliers who bid the absolute lowest price, or those that best meet the buyer's specific, pre-established terms for quality, capacity, or other value-adding capabilities.

Special Considerations for RECs

RECs can be bought from 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 fee. They can help negotiate deals that take into account an organization's unique interests.

REC Tracking Systems

A tracking system is an electronic database that is used to track the ownership of RECs or MWh of electricity, much like an online bank account. A tracking system issues a uniquely numbered certificate for each MWh of electricity generated by a generation facility registered in the system, tracks the ownership of certificates as they are traded, and retires the certificates once they are used or claims are made based on their attributes or characteristics. Because each MWh has a unique identification number and can only be in one owner's account at any time, this reduces ownership disputes and the potential for double counting.

A tracking system can be used to verify compliance with a RPS, to help create environmental disclosure labels, and to substantiate voluntary green power or environmental claims. Tracking systems are not substitutes for product certification and verification, as tracking systems only monitor wholesale transactions; individual retail green power customers do not generally hold accounts in tracking systems unless they make very large purchases. See Chapter 10, Resources for Additional Information, for details.

Reducing the Cost of Green Power: State of Connecticut

In late 2007, the state of Connecticut successfully used Web-based reverse auctions to secure electric supply contracts totaling 909 million kilowatt-hours between November 2007 and June 2009. The supply contracts include more than 22 percent electricity from green power sources, which was a prerequisite of the state. The online auction allowed Connecticut and the energy suppliers to participate in real-time with full price visibility, which heightened competition among suppliers and allowed the state to lock in the lowest price. Under these contracts for electric supply reported savings through December 2008 are $19.5 million, as compared to the price that would have been paid for standard service.

When buying RECs, organizations should make sure that the RECs they buy have not been double-sold and claimed by another party. For example, voluntary purchases of RECs should not also be counted by utilities for compliance with regulatory requirements such as renewable portfolio standards (RPSs), and RECs used to comply with such requirements should not be sold into voluntary markets. If they are double-counted, the voluntary purchaser would not create any benefits over and above what is already required by public policy. Utilizing tracking systems and third-party certifiers can help ensure that RECs are not claimed by more than one party. To avoid potential double claims on environmental benefits, contracts for RECs should be explicit about what environmental characteristics are included with the sale.

Sometimes RECs are incorrectly referred to as carbon offsets, but RECs and offsets are not the same. RECs are tradable instruments, expressed in terms of a unit of electric generation (1 megawatt-hour [MWh]), that represents the source's resource type, facility location, direct emissions, and generation date, among other characteristics. Offsets are expressed in tons of emission reduction and may come from a variety of project types not related to power generation. In voluntary markets to date, some renewable energy projects have qualified as sources for offsets; however, the associated environmental attributes from a green power project that are used to generate a REC cannot also be claimed for offset purposes. See Chapter 10, Resources for Additional Information, for details.

Chapter 7
Planning an On-site Renewable Generation Project

Depending on the size of the system, on-site generation projects tend to take more steps than do other green power purchases because they can 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 to get an on-site project up and running. Due to the complexity of building on-site renewable energy projects, organizations are increasingly turning to power purchase agreements (PPAs). With PPAs, a third-party project developer coordinates the building and maintenance of an organization's on-site system. The organization needs to purchase only the power output. The following steps, along with the information listed in Chapter 10, Resources for Additional Information, can help. In the end, the on-site renewable system—whether self-financed or third-party financed—will generate power and other benefits for many years to come.

Screening the Technologies

Based on work done in the first steps of the process of purchasing green power (Chapter 5, Steps to Purchasing Green Power), 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 net present value.

The analysis should account for state and federal financial incentives, interconnection rules (e.g., insurance requirements or standby charges), and net metering laws that might apply to the on-site generation facility. Each renewable technology has unique characteristics that make it more or less appropriate for a given situation. The evaluation criteria need to be defined in a way that objectively compare the various technologies. The result of this screening will be a specific technology that best 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 determined 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 photovoltaic [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 larger modules. A contractor or utility representative can help choose the right size system, or the organization can also use one of the software tools listed in Chapter 10, Resources for Additional Information.

Most on-site systems will be grid-connected, so that when the on-site renewable generation is less than the organization's electricity demand, remaining power needs can be met by the utility grid. The economic analysis will be affected if the organization wants to include energy storage (e.g., batteries, capacitors, flywheels) or backup generation to provide power when the utility grid is down. This is a separate decision, however, from the decision to install on-site generation. If backup power is included, the additional cost of the backup system and electrical equipment for switching from utility to backup power must be considered. The economic analysis will also be affected 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 its objectives and what questions to ask, in order to be able to write a procurement specification. At this point, the organization should seriously consider seeking 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, the Department of Energy's Federal Energy Management Program (FEMP) offers technical assistance to federal agencies.

The financial details are usually what make or break an on-site project, so the project team should collect information about incentives and financing options (including PPAs) that could make the project more cost-effective. Some state programs might also require that only certified installers install systems. Many states offer financial incentives specifically for customers that install qualified renewable generation systems. These incentives may take the form of direct payments (rebates), competitive solicitations, consumer financing, or lower taxes (either sales or property tax exemptions). 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.

Using Incentives to Finance an On-Site Generation System: Sierra Nevada Brewing Company

The Sierra Nevada Brewing Company installed a 1.2-MW DC fuel cell system at its brewery in Chico, California. The fuel cell is powered by natural gas and supplemented by digester gas from the treatment of brewing wastewater; its waste heat is harvested in the form of steam and used for the brewing process as well as other heating needs. The 1.2 MW of electricity, combined with 1.9 MW solar panels, supplies about 90 percent of the brewery's overall power requirements. The capital cost of the fuel cell system was funded by a $2.4-million incentive from the local utility (Pacific Gas and Electric Company), $1 million in financial support from the U.S. Department of Defense Climate Change Fuel Cell Program, and a 30 percent federal investment tax credit. These incentives covered about two-thirds of the upfront capital cost for the system.

Creating a Project Plan

Once the organization has decided on a specific generation 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 applicable incentive programs.

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 PPA 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. Moreover, it is important to consider how the choice of who owns the system will affect the availability of tax credits and incentives (for instance, non-taxable entities are not eligible for tax credits).

An organization can handle the procurement options for on-site generation in the following ways:

- **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.

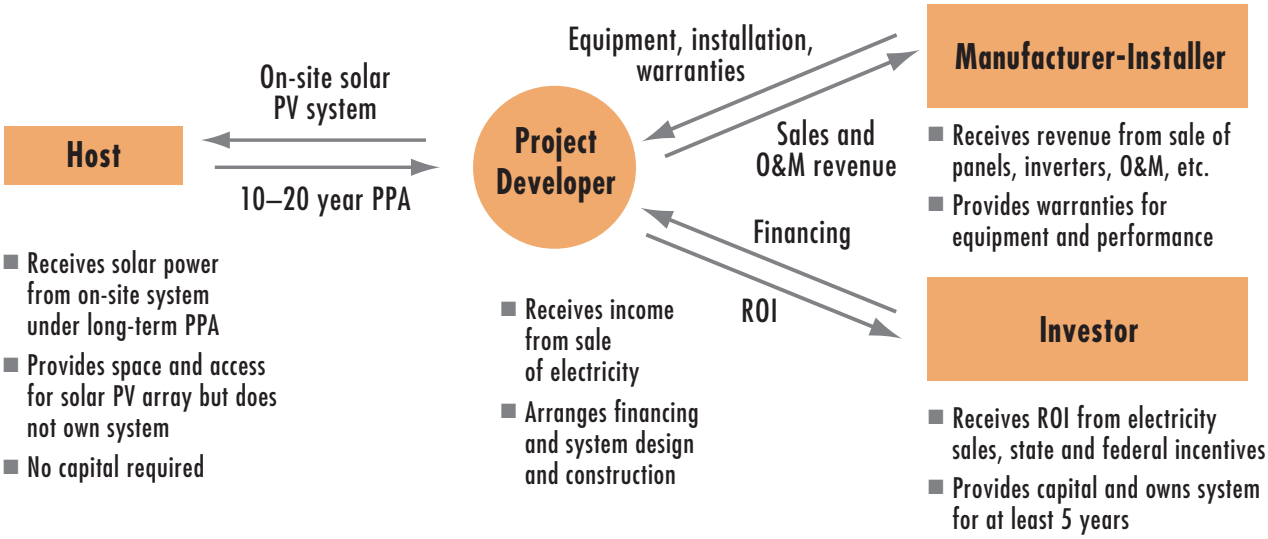
- **Hire a qualified contractor for a turnkey system.** An organization probably will use a request for proposal (RFP) to select an equipment manufacturer, a system designer, or a system installer to help design the system to its needs, to buy the materials, to arrange for installation, and to commission the system. There are some companies (particularly in the PV industry) that are vertically integrated, from manufacturing to design and installation to operations and maintenance. Before hiring a contractor, an organization should check with the state government to see if contractors must be licensed to install an on-site system.

- **Hire an energy services company (ESCO).** The ESCO will be responsible for design, installation, maintenance, and financing. This arrangement 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 electricity 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.

- **Host an independently owned system via a PPA.** 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, with no up-front cost. This approach is known as a power purchase agreement (PPA), and it can greatly simplify the process of installing on-site renewable power. Under a PPA, a third party owns the renewable energy system and sells the power to the site host under a long-term contract (usually 10 to 20 years). The power payments from the site host pays for the capital cost of the system. A third-party project developer typically handles all aspects of the project development including site assessment, system configuration, procurement, installation, and financing. The project developer is also typically responsible for system operations and maintenance. A PPA project usually involves two contracts: 1) a site license or lease, and 2) a power purchase agreement. The contractual arrangements are shown in Figure 7.

  As with other types of green power purchases, organizations should make sure that the contract also defines the ownership of the renewable energy certificates (RECs) and therefore the rights to claim the use of renewable

Figure 7. Power purchase agreement (PPA) contractual relationships



Note: Nonresidential customers refer to business and institutional customers. Data for on-site renewable generation is not available.

Source: Hassett, Timothy C., and Karin L. Borgerson. 2009, *Harnessing Nature's Power: Deploying and Financing On-Site Renewable Energy.* Washington, DC: World Resources Institute.

Procuring On-Site Generation Through a Solar Power Purchase Agreement: Staples & Kohl's

To avoid the large upfront capital outlays required of an on-site power generation system, many organizations have entered into solar power purchase agreements. Under these agreements, an organization hosts a PV system and agrees to purchase its output for a given period of time, while a third-party developer owns, operates, and maintains the system. Two companies that have been leaders in advancing the solar services model are Staples and Kohl's. As of June 2009, Staples is hosting 24 active rooftop solar systems on its stores, distribution centers, and offices throughout the country and has more than 100 more systems under development. The company's fleet of hosted solar systems totals almost 4,000 kW and produces about 4 million kWh per year. Staples has used solar power through a solar power purchase agreement since 2005. The fixed price for power in the agreements is competitive with local commercial rates and acts to hedge against price volatility in retail electricity. Similar to Staples, Kohl's entered into a solar power purchase agreement for a 20-year term in 2007. The company's near-term goal is to have 100 activated solar locations on its store rooftops. As of June 2009, Kohl's has 67 solar power systems activated in California, New Jersey, Wisconsin, and Connecticut, with another 10 in various stages of construction. The company estimates that, on average, a hosted solar system provides roughly 40 percent of a store's annual electricity needs. Kohl's is currently the largest retail host of solar electricity production in the world.

electricity. A host of an on-site system under a PPA wishing to claim environmental benefits such as a reduction of carbon emissions from the on-site system will need to retire the RECs generated from the on-site system.

Choosing a Vendor

When choosing a vendor, obtaining more than one bid is recommended, 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, Resources for Additional Information, lists more sources.

When choosing a vendor, the organization should obtain comparative information from the companies it is considering, usually through either an RFP or an RFI as described in Chapter 6, Procuring Renewable Electricity and Renewable Energy Certificates. An RFP is appropriate if the organization already has a detailed system design and simply wants a vendor to implement that design. An RFI is better for comparing vendors' qualifications and experience and should be used to select a vendor to 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 RFI 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 include 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 certifications 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 three categories: 1) technical, 2) financial, and 3) 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. Financial barriers come as a result of changing economic conditions, such as the availability of tax credits, direct subsidies, or the climate for loans and project finance opportunities. Regulatory barriers pertain mainly to the required permits and approvals, such as air emissions permits, utility standby charges, exit fees, 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.

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 post-construction 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.

Chapter 8
Capturing the Benefits of the Purchase

An organization should provide and seek recognition for its green power commitments in order to sustain momentum and support for the renewable energy program. An organization should consider various internal and external promotional and marketing strategies to generate measurable, positive publicity and public relations benefits. To maximize the positive publicity, the use of green power should be made part of the organization's comprehensive environmental management efforts. Purchasers of renewable energy may make claims about use of renewable energy by combining their renewable energy certificates (RECs) with their own electricity usage or through a utility green power purchase.

The Environmental Benefits

When an organization highlights its green power purchase, it is important that it know the quantity of any emissions avoided. These emissions can be greenhouse gases (GHGs)—primarily carbon dioxide, as well as other pollutants that affect the environment and human health, such as particulate matter. A buyer of green power can calculate its reduction of emissions using a tool provided by EPA's Green Power Partnership at <www.epa.gov/greenpower/pubs/calculator.htm>.

Despite the estimates provided by these calculation tools, organizations should be careful about claiming avoided emissions because the ability to make emission reduction claims vary according to the regulatory policies affecting the emissions in question. Under voluntary programs, such as EPA's Climate Leaders program, it has become common practice to use the zero emissions attributes of green power purchases to reduce indirect or "Scope 2" emissions (from purchased electricity) as permitted by the program's reporting guidelines. Under a mandatory cap and trade program, these accounting practices may change, so buyers of green power should check with EPA or other authorities about any updated greenhouse gas accounting rules prior to making new environmental claims.

The concern about climate change has prompted many organizations to complete a GHG emissions inventory. An inventory is a detailed list of emissions by source and type of greenhouse gas, usually expressed in metric tons of carbon dioxide equivalent ($MTCO_2e$).

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.

An inventory also allows organizations to record their emission information in an official registry with a government agency. Several GHG registry programs have been established to record GHG inventories, including The Climate Registry, Wisconsin's Voluntary Emissions Reduction Registry, the U.S. Department of Energy's l605b Voluntary Greenhouse Gas Reporting program, the American Carbon Registry, and the Regional Greenhouse Gas Registry. For more information, see the GHG accounting standards developed by the World Resources Institute (WRI)/World Business Council for Sustainable Development (WBCSD) GHG Protocol Initiative at <www.ghgprotocol.org>.

Renewable energy purchases and on-site generation may earn building owners credit toward a variety of green building standards. For example, the U.S. Green Building Council (USGBC) runs the Leadership in Energy and Environmental Design (LEED) certification program, which recognizes buildings that generate or purchase renewable energy for a certain amount of their electricity use, awarding credit proportional to generation and purchase amount. For purchased renewable energy, LEED requires that renewables meet the criteria of Green-e Energy.

Internal Promotion

One of the benefits of buying green power is improving employee morale. It is also important to maintain internal support for purchasing green power. To achieve these goals, 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 for their home electricity use 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. To be effective, organizations must be sure to substantiate any claims made, per Federal Trade Commission and National Association of Attorneys General marketing guidelines (see Chapter 10, Resources for Additional Information).

- **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.

Using Green Power for Promotion and Branding

Lundberg Family Farms supports the use and implementation of renewable energy through both on-site solar generation and the purchase of wind-based RECs. In 2008, the family-owned enterprise purchased 4.8 million kilowatt-hours (kWh) of renewable electricity, which accounts for 100 percent of its annual electricity use. In addition to this purchase, Lundberg installed two solar photovoltaic arrays on company warehouses, which produce nearly 688,000 kWh annually. To promote its commitment to renewable energy, Lundberg Family Farms is a member of both EPA's Green Power Partnership and Green-e Marketplace. Lundberg features its purchase on product packaging and spreads the word about green power through its public Web page, speaking events, newsletters, and at industry trade shows. Multiple local broadcast stations have also featured stories about the company's green power activities.

- **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. An 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. Organizations might also teach staff 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. These opportunities might include marketing the organization's purchase on its products and encouraging its suppliers and affiliates to follow its lead and buy green power.

- **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 EPA's Green Power Partnership and

those who participate in Green-e Marketplace can also use these programs' respective 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.

- **Awards competitions.** A number of entities recognize leadership in the purchase of renewable energy, including EPA's Green Power Partnership and the Center for Resource Solutions' Green-e Energy program as part of the annual Renewable Energy Markets conference. See Chapter 10, Resources for Additional Information, for more details about these awards.

Chapter 9
Conclusion

Purchasers of electricity can have a significant impact on the way that power is produced, now and in the future. Businesses, governments, and nonprofit organizations 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 support 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

The Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) works to strengthen the United States' energy security, environmental quality, and economic vitality through public-private partnerships. It supports this goal by enhancing energy efficiency and productivity and by bringing clean, reliable, and affordable energy technologies to the marketplace.

As a part of EERE, the Department of Energy's Federal Energy Management Program (FEMP) facilitates the federal government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship. FEMP provides project transaction services, applied technology services, and decision support services. All of these services are available to assist federal agencies with deploying renewable technologies.

- Federal Energy Management Program: <www1.eere.energy.gov/femp>
- Green Power Network: <apps3.eere.energy.gov/greenpower/>
- FEMP Renewable Power Purchasing: <www1.eere.energy.gov/femp/technologies/renewable_purchasingpower.html>

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency's (EPA's) Green Power Partnership is a voluntary program that encourages organizations to buy green power as a way to reduce the environmental impacts associated with purchased electricity use. The partnership has more than 1,200 partner organizations voluntarily purchasing billions of kilowatt-hours of green power annually. Partners include a wide variety of leading organizations such as Fortune 500 companies; small and medium sized businesses; local, state, and federal governments; and colleges and universities.

- Green Power Partnership: <www.epa.gov/greenpower>
- Green Power Equivalency Calculator: <www.epa.gov/greenpower/pubs/calculator.htm>
- Clean Energy: <www.epa.gov/cleanenergy>
- Climate Leaders: <www.epa.gov/climateleaders>
- Landfill Methane Outreach Program: <www.epa.gov/lmop>
- eGRID Database: <www.epa.gov/cleanenergy/egrid>
- Power Profiler: <www.epa.gov/cleanenergy/powerprofiler.htm>
- Green Power Leadership Awards: <www.epa.gov/greenpower/awards/index.htm>
- ENERGY STAR: <www.energystar.gov>

World Resources Institute

World Resources Institute (WRI) is an environmental think tank that goes beyond research to find practical ways to protect the Earth and improve people's lives. WRI's mission is to move human society to live in ways that protect the Earth's environment and its capacity to provide for the needs and aspirations of current and future generations. Its work is organized around four key programmatic goals: People & Ecosystems, Governance, Climate Protection, and Markets and Enterprise.

WRI has been engaging the private sector on climate policy and low-carbon technology deployment for a decade. These projects are designed to achieve two primary goals: 1) accelerate corporate deployment of renewable energy, and 2) build a business constituency that is more informed on climate

and energy policy. WRI's business network is composed of more than 70 large corporations that are engaged through the Green Power Market Development Group (GPMDG), along with its California and European affiliates, and the U.S. Climate Business Group, with regional workgroups in the Northeast, Midwest, and Southeast. This activity has achieved several important milestones. For instance, GPMDG partners have procured more than 1,000 MW of new, cost-competitive renewable energy, while several GPMDG members have made the list of top corporate users of solar photovoltaics.

- World Resources Institute: <www.wri.org>

Green-e Programs

The Green-e® certification programs are among the nation's leading voluntary certification and verification programs, designed to help businesses and households compare and select clean renewable energy and carbon offset options. Renewable energy products that meet the Green-e Energy standards and carbon offsets that meet Green-e Climate standards are identified by the Green-e logo. Renewable energy products that meet the Green-e Energy standards and carbon offsets that meet Green-e Climate standards are identified by the Green-e logo, as shown below.

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.

Additional Resources

The Additional Resources section is not intended to be an exhaustive list of all resources on a certain subject, but rather an introduction for learning more on a topic of interest.

Developing a strategic energy management plan:

ENERGY STAR's Guidelines for Energy Management: <www.energystar.gov/index.cfm?c=guidelines.guidelines_index>

Electricity restructuring:

2002. May. *A Primer on Electric Utilities, Deregulation, and Restructuring of U.S. Electricity Markets.* U.S. Department of Energy. <eere.pnl.gov/femp/publications/Primer-ElectricUtilitiesDeregulationRestructuring.pdf>

Status of Electricity Restructuring by State Web Site. Energy Information Administration. <www.eia.doe.gov/cneaf/electricity/page/restructuring/restructure_elect.html>

Current state of green power markets:

Bird, Lori, Claire Kreycik, and Barry Friedman. 2009, September. *Green Power Marketing in the United States: A Status Report (2008 Data).* Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A2-46581. <www.nrel.gov/docs/fy09osti/44094.pdf>

(Updates will be posted on the Green Power Network's Web site at <apps3.eere.energy.gov/greenpower/>).

Bird, Lori, David Hurlbut, Pearl Donohoo, Karlynn Cory, and Claire Kreycik. 2009, March. *An Examination of the Regional Supply and Demand Balance for Renewable Electricity in the United States through 2015.* Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A2-45041. <www.nrel.gov/docs/fy09osti/45041.pdf>

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

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

Green-e lists certificate marketers and brokers that offer certified products: <www.green-e.org/base/re_products>

The World Resources Institute Green Power Market Development Group, *Guidelines for Writing a REC Request for Proposal and Sample Contract for Renewable Energy Certificates.* <www.thegreenpowergroup.org/tools.cfm?loc=us>

Renewable energy tracking systems:

EPA's Green Power Partnership page on REC tracking systems: <www.epa.gov/greenpower/gpmarket/tracking.htm>

Environmental Tracking Network of North America (ETNNA): <www.etnna.org/>

Electric Reliability Council of Texas (ERCOT): <www.texasrenewables.com/>

New England Power Pool/Generation Information System (NEPOOL/GIS): <www.nepoolgis.com/>

PJM Generation Attribute Tracking System (GATS): <www.pjm-eis.com/>

Western Renewable Energy Generation Information System (WREGIS): <www.wregis.org/>

Midwest Renewable Energy Tracking System (M-RETS): <www.mrets.net/>

APX's North American Renewables Registry: <narenewables.apx.com/>

Utility green-pricing programs:

The Green Power Network updates lists of top utility programs: <apps3.eere.energy.gov/greenpower/>

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Green power product lists:

The Green Power Network maintains lists of products offered in each state: <apps3.eere.energy.gov/greenpower/>

The EPA Green Power Partnership supports a Green Power Locator: <www.epa.gov/greenpower/pubs/gplocator.htm>

Green-e maintains a list of certified products offered in each state: <www.green-e.org/base/re_products?cust=b>

On-site renewable energy generation:

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U.S. Department of Energy. 2007. *Small Wind Electric Systems: A U.S. Consumer's Guide.* <www.windpoweringamerica.gov/pdfs/small_wind/small_wind_guide.pdf>

Wind Powering America. <www.windpoweringamerica.gov/index.asp> (See "Quick Links to States" for state-specific information).

Massachusetts Renewable Energy Trust. 2009. *The Commercial Buyer's Guide to Solar Electricity in Massachusetts.* <www.masstech.org/cleanenergy/cando/SolarGuide-spreads.pdf>

Midwest Region Consumer's Guide to Buying a Solar Electric System. <www.state.mn.us/mn/externalDocs/Commerce/Consumer_Guide_to_Solar_Systems_123002022801_pvguide3.pdf>

Hassett, Timothy C., and Karin L. Borgerson. 2009, March. *Harnessing Nature's Power: Deploying and Financing On-Site Renewable Energy.* Washington, DC: World Resources Institute. <www.wri.org/publication/harnessing-natures-power>

Government incentives for renewable energy:

The Database of State Incentives for Renewable Energy includes information about capital cost incentives and net-metering laws at the state level, as well as information about federal and utility incentives: <www.dsireusa.org>

The Clean Energy States Alliance is composed of "Clean Energy Funds" or "State Funds," a growing number of public funds in the United States whose objective is building markets for renewable energy and clean energy resources. The alliance collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds: <www.cleanenergystates.org>

The American Wind Energy Association lists state incentives for small wind installations: <www.awea.org/smallwind/states.html>

Bolinger, Mark, Ryan Wiser, Karlynn Cory, and Ted James. 2009, March. *PTC, ITC, or Cash Grant? An Analysis of the Choice Facing Renewable Power Projects in the United States.* Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-1642E. <eetd.lbl.gov/ea/EMS/reports/lbnl-1642e.pdf>

Interconnection with the utility grid:

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>

This standard has several components:

- IEEE 1547.1 2005 Standard for Conformance Tests Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems
- IEEE 1547.2 Application Guide for IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems
- IEEE 1547.3 2007 Guide For Monitoring, Information Exchange, and Control of Distributed Resources Interconnected with Electric Power Systems
- IEEE P1547.4 Draft Guide for Design, Operation, and Integration of Distributed Resource Island Systems with Electric Power Systems

The Federal Energy Regulatory Commission (FERC) has issued standard procedures and a standard interconnection agreement for the interconnection of generators to the power grid. The rules differ depending on whether the generator is larger or smaller than 20 megawatts: <www.ferc.gov/industries/electric/indus-act/gi.asp>

The DSIRE database lists state interconnection rules: <www.dsireusa.org/> (click on "Summary Tables" then "Rules, Regulations, & Policies for Renewable Energy").

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

Department of Energy (DOE) Office of Electricity Delivery and Energy Reliability: <www.oe.energy.gov/renewable.htm>

DOE Federal Energy Management Program (FEMP), Interconnection and Permitting Guide. <www1.eere.energy.gov/femp/technologies/derchp_ipg.html>

Haynes, Rusty, and Chuck Whitaker. 2007. *Connecting to the Grid: A Guide to Distributed Generation Interconnection Issues.* Fifth Edition. Interstate Renewable Energy Council (IREC). <www.irecusa.org/index.php?id=31>

Measurement and verification of renewable system performance:

Webster, Lia, and James Bradford. 2008, April. *M&V Guidelines: Measurement and Verification for Federal Energy Projects, Version 3.0.* Washington, DC: Federal Energy Management Program. <www1.eere.energy.gov/femp/pdfs/mv_guidelines.pdf>

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. <www.nrel.gov/rredc/pvwatts/>

PV systems:

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, April. *Buying a Photovoltaic Solar Electric System: A Consumer Guide.* <www.energy.ca.gov/reports/500-99-008.PDF>

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

Bolinger, Mark. 2009, January. *Financing Non-Residential Photovoltaic Projects: Options and Implications.* Berkeley, CA: Lawrence Berkeley National Laboratory. <eetd.lbl.gov/EA/EMP/reports/lbnl-1410e.pdf>

Merry, Liz, and Elisa Wood. 2008, October. *The Customer's Guide to Solar Power Purchase Agreements.* The Rahus Institute. <www.californiasolarcenter.org/sppa.html>

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Renewable energy trade associations:

American Council on Renewable Energy:
<www.acore.org>

American Solar Energy Society:
<www.ases.org>

American Wind Energy Association:
<www.awea.org>

Biomass Coordinating Council:
<www.acore.org/committees/biomass_council>

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>

Midwest Renewable Energy Association:
<www.the-mrea.org>

National Hydropower Association:
<www.hydro.org>

National Wind Coordinating Collaborative:
<www.nationalwind.org>

Northeast Sustainable Energy Association:
<www.nesea.org>

Renewable Energy Markets Association:
<www.renewablemarketers.org>

Solar Electric Power Association:
<www.solarelectricpower.org>

Solar Energy Industries Association:
<www.seia.org>

Utility Wind Integration 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.

RETscreen International
Developer: Natural Resources Canadas 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): <analysis.nrel.gov/retfinance>

Carbon Value Analysis Tool
Developer: World Resources Institute
A screening tool to help companies integrate the value of carbon dioxide emissions reductions into energy-related investment decisions: <www.wri.org/publication/carbon-value-analysis-tool>

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.cleanpower.com/Home>
A version for California facilities is offered by the CEC: <cec.cleanpowerestimator.com/cec.htm>

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

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: <analysis.nrel.gov/fresa/>

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 research and development and the valuation of distributed generation assets: <www.nrel.gov/realoptions>

PV Watts
Developer: NREL
Provides estimated system output and savings calculations based customizable system specifications and in the field system performance data. User inputs their system information and selects a system in the general area of the user's own site to provide calculations. <www.nrel.gov/rredc/pvwatts/>

Greenhouse gas resources:

World Resources Institute/World Business Council for Sustainable Development Greenhouse Gas Protocol: <www.ghgprotocol.org>

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

Guidance from Climate Leaders about treatment of RECs and other green power purchases in greenhouse gas inventories: <www.epa.gov/climateleaders/documents/greenpower_guidance.pdf>

The Climate Registry: <www.theclimateregistry.org>

Carbon Disclosure Project: <www.cdproject.net>

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

World Wildlife Fund's (WWF) Climate Savers: <www.worldwildlife.org/climate/climatesavers2.html>

World Resources Institute Carbon Value Analysis Tool: <www.wri.org/publication/carbon-value-analysis-tool>

The California Energy Commission has summarized state activities related to greenhouse gas inventories at <www.climatechange.ca.gov/>

The Regional Greenhouse Gas Initiative: <www.rggi.org/rggi>

EPA rulemaking
In response to the FY2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110161), EPA published the Mandatory Reporting of Greenhouse Gases Rule in September 2009. This rule requires reporting of greenhouse gas (GHG) emissions from large sources and suppliers in the United States, and is intended to collect accurate and timely emissions data to inform future policy decisions. <www.epa.gov/climatechange/emissions/ghgrulemaking.html>

Metzger, Eliot. 2008. *Bottom Line on Climate Policy Terminology.* Washington, DC: World Resources Institute. <www.wri.org/publication/bottom-line-climate-policy-terminology>

Heilmayr, Robert. 2008. *Bottom Line on GHG Emissions Registries.* Washington, DC: World Resources Institute. <www.wri.org/publication/bottom-line-ghg-emissions-registries>

Carbon Offsets:

Climate Action Reserve <www.climateactionreserve.org>

Green-e Climate Standard: <www.green-e.org/docs/climate/G-e%20Climate%20Standard%20V1-1.pdf>

Green-e Climate Protocol for Renewable Energy: <www.green-e.org/docs/climate/Green-e_Climate_Protocol_for_RE.pdf>

World Resources Institute Bottom Line on Climate Policy Terminology: <www.wri.org/publication/bottom-line-climate-policy-terminology>

Voluntary Carbon Standard Registry: <www.vcsregistry.com>

Glossary

This glossary defines some of the important terms used in this guide. More definitions can be found at <www.epa.gov/cleanenergy/energy-and-you/glossary.html>.

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

Cap and trade. A policy for limiting the amount of pollution emitted. The cap is a limit on the total amount of pollution that can be emitted (released) from all regulated sources (e.g., power plants); the cap is set lower than historical emissions in order to reduce emissions. Trading is a system in which emission sources can buy or sell allowances on the open market. Because the total number of allowances is limited by the cap, emission reductions are assured. For more information about cap and trade programs, see the EPA's cap and trade Web page at <www.epa.gov/captrade/>.

Capped and uncapped markets. Power markets in the United States that are either subject to carbon dioxide emission caps (most notably the northeastern states) or not, as of mid-2009. The treatment of avoided carbon dioxide emissions due to renewable power purchases differs depending on the type of carbon market in which the purchaser is located.

Carbon dioxide. A gas created in the atmosphere from burning fossil fuels. Burning fossil fuels releases carbon that has been stored underground for millions of years that transforms during the combustion process 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 burning fossil fuels.

Combined heat and power (CHP). 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. Generic electricity not associated with a particular power generation source.

Competitive markets. Allowing consumers to choose from among several electricity suppliers. 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 the late 1990s and early 2000s, however, several states restructured their electricity industry and now give consumers a choice of competing suppliers.

Conventional power. 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. 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. When products or systems use 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. Coal, oil, and natural gas, the United States' principal source of electricity, due largely to their low cost. All three were formed many hundreds of millions of years ago; 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. Long-term alteration in the Earth's climate, compared to what would be expected naturally, due to human activities. 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 the 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 increase 2 to 6 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 EPA's Climate Change Web site at <www.epa.gov/climatechange/>.

Green power. Electricity that is generated from renewable energy sources. Green power is a term that implies a lesser environmental impact than from conventional electricity generation. The resources that qualify as green power vary depending on the state or organization. For more details, see Chapter 2, Green Power Defined.

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

Green power products. Electricity generated exclusively from renewable resources or from a combination of fossil and renewable resources if they are differentiated from the standard mix of generation resources.

Green pricing. 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.

Greenhouse effect. A natural process whereby 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 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 (GHGs). Gases in the Earth's atmosphere that 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.

Interval meter. 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). 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. Hydroelectric power generated with fewer environmental impacts than large-scale hydropower, 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. 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 facilities. Facilities built in the recent past or will be built to meet the growing market demand for green power. Currently, new generation must be from renewable energy generating facilities that

began operation on or after January 1, 1997, according to the Green-e Energy certification standard and EPA Green Power Partnership requirements.

Offsets. Expressed in tons of emissions reduction and may come from a variety of project types not related to power generation. In voluntary markets to date, renewable energy projects have qualified as sources for offsets, relying on a rigorous review and criteria that assess whether the emissions reductions are real, additional, measurable, permanent and verified. However, output from a project that is used as a REC for energy purposes cannot also be claimed for offset purposes, too.

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

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

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

Power purchase agreement (PPA). A contract to purchase power from a third-party project developer for a specified period and price. This type of contract can be used to purchase power from on-site renewable generation systems, avoiding large capital investments for the end-user.

Registry. Usually refers to "climate registries," which are systems that set consistent and transparent standards to calculate, verify, and publicly report greenhouse gas emissions.

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

Renewable energy certificates (RECs). Tradable instruments that can be used to meet voluntary renewable energy targets as well as to meet compliance requirements for renewable energy policies. A REC is a certificate that represents the generation of 1 megawatt-hour (MWh) of electricity from an eligible source of renewable energy. Each REC denotes the underlying generation energy source, location of the generation, and year of generation (a.k.a. "vintage"), environmental emissions, and other characteristics associated with the generator. RECs represent a claim to the environmental attributes associated with renewable energy generation, but purchasers should nevertheless ensure that their contracts are explicit about which environmental attributes are conveyed to them. RECs are also known as "green tags," "green certificates," and "renewable energy credits."

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

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

Tracking system. An electronic database that is used to track the ownership of RECs, much like an online bank account. A tracking system issues a uniquely numbered certificate for each MWh of electricity generated by a generation facility registered in the system, tracks the ownership of certificates as they are traded, and retires the certificates once they are used or claims are made based on their attributes or characteristics. Because each MWh has a unique identification number and can only be in one owner's account at any time, a tracking system reduces ownership disputes and the potential for double counting.

Appendix

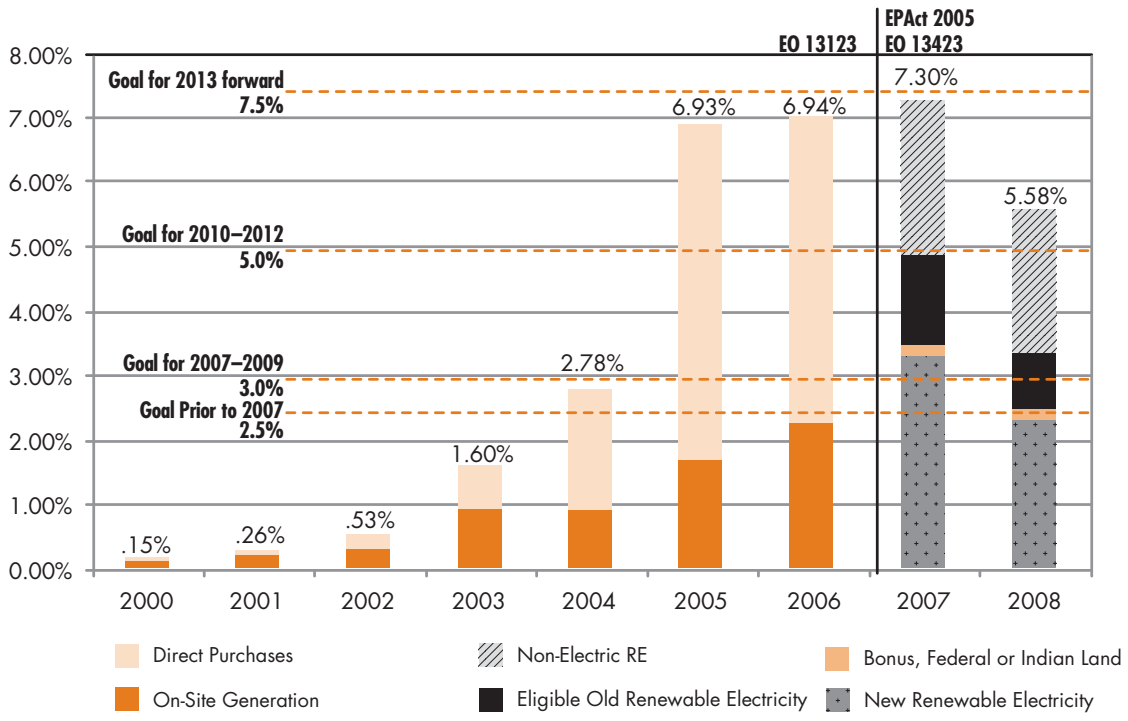
Green Power Considerations for Federal Agencies

Purchasing green, or renewable[1], power means making a difference by changing the way we purchase basic commodities. For the federal government—the largest consumer of electricity in the United States with an annual electricity bill of more than $4 billion—the ability to make a difference is enormous. This appendix provides an overview of considerations specific to federal agencies that buy renewable power.

Section 203 of the Energy Policy Act of 2005 (EPAct 2005) directs that federal agencies meet renewable energy consumption goals, eventually reaching 7.5 percent of the electric energy they consume. Executive Order 13423 further directs agencies that at least half of their renewable energy consumption must come from "new" renewable sources (projects built after January 1, 1999) and, to the maximum extent possible, renewable energy generation projects should be implemented on agency property for agency use.[2] The goal of these requirements is to make the federal government a leader in developing the market for renewable power.

As a result of these policies (and previous executive orders), the federal government's purchases of renewable power have increased dramatically over the last decade (Figure A-1). In fiscal year 2006, the latest year for which detailed data are available, purchases of renewable energy, including renew-

Figure A-1. Renewable Power Purchases by Federal Agencies



Source: DOE/FEMP; Note: direct purchases during 2000–2006 include RECs; categories changed in FY07 due to a change in the renewable reporting requirements.

[1] The federal government uses the term "renewable" instead of "green" power because it more clearly defines the product being purchased. The term "renewable" will be used in this appendix.

[2] The Energy Independence and Security Act (EISA) of 2007 also directs that 30 percent of the hot water demand in new federal buildings (and major renovations) be met with solar hot water equipment.

able power, renewable electricity credits (RECs), and landfill gas, comprised more than 80 percent of federal government renewable energy use (with the remainder coming from on-site generation, as identified in Table A-1).

Although the federal government is meeting its current goals, many challenges remain in making sure that the government's power purchases are promoting the development of new, high-quality renewable resources in the most cost-effective way. 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 these goals. Federal 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 RECs" in this appendix.

Table A-1. Federal Renewable Technologies and Purchases, 2006

Source	Annual Energy Contribution (GWh)
Biomass thermal	109
Green power purchases	2245
Ground-source heat pump	182
Photovoltaics	34
Solar thermal	11
Wind	19
Total	**2600**

Source: DOE/FEMP. Data FY2006. Purchases include RECs and renewable power purchases.

Federal Definitions of Renewable Energy

EPAct 2005 (sec. 203) defines "renewable energy" as electric energy generated from solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project. Biomass resources can only meet the renewable consumption goals if they meet carefully defined criteria, which federal agencies should ensure they are familiar with before proceeding with a biomass-fueled renewable energy project. Federal agencies can use the renewable resources listed above as defined in EPAct 2005 to meet renewable power use goals.

FEMP provides guidance on renewable resource definitions and other issues relating to Executive Order 13423 and EPAct 2005's renewable use goals on its Web site at <www1.eere.energy.gov/femp/pdfs/epact05_fedrenewenergyguid.pdf>. Note that FEMP guidance is subject to change.

Benefits from Federal Renewable Power Purchases

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

Federal agencies accrue many direct benefits from purchasing renewable energy, including:

- **Compliance with federal goals.** EPAct 2005, Executive Order 13423, the Energy Independence and Security Act of 2007 (EISA 2007), and Executive Order 13514 contain several energy management goals for federal facilities, including: energy intensity reduction, greenhouse gas reduction, green buildings, and the use of renewable energy. Using renewable energy or installing on-site generation systems might help an agency meet all four of these goals (although the ability to count renewable energy and RECs toward energy intensity reduction is being gradually phased out between 2007 and 2012).

- **Accomplishment of an agency's organizational mission.** Many in the federal government understand that the government's overall mission also includes a commitment to environmental protection. Beyond that general obligation, individual agencies, such as the EPA, have the specific mission of protecting the environment. Purchasing renewable energy is one way to help fulfill both goals.

- **Demonstration of responsiveness and leadership.** The purchase of renewable energy represents a clear demonstration of the agency's responsiveness to its citizens, the majority of whom, according to several surveys, favor renewable energy. The federal government has shown that it can be a leader in the area of renewable energy.

- **Increased visibility.** Presidential awards are given to federal agency energy management teams that strive to comply with federal requirements. Energy scorecards for each federal agency are tallied to gauge the degree of compliance. Federal agencies that become EPA Green Power Partners are also eligible for awards through the partnership program.

Federal renewable energy purchases also include societal benefits, such as:

- **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 energy consumption, purchases of renewable power by federal agencies help stimulate the overall renewable power market. Further, a strong federal demand for renewable energy demonstrates that switching to renewable energy is a national priority; exemplifies renewable power's societal and customer benefits; facilitates the availability of renewable power products, which can help lower their cost.

Sources of Federal Authority to Purchase Renewable Power

Energy Policy Act of 2005

The Energy Policy Act of 2005 (EPAct 2005) provides the fundamental authority for federal agencies to buy renewable power.

Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 (EISA 2007) directs federal agencies to purchase solar thermal hot water systems and makes it easier for agencies to finance renewable energy projects through energy savings performance contracts.

Executive Order 13423

To comply with E.O. 13423, federal agencies must ensure that at least half of all renewable energy required under EPAct 2005 comes from new renewable sources (developed after January 1, 1999). To the maximum extent possible, renewable energy generation projects should be implemented on agency property for agency use. Agencies can also purchase renewable energy to help meet E.O. 13423 requirements.

Executive Order 13514

Federal agencies are required to inventory and manage greenhouse gas (GHG) emissions to meet federal goals and mitigate climate change. Renewable power is an important component of GHG management.

Regulations Governing Renewable Power Procurement

Best Value

The Federal Acquisition Regulation (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 8.405[c][3]). 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."

Commercial Items

In restructured or competitive 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 help to establish renewable energy as a commercial item by establishing a brand name. Third-party certification provides additional value to the federal government through verification and annual audits to eliminate double counting of renewable products. When buying renewable power and RECs for federal agencies, the GSA and DESC routinely use the commercial item designation and require third-party verification.

Utility Services

As a large purchaser of electricity, the federal government has well developed methods for purchasing power, known as utility services. FAR Part 41 governs these procurements, typically from regulated utilities, which have been used by agencies to purchase renewable power, RECs, and on-site generation systems through a power purchase agreement (PPA).

FAR and the Environment

FAR Part 23 seeks to minimize the environmental impacts of federal purchases. Subpart 23.2 addresses energy and water efficiency, as well as renewable energy. 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 as "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."

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 l1.002[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).

Innovative Purchase Opportunities

Even though the procurement of renewable power has become common enough that it is generally not "innovative," in some situations the methods outlined above do not apply, and 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 l.102[d]).

Procurement Approaches to Renewable Electricity and RECs

Restructured/Competitive Markets

In a restructured or 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: 1) using designated contracting agencies, such as the GSA, the DESC, or, in some cases, Western; or 2) 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 renewable power through a green pricing program offered by their local utility. If such a program exists, agencies should find out the specific participation 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.

RECs

Federal agencies can buy RECs throughout the country. Since a variety of suppliers offer RECs, normal solicitation procedures must be followed. GSA, DESC, and Western have experience with REC procurement.

On-site Systems

Federal agencies are encouraged to procure renewable power in the form of on-site renewable energy systems. EPAct 2005 provides a bonus to agencies toward federal renewable energy goals by allowing agencies to double count renewable energy if it is produced on-site and used at a federal facility, produced on federal lands and used at a federal facility, or produced on Native American land and used at a federal facility.

On-site systems can be procured through a variety of financing mechanisms, including energy savings performance contracts (ESPCs), utility energy services contracts (UESCs), and power purchase agreements (PPAs). ESPCs and UESCs allow a third party to provide the capital financing for the renewable system to be repaid over the life of the system (for more information about ESPCs and UESCs, see the FEMP financing page listed at the end of this appendix). Agencies can also purchase on-site systems using appropriated funds and standard contracting for commercial items.[3] Before starting a renewable power project, it is important to contact the local utility regarding interconnection procedures, net metering, incentives, power purchase agreement (PPA) rules, tariff provisions, and standby charges.

Federal agencies can also purchase renewable power produced by on-site renewable energy systems through PPAs, as described in Chapter 7 of this guide. While these types of power purchase contracts have become common outside the federal government, the federal government has limited experience with these procurement methods. PPA purchase terms usually extend over 10 to 20 years, as shorter contract terms make it harder for project developers to obtain financing. GSA and other agencies have executed power purchase agreements with terms of 10 years or less, although this shorter term makes the project riskier for the developer and thus more expensive for the federal agency. Usually, federal agencies purchase electricity as a utility service under FAR Part 41, which limits contracts to 10 years. A contract term longer than 10 years may be possible if Western acts as the procurement agent for facilities in the Western service territory, or if the procurement is done under DoD's 2922A 30-year authority. The DESC renewables team has experience with entering into PPAs for on-site renewable systems and is a good resource for federal agencies looking to make this type of purchase.

Some of the factors that need to be considered in a PPA include the type of land use agreement, National Environmental Policy Act (NEPA) review, default and recourse for the agency, and utility incentive payments. As with other on-site systems, it is important to coordinate with the local utility on issues such as interconnection requirements, net metering rules, and potential standby/tariff changes. In addition, it is important that the PPA contract ensures that the ownership of RECs produced by the system is clearly articulated. In most of the federal PPA projects completed to date, the project developer has sold the RECs to the local utility to help the utility meet its solar requirement. Selling valuable RECs allows the project developer to reduce the PPA price. If the agency does not retain the RECs, it needs to purchase "replacement" RECs in order for the on-site system to count toward renewable consumption goals (this is known as a "REC swap"). In addition, if the agency does not retain the RECs, it will not be able to claim the carbon reductions in its comprehensive greenhouse gas emissions inventory. On-site systems whose RECs are swapped are still eligible for the double bonus toward federal renewable purchasing goals, as long as the swap is done according to FEMP's guidance on this subject.

Using GSA, DESC, or Western

GSA Power Procurement Services

GSA has assisted many federal agencies in the procurement of renewable power, and its ability to aggregate renewable requirements for many agencies might result in lower prices. GSA's support to its federal customers for energy-related products is provided by the GSA Energy Division at <www.gsa.gov/energy>. Through this division, GSA provides areawide contracts (AWC) for the procurement of utilities and aggregate purchasing of natural gas and electricity. GSA customizes its aggregate electric and natural gas procurements to meet the financial and physical supply requirements of its federal and non-federal agency clients. In addition, GSA has federal supply schedules for energy services, which federal agencies can use to help assess and manage their procurement of renewable power and renewable energy generation systems. Visit <www.gsa.gov/energyservices> for more information.

DESC Power Procurement Services

Under the DESC Electricity and Renewables Program, competitive solicitations are issued for electricity, RECs, and on-site renewable power projects. DESC is involved in retail electricity purchases in states that have approved and implemented deregulation/restructuring. RECs can be purchased

[3] The GSA supply schedule includes some renewable energy systems.

nationwide. DESC recently expanded its offerings to include competitive purchases for on-site renewable generation that are financed, owned, operated, and maintained by a third party.

Under its Electricity and Renewables Program, DESC:

- Procures electricity for Department of Defense and federal civilian activities.
- Uses aggregation to attract market interest without customer cross-subsidization.
- Acts as procurement agent for on-site PPA projects.
- Works with customers to develop requirements, identify risk preferences, and develop risk-mitigation plans.
- Tailors each solicitation to market conditions and customer requirements.
- Conducts "best value" and "low-price technically acceptable" acquisitions, depending on requirements and customer preference.
- Contracts for Economic Load Response Services.
- Uses various pricing methods: fixed price, block and index, and Locational Marginal Pricing.
- Has extensive experience procuring power for the federal government.
- Performs all 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. DESC is also involved in ESPC and UESC procurements on behalf of DoD and federal civilian agencies.

Go to <www.desc.dla.mil> to view ongoing DESC solicitations or to find contact information for DESC's electricity and renewables acquisition team.

Western Renewable Power Products

Regardless of location, federal agencies can purchase RECs from Western. An agency pays for the renewable energy/benefit at cost, plus a fee to cover the administrative cost of acquiring the renewable resources from a supplier. For more information about these programs, visit Western's Web site at <www.wapa.gov/powerm/pmtags.htm>.

For a federal agency that is a Western customer within the Western territory, Western may be able to buy and deliver renewable energy to the federal site. Agency costs include renewable power generation, transmission (if needed), related ancillary services, distribution (if needed), and program administration. If the agency receives power from another utility, the agency will need to obtain the cooperation of that utility before arrangements can be made to deliver renewable energy from Western.

If the federal agency has a physical site for a renewable energy project within the Western territory and would be willing to host a third-party owned system, Western can purchase the energy from that project on behalf of the agency under a long-term contract.

Agency Procurement

If an agency does not deem it advantageous to request assistance from GSA, DESC, or Western, it may contract separately for renewable energy. In this case, the purchase should meet the requirements of the FAR section the agency has decided to use, such as FAR Part 12 or Part 41.

FEMP Assistance for On-site Renewable Generation Projects

On-site renewable generation projects face different issues than do power purchases. 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.

Agency-Level Planning

FEMP offers technical assistance to help federal agencies identify and prioritize energy projects across the entire agency portfolio. This can be useful when the agency elects to develop a long-term strategic vision that can be used to prioritize energy management activities over a multi-year period.

Renewable Resource Screenings and Assessments

To help agencies and facility managers assess their opportunities for on-site renewable energy generation, FEMP offers assistance with renewable resource screenings and assessments. Screenings can be done on a large group of sites to identify which of those sites have potential for cost-effective renewable projects, or can be done to screen out sites with little potential. Screenings can also be conducted on a single

site or as part of an ESPC or UESC project. While screenings are done at a broader level, assessments dig deeper to analyze which specific renewable technologies would be best for satisfying the energy needs at particular sites. Screenings and assessments take into account such factors as the quality of renewable resources available, applicable incentives or rebates, and other site-specific factors. To begin the screening or assessment process, information about each site is needed including site name, address, longitude and latitude, square footage of individual buildings, and utility use and cost data for each fuel.

Agencies can generally assess the quality of renewable resources at their sites by using renewable resource maps. Maps are available at <www.nrel.gov/gis/femp.html> for a wide variety of renewable resources including solar, wind, biomass, and geothermal. These maps indicate the degree of availability of each resource at locations across the entire United States. Some maps show where each renewable technology would be cost-effective for federal facilities under varying assumptions including electricity and renewable system prices.

Agencies can also find screening tools on the FEMP Web site. By entering basic site information into these software tools, agencies can obtain a general indication of which sites have potential for cost-effective projects using a particular renewable technology.

Before initiating a project, renewable resources at a site must be confirmed, especially for renewable resources that are very site-specific, such as wind. Resource maps and screening tools are a good start, but it is important to consult an expert for a professional evaluation before implementing renewable energy projects.

Technical Assistance

FEMP can also help agencies implement renewable energy projects. This technical assistance can include engaging stakeholders, developing product specifications, sizing systems, reviewing plans and specifications, designing requests for proposals, reviewing and evaluating proposals, choosing the best financing and contract vehicles, and in some cases evaluating the performance of installed systems. FEMP allocates funding according to a "Call-for-Projects" process, in which federal agencies apply through a merit-based selection process for FEMP-funded technical assistance on their renewable energy projects, but agencies may also fund assistance through interagency agreements.

Technical assistance funding is not for system purchases, but FEMP does help some project teams acquire additional project financing if needed. Agencies 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. FEMP has helped agencies obtain financing for biomass fuels, geothermal heat pumps, parabolic-trough solar collectors, and photovoltaic systems through these financing programs.

Training

FEMP offers various training courses to help federal energy managers become more proficient in energy management and learn about alternative forms of financing for energy-saving projects. For more information, visit FEMP's training Web site listed at the end of this appendix.

Utility-Scale Projects

FEMP encourages agencies to facilitate large renewable energy projects on federal lands. These utility-scale projects are typically owned by third parties and can be developed under Enhanced-Use Lease (EUL) arrangements, for agencies with such authority. The projects offer the opportunity for large-scale application of renewable energy technologies, but it is very important to coordinate with the local utility regarding interconnection, net metering, tariff changes, etc. before moving forward with a utility-scale project.

Power generated from a utility-scale project can be used to meet the load of the host federal site, or be sold by the local utility to its non-federal customers.

Federal sites in western states should contact the Bureau of Land Management (BLM) about opportunities to collaborate on utility-scale renewable energy projects on federal lands. FEMP and BLM have identified those federal lands with the best potential for large renewable energy projects. The joint study is available on FEMP's Web site.

Key Elements of a Successful Procurement or On-site Installation

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

Stakeholder Involvement

Renewable power advocates must get agreement in advance from internal stakeholders such as comptrollers, energy managers, and key decision-makers. The stakeholders must participate in the process and make reasoned, balanced

decisions. It is important to be honest and clear about the project's renewable sources and benefits. A cross-functional team with representatives from across the organization will result in the best project.

Cost Control

Federal energy management directives specifically allow the savings from energy efficiency to be used to pay for renewable energy. Projects that bundle renewable power purchases with energy efficiency projects (possibly through an ESPC or UESC) can result in a shorter payback period for the combined project. Buying RECs is generally the least expensive way to meet renewable energy requirements, but agencies should consider making at least a small purchase of renewable power through their local utility, if they have a program.

Developing an Effective Solicitation

An agency's electricity consumption data should be part of any renewable power RFP and are required by GSA, DESC, and Western for the procurement of on-site systems. The purchasing agency should notify renewable power suppliers of the RFP and conduct a pre-proposal 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 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 renewable power programs without public utility commission 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 discounted pricing that may be available for large volume purchases.

Capturing the Benefits of the Purchase

After successfully completing a renewable 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. Especially with on-site generation, however, it is important to be careful about making claims when REC-swapping or selling is involved. An agency cannot claim to be using power generated by on-site solar, for example, if the RECs are sold or swapped for some other type of RECs.

Federal agencies are required to report annually on their progress toward meeting their energy management goals. FEMP has published guidelines for counting renewable power purchases and on-site renewable energy toward an agency's energy management goals at <www1.eere.energy.gov/femp/regulations/facility_reporting.html>.

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. Renewable energy suppliers should contact the GSA (Ken Shutika), DESC (John Nelson), or Western (Randy Manion) to be placed on renewable procurement notification lists. Contact information is listed at the end of this appendix.

Summary of Renewable 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 EPAct 2005 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 for buying renewable energy. Using the strategies outlined in this guidebook, federal agencies can meet their renewable energy goals and help move the United States toward a more sustainable energy future.

Federal Resources for Renewable Power Information

For federal agencies buying renewable power, assistance is available from the following federal agencies and national laboratories:

Green Power Network:

<apps3.eere.energy.gov/greenpower/>

FEMP Web sites:

Renewable energy: <www1.eere.energy.gov/femp/technologies/renewable_energy.html>

Renewable purchasing: <www1.eere.energy.gov/femp/technologies/renewable_purchasingpower.html>

Renewable power purchase agreements: <www1.eere.energy.gov/femp/financing/power_purchase_agreements.html>

Financing: <www1.eere.energy.gov/femp/financing/mechanisms.html>

Training: <www1.eere.energy.gov/femp/news/events.html>

Federal Renewable Energy Working Group:

<www1.eere.energy.gov/femp/technologies/renewable_workinggroup.html>

Federal Acquisition Regulation (FAR):

<www.acquisition.gov/far/>

For assistance with program resources:

Department of Energy, Federal Energy Management Program

Mark Reichhardt, Renewable Purchasing (202) 586-4788

mark.reichhardt@ee.doe.gov

Anne Sprunt Crawley, Technical Assistance (202) 586-1505

anne.crawley@ee.doe.gov

For assistance issuing solicitations:

General Services Administration

Ken Shutika (202) 260-9713

ken.shutika@gsa.gov

Defense Energy Support Center

John Nelson (703) 767-8523

john.nelson@dla.mil

Andrea Kincaid (703) 767-8669

andrea.kincaid@dla.mil

<https://www.desc.dla.mil/DCM/DCMPage.asp?pageid=589>

Western Area Power Administration

Renewable Resources for Federal Agencies Program

Randy Manion (720) 962-7423

manion@wapa.gov

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

Lawrence Berkeley National Laboratory

Gerald Robinson (510) 486-5769

GTRobinson@lbl.gov

Rich Brown (510) 486-5896

REBrown@lbl.gov

National Renewable Energy Laboratory

Chandra Shah (303) 384-7557

chandra.shah@nrel.gov

Pacific Northwest National Laboratory

Mike Warwick (503) 417-7555

mike.warwick@pnl.gov

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

National Renewable Energy Laboratory

Bob Westby (303) 384-7534

Robert.Westby@nrel.gov

Sandia National Laboratory, Defense Energy Support Program

Dave Menicucci (505) 844-3077

dfmenic@sandia.gov

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Guide to Purchasing Green Power

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

a collaboration of

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