Green power procurement

Understanding the options

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Introduction

Over the last several years, the desire to integrate renewable energy purchasing into enterprise sustainability and energy management programs has increased, and available options have significantly evolved. Various factors are driving organizations to consider renewable energy procurement, including energy cost savings, ambitious carbon reduction goals, and/or public commitments to procure renewable energy. Additionally, the number of companies taking action by setting greenhouse gas (GHG) science-based targets and/or committing to source 100% of electricity from renewable sources by signing onto the global RE100 initiative has continued to grow. It is increasingly becoming evident that green power is no longer a distant aspiration, but is instead an essential component of any organization's successful sustainability and energy program.

For organizations interested in transitioning to green power, available options are not always clear and the most viable choice is often difficult to identify when accounting for an organization's specific goals, financial restrictions, and physical location. Add in the standards and guidance from the Federal Trade Commission (FTC) and RE100 around communicating these purchases, and the process of balancing priorities becomes even more difficult. The following discussion provides an introduction to the various options available for green power procurement and discusses benefits and special considerations for each one.

This analysis focuses primarily on green power options in the United States, though most of the options described here are also available in other countries, with some variation. It should be noted that green power is a subset of renewable energy, limited to energy resources with the 'highest environmental benefit' including solar, wind, geothermal, biogas, eligible biomass, and low-impact small hydropower systems, as defined by the U.S. Environmental Protection Agency (EPA). Renewable energy more broadly includes additional technologies such as waste to energy and large-scale hydropower. Additionally, RE100 and Green-e provide best practice criteria for green power and for making credible claims on its use. These criteria include projects that have been developed within the last 15 years to contribute new capacity, are geographically matched to the market of consumption, have production volumes that are tracked using a reliable attribute tracking system, provide an exclusive ownership and claim to the attributes, and provide production volumes (vintage) that are matched to the time period being claimed.

Differentiating Characteristics

Before discussing the procurement options, it is important to understand the key characteristics that apply to and differentiate each one. The differences among the available options in green power can be described with reference to six primary characteristics: generating system location, system ownership structure, procurement of physical electricity, bundled Renewable Energy Certificates (REC) availability, market restrictions, and impact. One characteristic, RECs, is common to all seven green power procurement options and is the primary mechanism for tracking the ownership of environmental attributes from green power projects.

Table 1 summarizes the various combinations of procurement pathway and green power characteristics. The vertical axis contains the seven pathways for green power procurement and the horizontal axis contains the six primary characteristics.

Table 1: Characteristics of Green Power Procurement Options

	Generate System Location	System Ownership Structure	Procurement of Physical Electricity	Bundled REC Available	Market Restrictions	Impact
Owned On-Site Generation	✔	✔	✔	✔	✔	High
Owned Off-Site Generation		✔	✔	✔		
On-Site PPA/ Operating Lease	✔		✔	✔	✔	
PPA			✔	✔		
Synthetic PPA					✔	
Utility Products / Green Tariffs					✔	
Unbundled RECs					✔	Low

These characteristics are graphically illustrated in each of the following procurement pathway sections. It should be noted that the above matrix and proceeding illustrations are intended to help the reader discern the difference between the myriad of options available, and as such highly simplify the underlying details of a technically complicated subject.

Understanding Renewable Energy Certificates

Renewable electricity generation projects have two products of interest for the typical green power purchaser – physical electricity and RECs. It is essential to have a clear understanding of RECs, since they are the mechanism that allows an organization to claim the renewable benefits of a green power project. The EPA defines a REC as the representation of the property rights to the environmental, social, and other non-power qualities of one MWh of renewable electricity generation, which can be sold as a separate commodity from the electricity being produced by the renewable energy system.

If RECs are sold together with the associated electricity, they are known as bundled RECs. If sold separately, they are known as unbundled RECs. The separation of RECs from electricity allows for renewable energy attributes to be applied to specific facilities across diverse geographic regions, thereby improving an organization's flexibility in meeting its green power or GHG reduction goals.

To be able to claim and communicate the renewable energy benefits from any green power procurement option, an organization must own and retire the RECs or have the RECs retired on their behalf. If a system's RECs are sold in the markets, the project owner and electricity purchaser release claim to any environmental benefit of the system. This largely negates the public relations and marketing benefits of installing the system or purchasing its electricity, as the organization is restricted by the FTC's Green Guides from speaking about the project without clarification that the organization sells the renewable electricity to an external party.

If an organization owns a green power system (discussed in more detail in the following section), it may choose to sell the RECs generated by the system, then buy the same quantity of replacement RECs from a different project. This practice is often called a REC swap. This arrangement is typically executed when the original RECs can be sold into a compliance market at a high price (compliance RECs sold at over $20/MWh in several states in 2016 and above $200/MWh in some cases for solar RECs) and replacement RECs can be purchased from a voluntary market at a lower price (2016 national average prices averaged less than $0.50/MWh). A REC swap allows an organization to claim renewable energy consumption and GHG reduction benefit, but it does not restore the ability to claim consumption of renewable energy from the owned system.

While separation of RECs from electricity does improve the flexibility of these products' use, the separation also raises the possibility that an organization may be unaware that it does not retain RECs from a renewable energy project or electricity purchase, and thus be unaware that it cannot claim the associated renewable attributes. When an organization is purchasing renewable energy from a third party, such as with a power purchase agreement (PPA), it is important it clearly understands how RECs will be handled in the contractual agreement. When a PPA is signed with a green power project, the purchaser will typically contract for the supply of electricity and RECs (i.e., bundled RECs). It is, however, possible to enter into an agreement with a green power project and not purchase RECs. In this case, the purchaser does not have the ability to claim or communicate the green power benefits due to FTC regulations. It is as if the purchaser is still buying standard "brown" power from the local utility.

Generating System Location

A project's location is categorized as either "on-site" or "off-site." If the green power system is physically located at the facility it is serving and is directly connected to the building's electrical circuits, it can be considered on-site. If the system must be connected to utility-owned transmission or distribution infrastructure before serving the facility's load, it is considered off-site.

System Ownership Structure

Whether or not an organization owns its power generating system will define the required investment, maintenance responsibility, tax liability, and potential for financial risk and return on a green power project. Systems directly owned by an organization have the disadvantage of higher up-front capital cost, but with careful planning and design they often result in a higher return on investment.

Procurement of Physical Electricity

In some green power procurement options, an organization purchases electricity generated by a particular green power project. In other options, it purchases only unbundled RECs. The options that involve ownership of generated electricity will provide direct cost benefits on an organization's electric utility bill, either through avoided purchases (on-site generation) or supply credits (physical PPAs). These options offer the potential to mitigate future price increases by allowing companies to lock in long-term fixed electricity prices. However, as previously noted, these electricity purchases cannot claim the environmental attributes associated with the green power project unless the bundled RECs are purchased from that project as well.

Bundled REC Availability

As previously discussed, RECs that are sold together with electricity are known as bundled RECs, whereas those that are sold separately are known as unbundled RECs. Bundled REC agreements are typically viewed as having a higher impact than unbundled agreements, for several reasons. In most situations, bundled RECs are purchased as part of a long-term agreement and provide the financial backing necessary for a new project to be developed. In addition, because bundled RECs are sold with the accompanying electricity, they can only be sold within an electricity market, while unbundled RECs can be sold nationally. This distinction helps motivate development of green power projects local to power demands.

Market Restrictions

There are two broad categories of utility markets in the U.S., regulated and deregulated. Regulated markets have vertically-integrated utilities that own and control the assets to produce and transmit electricity from power plants to customers. In deregulated markets, utilities divest ownership of generation and transmission assets and independent generators can provide electricity to end users. Deregulated markets offer customers additional flexibility in choosing the source of electricity they purchase and provide customers with additional green power procurement options than are available in a regulated market. In addition to restrictions that exist in regulated markets, states may have additional restrictions precluding the use of owned off-site generation or other green power procurement options.

Impact

Not all green power options are equal. While each green power procurement pathway offers different advantages to a customer, some options have a larger impact than others in driving the development of new green power capacity and advancing the market. Investments that directly bring new projects online have the highest impact on the market. Investments that help to enable project financing and assume some of the risk through long-term commitments also have a high impact. Investments that simply leverage assets of an existing green power project have indirect impact on driving the development of new green power capacity. NGOs, stakeholders, and environmental watchdog organizations often place significant emphasis on the impact of green power purchases, especially for corporate buyers. As such, a lower-impact green power purchase may come at a lower cost, but it is often viewed as providing less environmental benefit in the eyes of some external parties.

Green Power Options

The following discussion focuses on seven distinct green power procurement options: owned on-site generation, owned off-site generation, on-site PPAs and operating leases, physical PPAs, synthetic PPAs, utility products and green tariffs, and unbundled RECs.

Owned On-Site Generation

On-site renewables, like rooftop solar photovoltaic (PV) panels or micro-wind turbines, provide a visible and clear commitment to green power. An organization may retain ownership of the equipment and be responsible for maintenance and operation, though these functions, along with design and installation, can be contracted to an external party. While these systems require up-front capital investment, there are often tax benefits and incentives at the local, state, and Federal levels (which are not directly available to non-owned green power projects) that help reduce costs. Unlike the other green power options, owned systems incur the majority of their costs up front. However, they have the added benefit of high project visibility and the subsequent opportunity to be highlighted in internal/external communications.

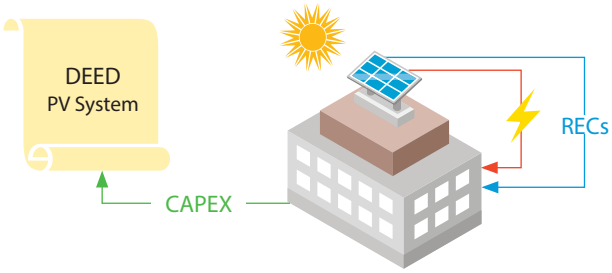

Figure 1. Owned On-Site Generation

Benefits

- Facility is directly powered by green power and has the highest impact
- High-visibility, with the opportunity to highlight in internal/external communications
- Investment directly results in development of new green power project
- Reduced electricity costs after initial capital and minimal ongoing O&M costs
- Insulated from volatility in electricity and fuel prices

Considerations

- Requires up-front capital investment
- Organization is responsible for contracting or supplying operation and maintenance of system
- Installation space and load matching limitations typically prevent system from meeting 100% of facility demand
- Generation potential dependent on local renewable resources

Owned Off-Site Generation

When on-site renewables are not feasible or cannot provide desired capacity, an organization may look to ownership of an off-site system as a next best option, either as a full- or part-owner. Owned off-site generation can come in several forms and the selection of the most appropriate option will often be limited by state and market regulations.

The first option involves a direct-line connection to an off-site generator owned by the electricity consumer. Unlike a PPA, the generator is directly connected to the electricity consumer and therefore does not use a utility's distribution lines. Electricity and RECs generated by the system are owned by the electricity consumer.

A second option involves owning and operating an off-site generator without a direct-line connection to a specific facility. In this scenario, the organization is the financial owner of the project and may retain ownership of the physical power for its own use, in which case the owner is required to pay applicable transmission and distribution fees for using the utility's grid for transporting electricity from the generator to its facilities. The owner may instead choose to sell power to others, but

retain the RECs. While interest in on-site generation has increased over the past few years, end-user ownership of off-site generation investments has been slower in adoption by private investors. This is likely due to the increased complexity of managing a large-scale green power project from planning and permitting through construction and operation, particularly when PPAs offer a potential alternative.

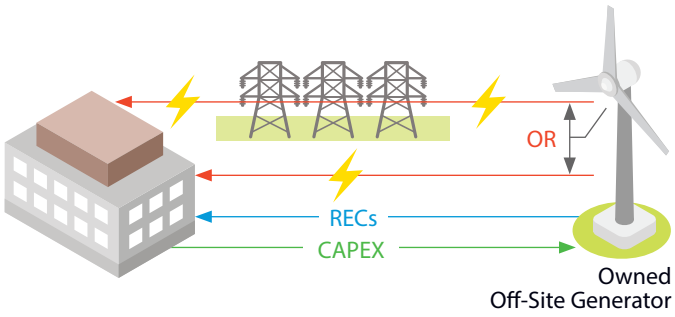

Figure 2. Off-Site Generation

Benefits

- High-visibility with the opportunity to highlight in internal/external communications
- Investment directly results in development of new green power project
- Reduced electricity costs after initial capital and minimal ongoing O&M costs, if organization receives electricity
- Insulated from volatility in electricity and fuel prices, if organization receives electricity
- Increased flexibility in system location and scale compared to on-site generation

Considerations

- Requires up-front capital investment
- Organization is responsible for contracting or supplying operation and maintenance of system
- Generation potential dependent on local renewable resources
- Opportunities may be limited by state or market regulations
- Greater implementation and contracting complexity than on-site generation

On-Site PPA/Operating Leases

On-site PPAs and operating leases offer alternatives to companies interested in on-site generation without the associated capital investment. In both on-site PPAs and operating leases, an external party owns, installs, operates, and maintains a green power system (typically solar PV) at an organization's facility. The difference comes in the financial agreement between the owner and customer. An on-site PPA agreement establishes a fixed rate for electricity and/or RECs generated by the system that are sold to the customer, typically for a 20- to 25-year term. In an operating lease agreement, the customer leases the system at a fixed monthly rate, irrespective of the amount of electricity generated by the system, typically for a 5- to 15-year term. Both options usually offer the option to purchase the system for market value at the end of the agreed term.

Both agreement types offer the benefit of on-site generation without initial capital investment, or financial risk associated with project ownership. However, these agreements will typically have a higher levelized cost of energy than an on-site generation system owned outright, since the energy cost savings are split between two entities.

It is important for the purchaser to clearly understand how RECs are handled in an on-site PPA. It is common for the system owner to retain the RECs in an on-site PPA, especially for solar projects. The RECs are typically sold into a compliance market, where they command a high price (reaching over $200/MWh in some markets in 2016). In this case, the electricity purchaser does not have the ability to claim or communicate the green power benefits. REC swaps (described previously) are a possible option with on-site PPAs.

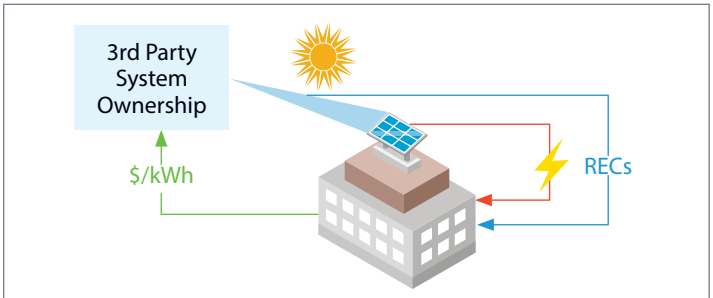

Figure 3. On-Site PPA / Operating Lease

Benefits

- High-visibility projects with the opportunity to highlight in internal/external communications, if the RECs are retained
- Provides a market signal for increased green power demand and helps bring new projects online
- Contracted prices often at or below utility prices
- Organization is not responsible for up-front capital costs or O&M

Considerations

- Long-term commitment
- Installation space and load matching limitations typically prevent system from meeting 100% of facility demand
- Generation potential dependent on local renewable resources
- Reduced financial benefit compared to outright system ownership
- Not allowed in all states or utility markets

Power Purchase Agreements

PPAs are a contractual agreement used in the utility power sector for long-term purchase of electricity produced by a particular source of generation. For electricity producers, PPAs offer long-term revenue certainty with a credit-

worthy purchaser that allows the project to attract capital investment. For electricity purchasers, PPAs offer a long-term supply of green power with stability in prices, often at or below current market prices. Physical PPAs are restricted to customers located in deregulated electricity markets. However, in some regulated markets like California, "Direct Access" agreements offer an alternative similar to a PPA, but using the utility as an intermediary.

PPAs are increasingly becoming the most common green power solution for large-scale electricity consumers, particularly those in the IT sector, due to the ability to meet a significant portion of a company's electricity demand with a single large-scale project that avoids a large up-front capital investment.

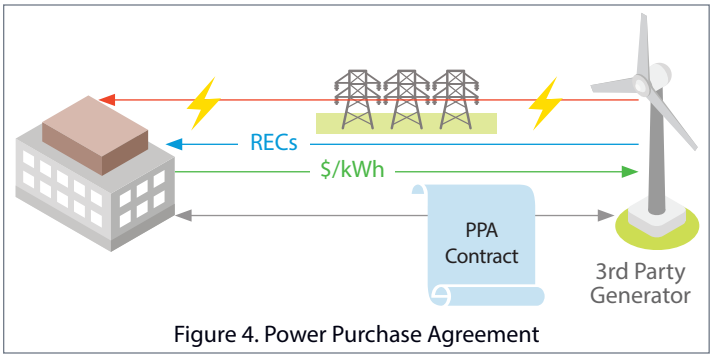

Figure 4. Power Purchase Agreement

Benefits

- Provides a market signal for increased green power demand and can help bring additional projects online
- Off-site projects lower the cost of electricity supply through economies of scale and optimal siting in areas with high resource potential
- Contracted prices often at or below market prices
- Significant volume can be purchased in a single transaction

Considerations

- Typically, significant effort required for internal stakeholder education and alignment
- Only available in states with deregulated electric power markets or direct access agreements
- Purchasers are limited to contracting with projects in the same power market as their facilities
- Long-term commitments of 10-20 years are typical
- Purchaser can be left exposed if future electricity prices drop below contract pricing

Synthetic Power Purchase Agreements

A synthetic PPA, also known as a virtual PPA or a contract for differences, is a financial swap that allows an electricity purchaser to provide financial and credit support to a project developer by setting a floor price for electricity sold by the project to the wholesale electricity market. If the wholesale price is below the floor price, the purchaser pays the developer the difference. If the wholesale price exceeds the floor price, the developer pays the purchaser. In return for guaranteeing a floor price, the purchaser receives RECs from the project. This option is a potential solution for customers that have electricity load distributed over a number of smaller facilities, or with loads in regulated electricity markets. Unlike a physical PPA, synthetic PPAs do not include the physical consumption of electricity and as a consequence, there is no need for a purchaser's facilities to be located in the same power market area as the project. The combination of wholesale electricity market revenues and the floor price provides financial and credit support to the project owner sufficient to proceed with project financing and construction, thereby providing the critical support necessary for a new project to be implemented.

From an electricity purchaser's perspective, a synthetic PPA can provide a long-term fixed supply of RECs along with potential for annual revenues on the contract. The purchaser, in a sense, is making a bet that market prices will continue to rise and that revenue from increasing prices will flow through the project to the purchaser. If properly structured, this contract can hedge against future electricity price increases or volatility. Purchasers must also understand the risk and financial exposure they face if market prices decline over the term of the agreement.

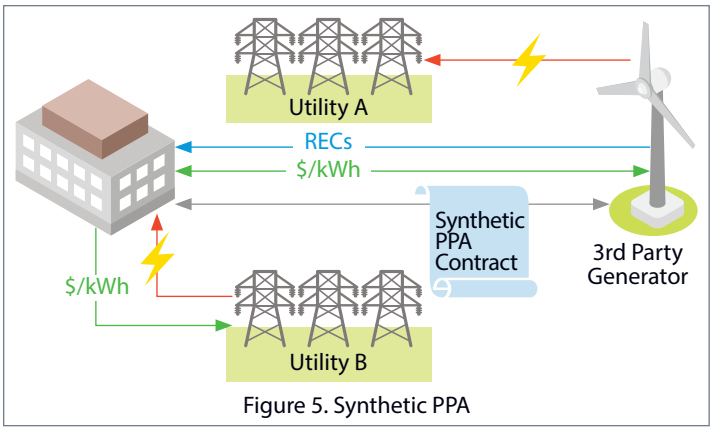

Figure 5. Synthetic PPA

Benefits

- Provides a market signal for increased demand and helps bring new green power systems online
- Purchasers are not limited to contracting with projects in the same power market as their facilities
- Significant volume can be purchased in a single transaction
- Potential for revenue generation during periods of high electricity prices

Considerations

- Typically, significant effort required for internal stakeholder education and alignment
- Long term commitment
- Purchaser may be left exposed if electricity prices drop in the future
- Purchaser does not receive physical electricity from renewable sources

Utility Products/Green Tariffs

Electricity markets in a growing number of states offer customers the ability to purchase green power directly from a local utility. These agreements allow the customer to contract for some or all of their purchased electricity to be attributed to existing green power projects feeding into the local grid. The utility will then retire the coinciding RECs on the customer's behalf, allowing the customer to claim the environmental benefits associated with the purchase of green power. Variations of this mechanism are available in regulated and deregulated markets. In deregulated markets, a customer may directly choose their electricity provider, while customers in regulated markets may have the option to pay a premium on their electric bill to claim energy generated from the utility's renewable portfolio.

Because utility products and green tariffs are typically based on existing renewable energy projects, their impact on the development of new green power projects is not as direct or significant as with other green power procurement options.

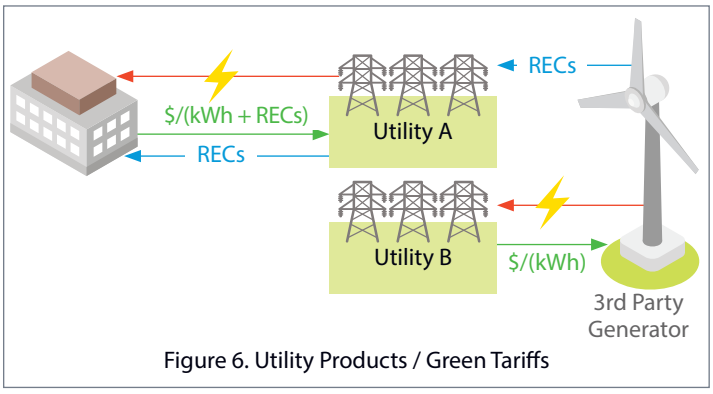

Figure 6. Utility Products / Green Tariffs

Benefits

- Simplified transaction that can be completed directly through a customer's local utility
- Low transaction cost
- Low commitment term

Considerations

- Indirect impact on promoting new green power projects
- Does not reduce vulnerability to future increases in electricity prices
- Not available in all states or utility markets
- No direct financial return on investment

Unbundled RECs

An organization can directly purchase RECs that are unbundled from the electricity supply. When purchased as unbundled commodities, RECs provide no physical electricity to the purchaser. Instead, the purchaser will continue to contract with their utility for electricity generated by the region's grid mix (including non-renewable fuel sources), but purchase the environmental attributes from individual green power projects.

Because unbundled RECs are typically purchased from existing renewable energy projects, their impact on the development of new green power projects is not as direct or significant as with other green power procurement options.

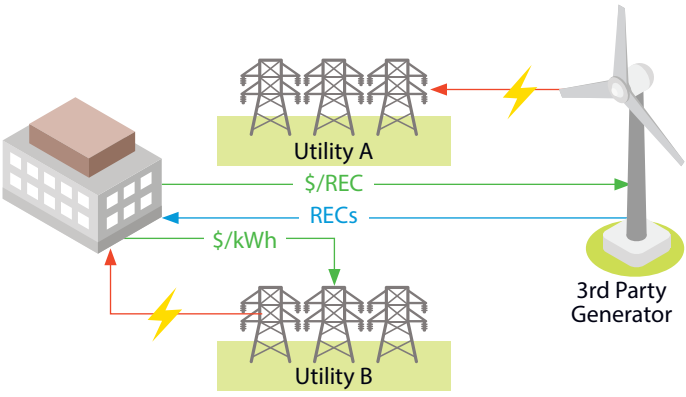

Figure 7. Unbundled RECs

Benefits

- RECs may be purchased in regulated or deregulated markets, and across markets, providing renewable attributes to electricity use at facilities of choice, regardless of geography or local green power resources
- Greater volume can be purchased in a single transaction than any other option
- Low cost (at current REC prices)

Considerations

- Indirect impact on promoting new green power projects
- Does not reduce vulnerability to future increases in electricity prices
- No direct financial return on investment.
- Ongoing (i.e., annual) procurement requirement

Conclusion

Green power has become an essential component of leading sustainability programs. Developing a strategy for green power procurement helps ensure that companies define and achieve their objectives in an efficient and cost-effective way. The seven distinct green power procurement options in this document all offer unique benefits and considerations, and can be the basis for developing a comprehensive renewable energy strategy that is tailored to each organization's objectives.

Unfortunately, even with a good understanding of the options available, selecting the most viable solution remains difficult, particularly when variables such as lifecycle cost and utility cost forecasting are included. Some organizations may invest heavily in unbundled RECs as the lowest cost option to meet their green power needs, unaware that in many situations on-site generation or PPAs may cost less and have greater impact in the long run. Another organization looking for a high-profile solution to its sustainable energy needs may lean toward on-site generation across its facility portfolio, but may discover that poor regional climate, limited local incentives, and market hurdles prevent some sites from ever recouping capital investment costs.

Fortunately, organizations do not need to make these decisions in a vacuum. A growing number of resources can help bridge the gap between project developers and interested green power purchasers. Organizations interested in learning more about the green power market are encouraged to read the EPA's Guide to Purchasing Green Power, which provides valuable resources to better understand the green power procurement process. EPA's Green Power Partnership provides resources, guidance, and recognition for companies in its green power procurement efforts. Companies interested in utility-scale green power can also become involved with Rocky Mountain Institute's Business Renewables Center (BRC), an organization dedicated to streamlining and accelerating the corporate procurement of wind and utility-scale solar power. Vendors and developers of green power products and projects can also provide important insight on available options and benefits. Information from organizations like these serve as an important resource to companies as they develop and execute an effective green power procurement strategy.

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