The On-Site Solar Playbook:

A Practical Guide for Corporate Sustainability Leaders

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Introduction

Sustainability executives are leading the charge on corporate renewable energy purchasing across the United States. The rise of renewable energy is encouraging new companies to get into the game, but many do not know where to start. Market maturation has brought about a variety of new purchasing options, and first-time buyers can find the process difficult to navigate.

Fortunately, sustainability leaders are uniquely positioned to clarify priorities and shepherd a renewable energy proposal through their corporate approval process. Sustainability serves as the hub connecting internal stakeholders that will need to be involved at various stages of the project (Figure 1).

This playbook provides practical advice for implementing on-site solar, which includes roof, ground, and carport arrays at corporate facilities and properties. After reading the playbook, you should understand:

- Major trends affecting the market for on-site solar
- Purchasing options available to your company
- The business case for on-site solar
- Strategies for engaging internal stakeholders
- Steps to managing an on-site solar program from start to finish

Today's leaders in on-site solar managed to dramatically scale their programs in just a few years, proving that newcomers can achieve dramatic results relatively quickly. This playbook draws on lessons learned from industry leaders to help you accelerate progress, avoid common pitfalls, and successfully manage a program that delivers both financial and sustainability results.

Figure 1: Key Internal Stakeholders to Consult

Solar Market Snapshot

The corporate on-site solar market is growing at a tremendous pace. In the first three quarters of 2016, companies installed over 140 MW at their facilities, eclipsing the total for all of 2015[1]. The average price of a commercial solar installation has fallen 58% since 2012[2] due to rapidly declining equipment costs.

Opportunities in the sector are driven by the so-called "three Rs of solar," which include resources, rates, and regulations. Opportunities exist in areas with a combination of strong solar resources, expensive underlying electricity rates, and robust regulatory incentive programs. California, Massachusetts, New Jersey, New York, and Maryland were the top states for corporate on-site solar development in 2016, but a host of other markets are thriving as well (Figure 2). Solar projects are eligible for a 30% federal Investment Tax Credit (ITC) that begins winding down in 2020 (Figure 3). The ITC effectively reduces the cost of solar energy, so corporate buyers are incentivized to act sooner rather than later.

Figure 2: New On-Site Solar Installations in 2016, Non-Residential

Source: U.S. Solar Market Insight

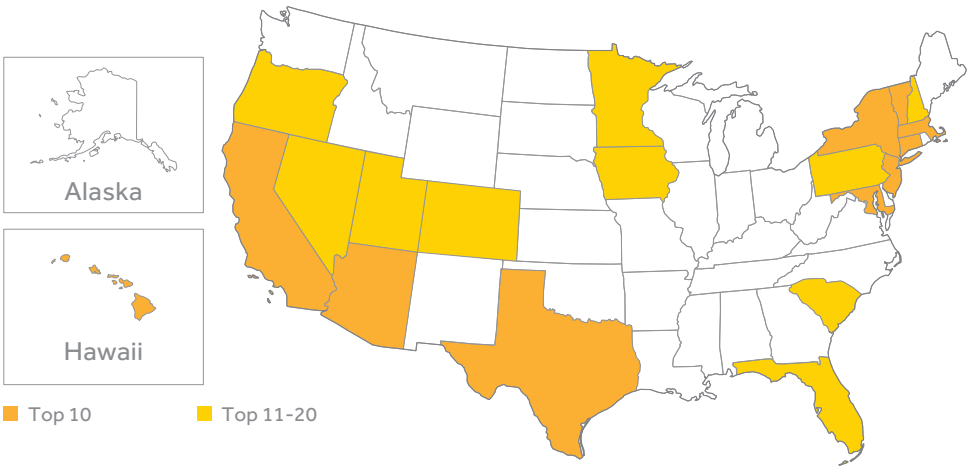
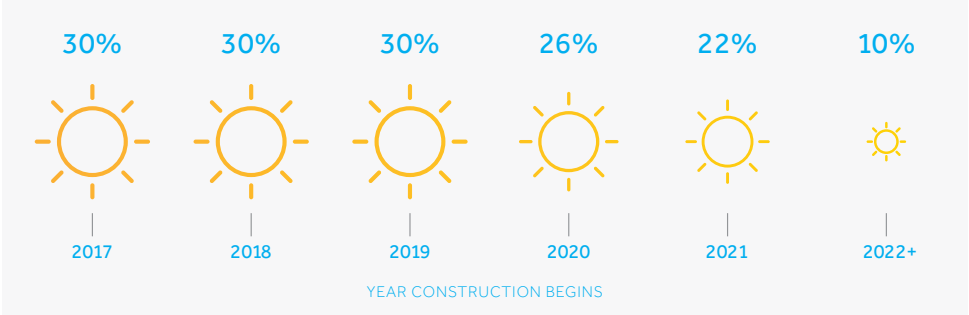


Figure 3: Federal Investment Tax Credit for Solar

Source: Energy.gov, Business Energy Investment Tax Credit (ITC)



[1] Source: Solar Means Business 2016, accessed June 21, 2017

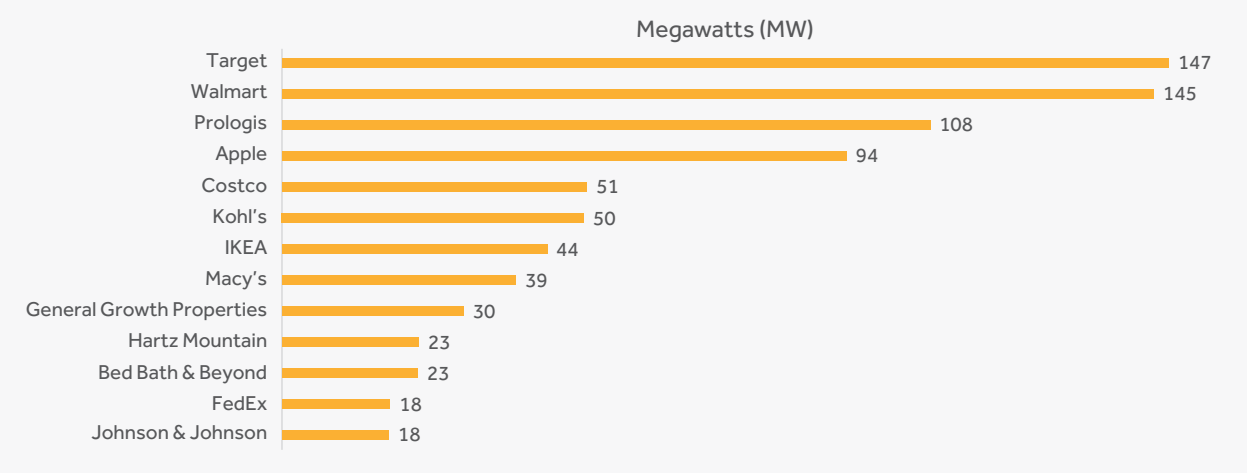
[2] Source: Solar Means Business 2016, accessed June 21, 2017

The retail and technology sectors dominate on-site solar purchasing, but companies in a host of other industries have made significant purchases to date (Figures 4 and 5). Companies are finding success pursuing solar at retail locations, distribution facilities, manufacturing centers, R&D facilities, datacenters, and corporate offices. Brownfield sites are increasingly being considered, but deployments have been limited compared to other market segments.

On-site solar projects come in the form of rooftop, ground, carport, or a combination of the three. These projects are built "behind-the-meter," meaning that electricity is directly consumed by the facility and exported to the grid when output eclipses consumption.

Figure 4: Top Companies, Total On-Site Solar Capacity*

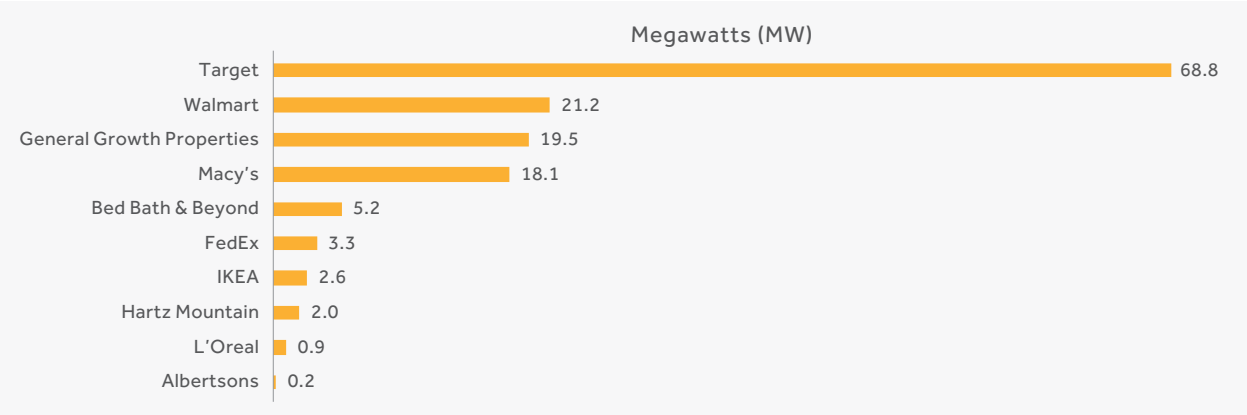
Source: Solar Means Business 2016



*through Q3 2016

Figure 5: Top 10 Companies, New On-Site Solar Installations in 2016*

Source: Solar Means Business 2016



*through Q3 2016

Project Benefits

The first step in pursuing renewable energy is clarifying the business case. Every company makes decisions differently, but here are some common points to bolster your argument:

- **Save money:** Companies expect solar projects to reduce their electricity costs. Rarely do they implement solar projects that will be more expensive in the long run.
- **Meet customer expectations:** A growing number of companies are setting greenhouse gas targets for their supply chains and using sustainability metrics to select suppliers. Solar can give you a competitive advantage in supplying a company that has sustainable purchasing criteria. Retailers are using on-site solar to connect with shoppers.
- **Achieve sustainability targets:** On-site solar projects reduce greenhouse gas emissions from purchased electricity[3]—defined as Scope 2 emissions by the Greenhouse Gas Protocol. Solar projects also enable facilities to gain credit toward Leadership in Energy and Environmental Design (LEED) and ENERGY STAR certification.
- **Engage employees:** On-site solar projects signal a company's commitment to sustainability. This can be a more impactful way to connect with employees than traditional engagement programs.
- **Enhance brand:** Companies implementing solar projects can gain reputational benefits by using zero-carbon energy. In fact, each of the top ten companies for corporate reputation in the United States has installed solar at their facilities[4]. The brand benefits of solar are often intangible, but contribute to the overall value proposition nonetheless.

[3] Assuming the company retires renewable energy certificates (RECs) associated with the project.

[4] Source: *the harris poll*, accessed June 21, 2017

Purchasing Options

Here are the three main options for implementing solar at your facilities:

1. **Power Purchase Agreement (PPA):** A PPA is a contract with a developer that commits your company to buying electricity from a solar array at your facility. The electricity is purchased at a fixed price over the length of the contract term, which typically ranges from 15 to 25 years. There are no up-front costs for your company to pay under a PPA—with rare exceptions. Tax credits and depreciation benefits accrue to the solar developer and investor.

   Best for companies that want a simple, low-risk approach or lack a significant tax burden.

2. **Lease:** A solar lease is similar to a PPA in that the developer will own, operate, and maintain the system at your facility. Rather than signing onto a fixed rate for electricity, however, your company agrees to a monthly payment that is independent from the actual electrical output of the system. Your company avoids up-front costs in most cases. Tax credits and depreciation benefits accrue to the solar developer and investor.

   An option for companies with facilities located in markets where third-party PPAs are not allowed, which include Alabama, Arkansas, Arizona, Florida, Kansas, Kentucky, North Carolina, Oklahoma, South Carolina, and West Virginia[5].

3. **Own:** Also known as a "cash purchase," your company buys the solar equipment outright and assumes responsibility for operating and maintaining the project. A third party can be hired to design, build, and operate the system, but your company assumes ownership status. Tax credits and depreciation benefits accrue to your company.

   Best for companies with prior experience and a significant, stable tax burden.

Of these options, PPAs are recommended for first-time buyers. Managers often ask "how much will this cost?" or "what's the return on investment?" PPAs avoid up-front capital costs, so there is no "investment" from which to gain a return. Rather, your company can realize immediate savings if the electricity purchased from the array costs less than what was previously being paid. If pursuing an ownership model, the project may be required to meet an internal corporate hurdle rate, since it competes with other uses of money.

PPAs also place responsibility for the system's performance, operation, and maintenance with the developer—freeing your company to focus on its core business. Tax and depreciation benefits accrue to the system developer and owner, but this value is passed along in the form of a lower electricity price. PPAs also incentivize the system developer to maximize output, since their revenues are based on energy production. This means more renewable electricity for your company to consume. All told, PPAs are the lowest-risk option for first-time buyers (Figure 6).

[5] Source: NC Clean Energy Technology Center, accessed June 21, 2017

Figure 6: Risk Analysis by Purchasing Option

Source: NRG

Risk Type	Description	PPA	Lease	Own
Performance	Managing system output under normal operating circumstances	🟢	🔴	🔴
Operations	Conducting preventative and reactionary maintenance to ensure system component functionality and valid warranties	🟢	🔴	🔴
Technology	Selecting appropriate solar technology and managing warranty claims	🟢	🟡	🟡
Cost Certainty	Maintaining a predictable cost of electricity (¢/KWh)	🟢	🔴	🟢
Tax/Accounting	Making use of solar tax credits directly or indirectly	🟢	🟢	🔴

🟢 Low risk 🟡 Medium risk 🔴 High risk

Five Tips for Success

Before reading the step-by-step guide that follows, here are some high-level tips to keep in mind throughout all stages of the on-site solar development process:

1. **Pursue PPAs** rather than lease or ownership structures to avoid up-front costs, reduce risk, and enable your company to focus on core business activities.
2. **Take a portfolio approach** by considering all of your corporate facilities at once, rather than pursuing projects on a site-by-site basis. The effort required to evaluate a single facility is not much more than what would be needed to examine all of them. A portfolio approach also allows your company to take advantage of lower equipment and financing costs that come with economies of scale. A "master PPA" that applies to all facilities under consideration—accounting for site-specific modifications—can streamline the process and avoid redundancies.
3. **Appoint a project manager** to organize internal stakeholders and interface with solar developers. If pursuing a large number of projects simultaneously, a full-time employee is recommended to manage the work load. A sustainability leader could fill this role.

4. **Anticipate problems** that will affect construction schedules, electrical output, aesthetics, and costs. No construction project runs perfectly, so you should familiarize yourself with PPA provisions governing changes from the established plan—they are in the contract for a reason. Anticipating problems is critical to minimizing impacts.

5. **Learn from your peers** by joining organizations and attending conferences devoted to renewable energy purchasing. Your fellow sustainability leaders are often well-positioned to advise you on best practices and lessons learned.

The On-Site Solar Playbook

The process of implementing on-site solar can be divided into the research, contract and due diligence, construction, and post-construction phases (Figure 7). This section provides a step-by-step guide for effectively managing a program under a PPA model.

Figure 7: The Four Phases of Solar Implementation

Phase One: Research (3-6 months)

Before entering into a formal agreement with a solar developer, there are several steps you should take to set yourself up for success. Diligent research will save time and effort further down the line. Steps you should take include:

1. Check your company's credit rating. Banks typically will not finance a project if your company's credit rating is below BBB-. Private companies lacking a public credit rating will need to provide financials so that a shadow credit rating can be developed. Without third-party financing, your company will not be able to sign a PPA with a developer. Work with the treasury or finance department to understand your company's credit rating.

2. Understand your company's approval process. Diagramming the stakeholders responsible for each decision can be a useful exercise at this stage. Watch out for those who mistakenly think they have the authority to make a decision. For instance, contracts that are typically signed by the CFO may need to be signed by the CEO if the term is 20 years or longer. Companies headquartered outside the United States may require approval from global leadership. If authority for corporate facilities is decentralized, you may need sign-off from individual site managers.

3. Establish a cross-functional team of internal stakeholders that will meet regularly to discuss the process. Relevant departments typically include energy procurement, facilities, real estate, accounting, finance, risk, legal, marketing, and communications. Developing a working group early in the process will help you address issues before they become major problems.

4. Familiarize yourself with the issues that will matter to your team of internal stakeholders. Some of these items may include:

    a. **Fixed electricity costs:** A PPA means that the portion of your facility's electricity supplied by the solar array may be converted from a variable market rate to a fixed rate. This should be discussed with your energy bill payer, as it will affect budgeting. Fixed-price contracts also carry different risk profiles that will need to be considered.

    Key stakeholders: energy procurement, facilities, accounting, risk, and legal

    b. **Permitting:** While the design and build aspects of the project are controlled by developers, permitting is overseen by local governments. Unlike the developer, local authorities are not bound by project timelines. A longer-than-expected permitting process can cause significant construction delays.

    Key stakeholders: energy procurement, facilities, and real estate

    c. **Construction impacts on facility operations:** Project construction can affect parking, employee access, and scheduled maintenance items. Ensure that your facility manager is aware of these potential issues, and that they are addressed in any eventual construction plan. You should also develop backup plans that account for construction delays.

    Key stakeholders: facilities, real estate, and legal

    d. **Site access for developers:** PPAs include language governing the developer's access to the solar array for operations and maintenance activities. Your facility manager will want to be involved in discussions about frequency of visits, expected maintenance schedules, and authority over scheduling repairs.

    Key stakeholders: facilities, real estate, and legal

e. **Site relocation:** If your company decides to sell or move from a facility before the PPA term has ended, it will be required to pay an early termination fee, move the system to the new facility, or transfer the PPA to the new owner. For a variety of reasons, paying an early termination fee is the most likely scenario in the event of a move. Ensure that you understand the implications of early termination if considering a move before the PPA term expires.

Key stakeholders: facilities, real estate, and legal

f. **Future renovations:** Once a solar array is in place, site renovations that affect system output, equipment, or site access may trigger financial penalties. You should ensure that any roof, land, or parking lot reserved for the system is not designated for future development.

Key stakeholders: facilities, real estate, and legal

g. **Aesthetics:** Your developer should provide renderings of the system, but these visuals do not always accurately reflect the materials, colors, and other design elements that will ultimately be implemented. Talk to your developer to understand how aesthetic features will be managed. In addition, local authorities may have specific requirements for construction items like privacy fences. Your developer will manage these issues, but it helps to be informed going into the process.

Key stakeholders: facilities, real estate, legal, marketing, and communications

5. Research solar developers. Look for partners with an extensive history working with corporate clients. If taking a portfolio approach, ensure that your developer can execute across multiple sites simultaneously. It is also advantageous to work with a developer that is agnostic about the equipment it uses. Solar technology is evolving rapidly, so developers that only use their proprietary technology may not have the best equipment for your situation.

6. Gather information that will enable a solar developer to conduct a "desktop assessment" of potential projects. This high-level analysis makes use of electricity data and satellite imagery to screen your properties for cost-saving opportunities. A desktop assessment can help you understand the landscape of economic solar options, but keep in mind that site visits and detailed due diligence may reveal some of these projects to be unfeasible. For each site under consideration, the developer will need:

   a. One year of electricity consumption in 15-minute-interval format. If 15-minute-interval data are not available, hour-interval data will suffice.

   b. One monthly electricity bill.

   c. Indication of whether the facility is owned or leased. For leased facilities, you will need to specify the number of years remaining on the contract.

This information is usually tracked by your company's energy, facilities, or real estate manager. If your company does not keep a record of interval data, you can sign a letter of authorization granting your developer permission to get the information from your electricity provider. This minimal amount of data enables developers to model project size, energy output, and potential savings.

7. Establish a plan for allocating savings. Your company will likely be inclined to pursue only those projects that generate electricity cost savings over time. Some companies have committed to applying savings to future renewable energy, energy efficiency, or sustainability efforts. Work with your energy bill payer to establish a plan for managing savings.

Phase Two: Contract and Due Diligence (3-6 months)

Once you have completed your research, it will be time to begin working with developers to establish a PPA. The contracting phase can be quite time-consuming for first-time buyers that have not yet encountered the type of deal structure being proposed. Significant engagement from the cross-functional team of internal stakeholders will be required. Steps you should take include:

1. Sign a letter of intent (LOI) with a chosen developer. An LOI establishes a period of exclusivity for the developer to work with you on specific projects. It is a non-binding agreement, so your company will not face a penalty if it decides not to transact. The LOI enables the developer to devote additional human and financial resources to proposing projects, conducting due diligence, and negotiating terms.
2. Initiate a dialogue with your electricity provider. Your utility must approve an interconnection application for each solar proposal. Upgrades to electrical equipment at your site may be a condition for authorization. Connecting an on-site solar project may also trigger a change to your company's tariff structure. Developers will take responsibility for managing these issues, but it is important to be informed of the process and offer help where needed. As a ratepayer, you may be able to spur your utility to action in ways that a developer cannot.
3. Familiarize yourself with site-specific issues that will cause projects identified in the desktop analysis to be altered or abandoned. The desktop analysis represents the high-water mark for potential projects, since on-the-ground realities will limit what can ultimately be implemented. Such factors include:
    a. **Landlord consent:** If a solar project has been proposed at a leased facility, it cannot be installed without landlord consent. Implementing solar at a leased facility is not an automatic deal-breaker, but it can add complication. A developer typically will not proceed unless many years remain on your lease. Landlords will also want to know what happens to a solar project installed on their property if you abandon the lease early or decide not to renew at the end of the term.

        Key stakeholders: facilities and real estate

b. **Roof status:** The roof of any building must be structurally sound enough to accommodate solar panels, equipment, and wiring. Older roofs may need to be replaced, repaired, or upgraded to accommodate the array. Solar panel installation will affect your roof maintenance and replacement schedule.

   Key stakeholders: facilities and real estate

c. **Geotech:** Similar to a roof audit and structural review, developers will analyze the soil and land characteristics of a potential project location to determine the type of support needed for a ground-mounted system. Unstable soil, seismic activity, and water inundation issues will determine structural requirements.

   Key stakeholders: facilities and real estate

d. **Environmental survey findings:** State and local governments can require environmental assessments before construction can begin. Studies can reveal issues related to trees, soil, wetlands, and endangered species that will affect project implementation.

   Key stakeholders: facilities, real estate, and legal

e. **Easements:** Proposed project sites may have easements for gas pipelines, electric lines, and water pipes that would limit construction. "No-build easements" prohibit construction entirely, while "consent easements" require authorization from the appropriate entity. Your company will typically be responsible for identifying easements and compensating developers in the event that they are breached during construction.

   Key stakeholders: facilities, real estate, and legal

f. **Title history:** The developer will also research your property's history to determine whether any title issues exist. These findings may surprise site managers and may need to be addressed before construction can take place.

   Key stakeholders: facilities, real estate, and legal

4. Determine how unforeseen design modifications will be treated. Your PPA will likely include language requiring you to "pay" for the cost of any unforeseen material changes to the initial system design. These costs are typically "passed through" in the form of a PPA rate adjustment. Talk with your developer and legal team to ensure that these provisions are understood and addressed in a satisfactory manner.

5. Provide technical documents for sites under consideration. Your developer will want to review "as-built drawings" that show the exact dimensions of the building and "single-line diagrams" that model a building's electrical system. Single-line diagrams are sometimes unavailable, requiring developers to visit your site and create their own.

6. Understand constraints that will affect construction. Your company's work schedule, operations, maintenance, special events, and security requirements should be communicated to your developer so that an accurate construction schedule can be established.

7. Establish a framework for managing permits. Local, state, and federal permits for air, zoning, sound, electrical, and other issues may be required. Depending on your relationship with local authorities, you may prefer to manage certain permits yourself and let the developer manage others. Whatever the case, ensure that the contract clearly specifies the party responsible for both known and unknown permit requirements. The construction schedule that you establish with your developer should be flexible enough to account for permitting delays.

8. Identify the information needed to vet on-site construction and maintenance crews. Your company may require specific certifications, safety records, or the authority to stop activity if concerns arise.

9. Understand your developer's relationship with third parties. Subcontractors will likely be involved in a portion of the construction process. Some developers build, operate, and maintain the system over its full life, while others build the array and sell it to a third-party owner and operator. Your company may need to vet subcontractors and long-term owners for safety and sustainability performance.

10. Understand how renewable energy certificates (RECs) will be managed. RECs give your company the ability to claim credit for the use of renewable energy consumption. RECs are sometimes provided as part of the PPA, but there are certain situations in which a developer may keep them. Work with your developer to ensure you are satisfied with the treatment of RECs and the resulting sustainability claims that you will be able to make.

11. Get to know the technology that will be installed at your facilities. The most appropriate solar equipment may change depending on the unique attributes of each site. The developer may propose more expensive and efficient panels at a site with limited room, while opting for cheaper and less efficient panels at a site with more space. Familiarizing yourself with the technology will help clarify expectations of electrical output, occupied space, and maintenance.

12. Establish communication protocols with the developer and internal stakeholders. Work with your developer to determine how information will flow between your respective companies. Your project manager can serve as the primary point of contact with your developer and share information with key stakeholders as appropriate.

13. Establish a marketing and communications plan. Corporate buyers typically issue press releases for the initial PPA signing, groundbreaking, and ribbon-cutting. For signing and groundbreaking announcements, avoid overly specific information about system size, volume of projects, and timing of implementation. These details will change when site-specific factors force changes to initial plans. Work with your marketing and communications groups to ensure that you articulate renewable energy claims appropriately based on the treatment of RECs.

14. Sign the contract. Once you and other internal stakeholders are confident that the previously described issues have been adequately addressed, your company can enter into a master PPA or set of individual PPAs with the developer.

Phase Three: Construction (8 months)

When entering the construction phase, prepare your internal stakeholders to anticipate changes from the established plan. Rarely are projects executed without some kind of hiccup. Steps you should take include:

1. Continue devoting human resources to the project. Getting to a signed contract represents the beginning of your commitment. No developer can be successful without a responsive partner. Continue convening your internal stakeholder group throughout the construction process.

2. Establish a set of key performance indicators (KPIs). Determine the types of financial and sustainability KPIs that are important to your company, and then set up a process of tracking these metrics. Align your KPIs with the information that would be required for the sustainability reporting frameworks in which you participate, such as LEED, ENERGY STAR, CDP, and others.

3. Track lessons learned. As the construction process begins, keep a record of what you would do differently the next time. Your company may be pursuing all projects that are financially viable today, but falling solar costs could present new opportunities over time. Tracking lessons learned will be helpful in future project pursuits.

Phase Four: Post-Construction (ongoing)

After cutting the ribbon on your solar array, it will be important to communicate and report results. Steps you should take include:

1. Register your RECs. The RECs from your project must typically be registered with an electronic certificate-based tracking system that varies by region. Talk with your developer to determine who will take responsibility for REC registration.
2. Identify new points of contact. Once construction has been completed, the developer many turn operations and maintenance responsibilities over to a new owner or contractor. Your company may also want to shift the point-of-contact away from the initial project manager. In any case, work with your developer to ensure smooth turnover.
3. Conduct a post-mortem analysis. Continue conversations with your internal stakeholders and the developer to determine what went right and wrong. Your list of lessons learned compiled during the construction phase can be especially useful.
4. Report results. Leveraging KPIs you have been tracking, communicate results according to the sustainability frameworks in which you participate.
5. Allocate energy cost savings based on the plan you established in the research phase. If your plan included applying savings to future projects, begin the process of looking for new opportunities.

Conclusion

Sustainability leaders are uniquely suited to implement on-site solar programs that reduce costs, meet customer expectations, engage employees, achieve sustainability targets, and enhance the brand. As the industry matures, more and more companies are capitalizing on solar's unique value propositions. The steps outlined in this playbook should help you save time, focus your efforts, and maximize your chances of success.

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