On-Site Commercial Solar PV Decision Guide

For the Hospitality Sector

September 2015

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Disclaimer

This report should be viewed as a general guide to best practices for end users in the hospitality sector who are considering the installation of a solar photovoltaic array. A qualified professional engineer or solar installer should always be contracted to oversee a photovoltaic project.

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Introduction

The Better Buildings Alliance works to develop and deploy innovative, cost-effective, energy-saving solutions in U.S. commercial buildings. According to the American Hotel & Lodging Association, in 2012 the U.S. lodging industry occupied 52,529 properties with 4.9 million guestrooms and spent $8.2 billion on energy.[1] With its extensive footprint and energy costs making up a large portion of operational expenses, the hospitality industry has the potential for significant savings. Against this back drop, the hospitality industry has begun to embrace certain sustainability measures, primarily guest-centric reuse and recycling programs. The American Hotel & Lodging Association published an industry survey in December 2014 examining the top trends in the hotel industry. Survey results showed that environmentally-friendly programs are increasingly popular with the majority of hotels participating.[2] Many hotels consider being environmentally responsible and "going green" to be an important priority aligned with guest interests.

In a study of European "green" hotels, hotel owners cited the following motivations for installing solar photovoltaic (PV) systems.[3] Although the U.S. market differs significantly from Europe in many ways, the reasons listed here may apply to businesses in the hospitality sector anywhere:

- Providing equal comfort while reducing operating costs;
- The well-being of customers and employees;
- Increased awareness and sensitivity among guests of environmental issues and hotel environmental policies;
- Corporate social responsibility and sustainable business operations;
- Concerns over climate change, environmental impact, and carbon emissions;
- Business platform for promoting awareness of environmental issues; and
- Becoming a host for green seminars and events.

However, a hotel's environmental policy's actual benefits to the business are often poorly quantified. Hotel decision-makers seeking a green measure that is also a good financial investment over the long-term should consider solar PV, which relates directly to electricity bill savings as well as green energy.

In September 2014, the Better Buildings Alliance Renewable Integration Project Team published the On-Site Commercial Solar PV Decision Guide for commercial buildings. Building on this work, the Hospitality Sector guide is intended to serve as an additional, targeted resource to address specific solar PV barriers and help drive solutions for hospitality.

[1] American Hotel & Lodging Association, 2013.
[2] AH&LA survey press release: www.ahla.com/pressrelease.aspx?id=36663.
[3] Hotel Energy Solutions, 2011.

Benefits and Barriers of Solar PV for Hospitality

Benefits of Solar PV for Hospitality

Solar PV has the potential to provide significant benefits to hotels by way of attracting guests and, more importantly, reducing operating costs.

- Unlike other types of commercial buildings, electricity costs contribute significantly to overall operating costs in the hospitality sector. Many hotels constantly run air conditioning and indoor and outdoor lighting to provide for guests' comfort which adds up in utility bills. Solar PV can offset a significant portion of the building's electricity consumption thereby reducing utility costs. If the hotel owner has sufficient upfront capital and tax liability to purchase the solar array, there is also likely an attractive return on investment (ROI) over the lifetime of the system.

Hotel chains may gain an additional advantage by bundling properties for financing and economies of scale in equipment procurement.

- Hotels are also likely to benefit from green marketing: a solar PV installation can attract customers, increase customer satisfaction, positively contribute to LEED ratings, and more. Although the extent to which guests are incentivized by a hotel's green practices has not been fully quantified, green travel practices are emerging as important to corporate customers.

Several research studies support the observation that guests are becoming increasingly aware of hotel environmental policies:

- A 2010 survey of Association of Corporate Travel Planners members found that 65% of corporate travel executives responsible for more than $10 million in annual travel budgets are in various stages of implementing green business-travel guidelines.[4]
- A study of 571 business and leisure travelers published in the Cornell Hospitality Quarterly in 2011 found that green hotel certification (such as LEED) was the most influential single attribute on hotel room preference.[5]

One thing that hotel decision-makers should not do is consider a solar installation to be just an expensive sustainability measure (compared to a linen reuse program, for example). The foremost benefit is that solar PV reduces operating expenses significantly over the long term. Saving on electricity costs is the primary motivation cited by hotels that have installed solar PV arrays.

Bardessono

Location: Yountville, California

Size: 197.4 kilowatts

Energy Production: 12,000 to 24,000 kWh per month (seasonal)

Bardessono is a LEED Platinum-certified luxury hotel in Yountville, California, with a rooftop-integrated solar PV array. It is one of three hotels to achieve this level in the U.S. The array was installed in 2010 as part of the new construction of the hotel. When the hotel opened, the LEED Platinum certification was a significant attraction for early guests.

Photo Credit: Bardessono

[4] www.hotelmanagement.net/green-products-often-seal-deal-for-corporate-travel-planners
[5] Millar and Baloglu, 2011.

Barriers to Solar PV in Hospitality

Solar installers and other hospitality market actors report implementation challenges in the hospitality sector although interest is still high. These challenges include the following:

- Hotels have many **different management structures** (including franchises, consortiums, and REITs) and change hands relatively frequently. This variety in ownership is a unique barrier to the hospitality industry. The various management structures create confusion, at least among solar providers targeting commercial buildings, around who is paying for what and whose approval is needed. Additionally, ownership structures in the real estate market are still evolving and the average U.S. hotel is estimated to be sold in a real estate transaction every 8-9 years.[6] While this hold period is longer than the 5-7 year turnover period before the financial crisis of 2007-2008, it still makes short payback periods essential and other financing strategies more difficult to navigate.
- Hotel owners and managers **focus primarily on their main business: selling rooms**. While some owners and managers recognize the significant savings potential of energy upgrades, few have fully understood on-site energy generation opportunities like solar PV. Implementing on-site renewable energy projects is different and sometimes less straightforward than implementing energy efficiency and other sustainability measures, which have their own challenges but by now are relatively well-understood.
- Hotel owners may not be comfortable committing **large capital to energy projects**. For example, an individual hotel may have a limited partnership arrangement without access to the parent company's capital or credit. Or, solar PV project payback periods are not short enough to justify the capital expenditure.
- Many hotels have **physical constraints: roofs are often crowded with other equipment**, too small and/or too uneven, or not structurally sound enough to bear the additional weight of the solar PV array. Additionally, there are many older hotels with roofs that may need to be replaced in the next five years.

The 102 kW Hampton Inn & Suites Bakersfield North-Airport carport array[7]

[6] Source: Conversations with hospitality industry experts
[7] This project is described further on page 7

Technical Considerations for Hospitality

Hotel Layout

Physical attributes of hotels that work well with solar installation include large, flat roofs and properties with an open, campus style. Tall multi-story buildings are less well-suited for solar, especially in dense urban areas, due to space limitations and shading. A hotel property with a sizable parking lot or unused grounds generally lends itself well to a solar installation.

Hotels with interesting architectural designs are not precluded from installing solar PV. Although hotel managers report that many roofs are too steep or have too many contours to host a solar PV array, the hotel may design a carport-mounted solar PV array for the parking lot or parking garage or a ground-mounted array on unused land. The same strategy applies to hotels with roofs that are already rented out to cell tower equipment and have insufficient available space, or are not structurally sound enough to bear additional weight.

Installation Type

Due to the extra materials for the structure, carport-mounted solar PV systems come with a higher price tag than roof-mounted systems. However, carports arrays also add benefits like shading cars from the sun (a valuable amenity in hot climates), sheltering cars from rain and snow, and providing a convenient location for electric-vehicle charging stations.

Snowy climates can be cause for concern because carport structures and parking canopies can shed snow into the guest parking lots. However, during regular storms the snow generally melts prior to substantial accumulation because the array heats when the sun comes out. However, if there is a storm overnight and snow remains on the carports the following day, several preventative actions can be taken:

- The carport can be manually cleared with a roof rake by maintenance staff.
- Management can have snow rails or guards installed on the carport, retaining and breaking up the snow so there are no large pieces sliding off the structure.

Snow guards on a roof in Jackson, WY.
Photo Credit: Wikipedia Commons.

A large commercial carport-mounted PV array.
Photo Credit: National Renewable Energy Laboratory.

If the hotel has an inadequate roof and is situated on a large property, a ground-mounted array may also be a viable option. An example of a successful ground-mounted installation is at the TownePlace Suites at Joint Base Andrews in Maryland.

Ground-mounted and carport arrays represent an added engagement opportunity as they are usually visible to hotel guests. PV on roofs are not in optimal viewing areas.

Hotels have even begun to integrate solar PV into canopies around pool areas and over outdoor seating and entrances to further showcase solar energy for guests and avoid potential roof issues.

New Construction

New construction may be the best option to incorporate solar PV as the architectural team has the ability to integrate the system into the property's overall design, while structural and electrical engineers can plan for adequate roof strength and necessary electrical equipment. Canopies and other more visible features may also be designed to accommodate solar energy and have an integrated campus appearance.

New and existing hotels should also consider installing a Building Energy Monitoring System (BEMS), which improves the ease and accuracy of the solar PV system design process.[8] Monitoring energy consumption is useful both before and after the installation of solar PV systems and energy efficiency upgrades in general.

Analyzing data from building controls allows hotel owners and managers make high-level decisions about operations and electricity use. It can also provide insight into guest behavior and preferences.

TownePlace Suites at Joint Base Andrews

Location: Clinton, Maryland

Size: 607 kilowatts

Energy Production: 839,000 kWh per year

Expected Payback Period: 8 years

Hotel Energy Offset: 100%

Solar Installer: Evergreen Solar Services with Centurion Development Group

Clinton Suites Hotel LLC constructed a large ground-mounted solar array for the TownePlace Suites Hotel, a Marriott franchise. The array offsets almost 100% of the hotel's electricity use, and supports the renewable energy mission of the U.S. Department of Defense at Joint Base Andrews. The ground-mounted array makes us of 4 acres adjacent to the hotel property.

Photo Credit: Centurion Development Group

Financing Solar PV for Hospitality

The Onsite Commercial Solar PV Decision Guide discusses general financing considerations for solar PV installations, including the Federal Investment Tax Credit (ITC) and depreciation benefits, types of state and local incentives, and some information on owning the system versus using a third party ownership model. Readers should refer back to that guide for additional information on this topic.

[8] Navigant Research defines BEMS technology as: "IT-based monitoring and control systems that can provide information on the performance of some or all of the components of a building or facility's infrastructure, including its envelope, heating and ventilation, lighting, plug load, water use, occupancy, and other critical resources."

Several key elements to consider while seeking financing for a solar PV project include:

- Tax liability and federal tax benefits;
- Loan terms;
- PPA rates, escalators, fees, and ownership transfer terms; and
- State and local incentives, including grants, performance-based incentives, and Solar Renewable Energy Certificates (SRECs).

Generally, lifetime dollar savings are higher with direct ownership. To manage the larger capital investment required for owning the PV array, hotels should seek grants, loans, or other financial assistance available at the federal, state, or local level (additional details below).

Third Party Ownership – Power Purchase Agreement

If hotel leadership is not interested in tax benefits, it typically makes the most financial sense to enter into a third-party Power Purchase Agreement (PPA). This strategy is also recommended for hotel owners who do not want to make a large, upfront capital investment. Third party ownership for solar PV systems has become a standard and reliable solution, and solar installers in some locations are able to offer a lease or power purchase agreement (PPA) price under the utility electricity rate resulting in an immediate decrease in operating costs.

Although PPAs are the lowest capital cost project structure and often offer immediate savings on operating costs, they can be complicated by ownership turnover. Since a hotel is likely to be sold at some point in the typical 20-year PPA term, the agreement has to be transferred to new ownership. Despite this potential complication, PPAs are very common for successful solar PV projects in hospitality and can be designed to make the transfer to a new owner simple and efficient. During negotiation, hotel owners should pay attention to PPA obligations relevant to the future sale of the property, including minimum credit ratings for the power purchaser and possible penalty fees.

A new partnership between Starwood Hotels & Resorts and NRG Energy will put solar PV on three hotels under a PPA financing structure: 568 kW on the Phoenician in Arizona, 1,072 kW on the Westin St. John Resort in the U.S. Virgin Islands, and 450 kW on the Westin Maui Resort & Spa in Hawaii. In each of the

Hampton Inn & Suites Bakersfield North-Airport

Location: Bakersfield, California

Size: 102 kilowatts

Energy Production: 157,080 kWh per year

Expected Payback Period: 7.75 years

Solar Installer: REC Solar

Blackstone Hospitality Group financed the purchase of the hotel with an SBA Green 504 Loan, including the cost of the solar installation and an energy efficiency upgrade in the same financing package. The carport-mounted array provides much-needed shade for guests' cars in the hot climate.

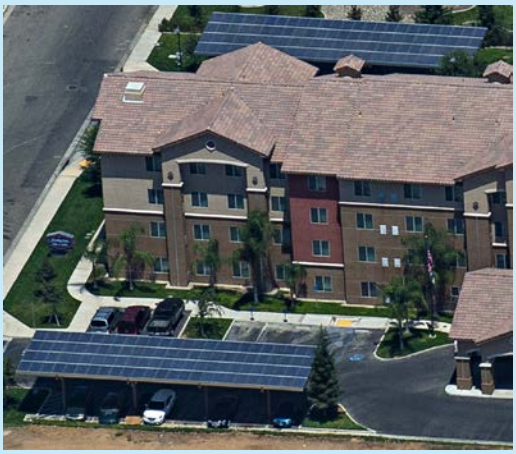

Photo Credit: REC Solar

three locations, NRG Energy will own the solar PV array and Starwood will purchase the electricity produced.[9]

Loans

One avenue for solar PV project financing at hotels is through the U.S. Small Business Administration (SBA) Green 504 Loan. The Hampton Inn & Suites Bakersfield North-Airport in California successfully used this loan to finance its new carport PV array (see inset on page 6). A newly purchased or constructed hotel qualifies for the loan if it uses at least 10% less energy on a per square foot basis than the property owner's existing buildings, or produces enough renewable energy to decrease its net energy consumption by 10% compared to what it would have consumed without the improvements. The cost of the installation of the renewable energy system such as a solar PV array can be included in the total loan amount. An additional benefit of the SBA Green 504 Loan program is that it allows for larger loans and multiple loans to the same applicant, whereas the typical SBA loan has a maximum eligibility limit of $5 million per borrower.[10]

As part of the loan program, the newly acquired property will be assessed by an energy consulting firm to analyze energy consumption. The consultant will then partner with a solar installer or other renewable technology provider to create a project plan for the property that will be reviewed, approved, and subsequently funded by the SBA. Although the program requirement is to achieve a 10% electricity offset, many loan recipients opt for larger generation systems to maximize benefits.

Property Assessed Clean Energy

Another promising option for hotels is Property Assessed Clean Energy (PACE) financing. PACE financing helps overcome the barriers of high upfront costs as well as concerns over selling the property in the future. Property owners borrow money from the local government to pay for the solar PV system and repay the amount via property taxes thus tying the costs of building improvements to the property itself. If a hotel uses PACE financing and then sells the hotel at a later date, the repayment obligation transfers with the hotel property. However, this opportunity is location-specific; local PACE programs are currently operating in at least nine states.[11]

Leased buildings pose particular challenges for all types of commercial solar PV projects because of split incentives between the building owner and tenant. Since properties are typically owned and not leased in the hospitality sector, this issue is not the focus in this guide. Hotels that do operate under lease arrangements may find detailed information on financing solar PV projects for leased buildings in the Better Buildings Alliance's new Promoting Solar PV on Leased Buildings Guide.

Stakeholder Engagement in Hospitality

Hotel Decision-Makers

The successful design and implementation of a solar PV system in the hospitality sector requires cooperation between hotel chain owners, franchise owners, investment funds, and management firms.

Solar projects under development will likely require support from a variety of stakeholders:

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[9] www.nrg.com/renew/projects/solar/starwood-hotel-resorts.
[10] www.ecogreenhotel.com/Take-Advantage-Of-SBA-Lending-Programs-Including-Green-Loans.php.
[11] PACE financing information at www.dsireusa.org.

- The **hotel property manager** often acts as a gatekeeper to the owner and will also have to buy into the project before bringing it to the owners and investors.
- Large hotel chains often have a **sustainability or energy manager**, and it is recommended for individual franchisees and project managers to work with this person or team to navigate corporate approval processes.
- The **facility manager** is crucial to the success of the project. Facility managers and engineers should be on board with the solar installation and communicate with maintenance staff.
- It may also be important to receive support from a **Board of Directors**.
- Final approval for the project will be issued by the **hotel owner**.

Hotel operations may also benefit from organized training sessions and seminars for staff around solar PV practices such as cleaning the panels and monitoring the condition of the equipment, depending on the project ownership and the operations and maintenance agreement.

More detailed information on this topic may be found in the U.S. Environmental Protection Agency's ENERGY STAR Guidelines for Energy Management, which provides a proven strategy for creating an energy management program focused on continuous improvement of energy performance. Although it is not solar PV-specific, the guide is relevant for any energy project requiring an organization-wide effort.

Guest Involvement

In the hospitality sector, it is particularly important to involve guests in major changes and inform them of green practices. During solar PV installation, guests may be disrupted in some ways by the construction activity, and they will be more understanding when properly informed of the improvements the hotel is making – especially when they learn that the improvements involve sustainability and renewable energy. Strategies to communicate with and actively involve guests include:

- Distribute or post informational leaflets with simple graphics on how the PV array works and how it will look when completed;
- Create a display for the lobby or other communal space explaining the construction activity, its goals, and how the PV array works;
- Install a digital panel showing electricity production from the PV array in the lobby or other communal space;
- Display a time-lapsed video of the construction;
- Display drawings, artistic renderings, and photographs of the project; and
- Provide and advertise electric car charging in conjunction with the PV array (if available).

Effectively connecting with guests is key to realizing the marketing benefits of the project. Hotel management will also have ideas on how to engage their typical clientele depending on the location and type of the hotel.

Working with a quality solar installer will also help ensure that disruptions to guests are minimal. Hotel management and facilities should communicate with the installer throughout the construction process and agree on a construction schedule, safety procedures, and other protocol in order to minimize disruptions. Hotel property managers who have done these things have reported very successful project implementation with zero complaints from guests.

For attracting new guests, a green certification can be effective. One example is the TripAdvisor

GreenLeaders Program, which showcases a variety of eco-friendly options and indicates which hotels are certified using a leaf badge on the hotel's listing page.[12] Hotels have jumped at this particular program, and the American Hotel & Lodging Association (AH&LA) has integrated the GreenLeaders' minimum eco-friendly requirements as part of its Green Guidelines.[13]

Resources for Hospitality

There are many other organizations and resources that provide support for energy management, energy efficiency, and renewable energy implementation in the hospitality sector. A selection is included below:

- **American Hotel & Lodging Association (AH&LA):** The sole national association representing all segments of the U.S. lodging industry, including hotel owners, REITs, chains, franchises, management companies, independent properties, state hotel associations, and industry suppliers. The AH&LA Green Resource Center provides information and tools for hotels at different "Green Levels," including best practices, benchmarks, EPA programs, state programs, and tips for travelers. AH&LA also supports the DOE Better Buildings Challenge. www.ahla.com/green.
- **Green Lodging News:** An online news source focusing on sustainability in the hospitality industry, including energy and waste management, lighting, water conservation, and many other topics. The site features a list of Renewable Energy All Stars (properties that have at least one of the following: wind turbines, solar panels, a geothermal system for heating and cooling, or a system that generates electricity through hydropower), a Green Hotels Focus section (properties that have gone above and beyond typical green hotels), and also profiles of individual sustainability champions. www.greenlodgingnews.com.

  Sample Resource: The Renewable All-Stars (www.greenlodgingnews.com/renewable-energy-all-stars).

  Sample Resource: The solar power listing (www.greenlodgingnews.com/solar-powered).
- **U.S. Green Building Council (USGBC):** An organization made up of tens of thousands of member organizations, focusing on better, more energy-efficient buildings. The USGBC created the Leadership in Energy and Environmental Design (LEED) certification program for buildings, and also provides educational courses. The USGBC's "Practical Strategies in Green Building: Hotels" describes various green strategies used by LEED-certified hotels, as a sample of possible approaches.[14] www.usgbc.org.
- **Virginia Green Travel Alliance:** An organization supporting the marketing and outreach efforts of the Virginia Green program, Virginia's program to encourage green practices in the state's tourism industry and by travelers. The Travel Alliance involves staff training and certification programs, as well as webinars and learning series on solar, renewable energy credits, electric vehicle fueling stations, and more. The Virginia Green program has more than 1,550 tourism partners self-certified in a wide range of environmental commitments. The program recognizes high achievers in the industry with the Green Travel Star and Travel Leader Awards. www.virginiagreentravelalliance.org.
- **Other State Travel Programs:** There are other strong local travel programs in addition to Virginia's that have Green Travel Alliance is one example of a strong local travel program, and there are others across the U.S. These resources supporting public recognition of renewable energy projects in the hospitality sector, including:
  - The California Department of General Services Green Lodging Program (www.dgs.ca.gov/travel/Programs/GreenLodgingProgram.aspx);

[12] www.tripadvisor.com/GreenLeaders
[13] www.environmentalleader.com/2013/09/25/tripadvisor-doubles-green-hotel-participation/#ixzz3gq5Qx0Po
[14] Full document here: www.usgbc.org/Docs/Archive/General/Docs7760.pdf.

- Massachussetts Stay Green (www.massvacation.com/stay-green).

- **International Hotel & Restaurant Association (IH&RA):** An international trade organization for the hotel and restaurant industries. IH&RA has developed a sustainability management platform for its members as part of its Sustainable Hospitality 2020 effort. www.ih-ra.com.
- **Hotel Energy Solutions:** A UN World Tourism Organization project delivering information, technical support, and training to small and medium enterprises in the tourism and accommodation sector across the European Union to increase their energy efficiency and use of renewable energy. Businesses in the U.S. may also benefit from these resources. www.hotelenergysolutions.net.
- **Green Hotelier:** An international online information source on the sustainable agenda within the hotel industry, acting as a key communication tool of the International Tourism Partnership.[15] Green Hotelier reaches 24,000 hotel properties in 100 countries, along with smaller, independent hoteliers. The website provides stories around multiple sustainability themes, including energy and carbon, profiles of industry leaders and best practice case studies. www.greenhotelier.org.
- **Financial Consulting Firms:** Consulting firms provide advisory services to the hospitality and tourism industries, including planning and developing projects, financing, improving operations, valuing assets, and buying and selling assets. The choice of a financial advisor must fall to individual hotel management, who best know their business needs.
- **The Database of State Incentives for Renewables & Efficiency (DSIRE):** A comprehensive source of information on incentives and policies that support renewables and energy efficiency in the United States. DSIRE includes up-to-date, state-by-state policy and incentive information. The database is a useful tool to review current incentives programs for any organization considered solar energy and energy efficiency. www.dsireusa.org.

[15] More information at: www.tourismpartnership.org

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