Renewable Energy Strategies for Real Estate

Urban Land Institute

About ULI

The Urban Land Institute is a nonprofit education and research institute supported by its members. Its mission is to shape the future of the built environment for transformative impact in communities worldwide. Established in 1936, the Institute has more than 45,000 members worldwide representing all aspects of land use and development disciplines.

About ULI Greenprint

The ULI Greenprint Center for Building Performance is a research organization focused on climate mitigation and makes the business case for green buildings by tying carbon reductions to increased asset value. ULI Greenprint also includes a worldwide membership alliance of leading real estate owners and developers committed to improving the environmental performance of the global real estate industry, striving to reduce greenhouse gas emissions by 50 percent by 2030, and achieving net zero carbon operations by 2050. ULI Greenprint is organized within the ULI Randall Lewis Center for Sustainability in Real Estate, which also oversees the Urban Resilience Program and the Building Healthy Places initiative.

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About This Report

Renewable energy is not a new concept or startup technology. All types of buildings with varying ownership models and lease structures have been able to generate or procure renewable energy. With increasing stakeholder demand for sustainable real estate and a growing attention on setting net zero goals, renewable energy will play a large role in buildings of the future.

Between 2009 and 2019, renewable energy use in buildings rose 4.1 percent annually, making it the fastest-growing energy source for buildings globally. However, as of 2019, renewable energy still accounts for only 14.3 percent of total energy use in buildings (Renewables 21), and the global energy consumption of buildings is projected to increase by an average of 1.3 percent per year from 2018 to 2050 (U.S. Energy Information Administration). As a major consumer of energy, the real estate industry also has a large carbon footprint, with emissions from buildings making up about 40 percent of global emissions. This also means that real estate has the potential to future-proof assets from regulatory and investor demands by decarbonizing—a task made easier by the declining cost of renewable energy and record-breaking costs of natural gas.

The goal of this report is to help real estate practitioners understand the business case for renewables and develop a strategy to identify, prioritize, and execute renewable energy deals both on site and off site.

"It is a common misconception that renewable energy is not a core part of the real estate business. This couldn't be further from the truth. It is part of being a best-in-class operator."

—Drew Torbin, Chief Executive Officer, Black Bear Energy

U.N. SUSTAINABLE DEVELOPMENT GOALS

An increasing number of real estate organizations are aligning with the United Nations Sustainable Development Goals (SDGs). The 17 SDGs aim to end poverty while also improving global health, reducing inequality, and protecting the planet. SDG 7 is to ensure access to affordable, reliable, sustainable, and modern energy for all. One of the targets is to increase substantially the share of renewable energy in the global energy mix.

Learn more about how real estate is aligning with the U.N. SDGs at uli.org/unsdgs.

Key Takeaways

Real estate is increasing its focus on renewable energy to help meet climate commitments and add value for the building, tenants, investors, and community. Recommendations for real estate practitioners interested in renewable energy include the following:

1. The best strategy for implementing renewables in real estate varies according to an organization's financials, goals, and priorities, as well as building-level attributes like geographic region, local utility, and tenant makeup.
2. As demand for renewable energy increases, real estate organizations can begin exploring renewable energy opportunities now in order to gain experience and build relationships with service providers who can help them succeed.
3. On- and off-site renewable energy deal structures are numerous, complicated, and best supported by expert external stakeholders.
4. Not all emission reductions are equally impactful. Energy efficiency should first be maximized wherever possible, then on-site renewable energy opportunities identified and off-site green energy purchased to ultimately achieve net zero.

Key Terms and Definitions

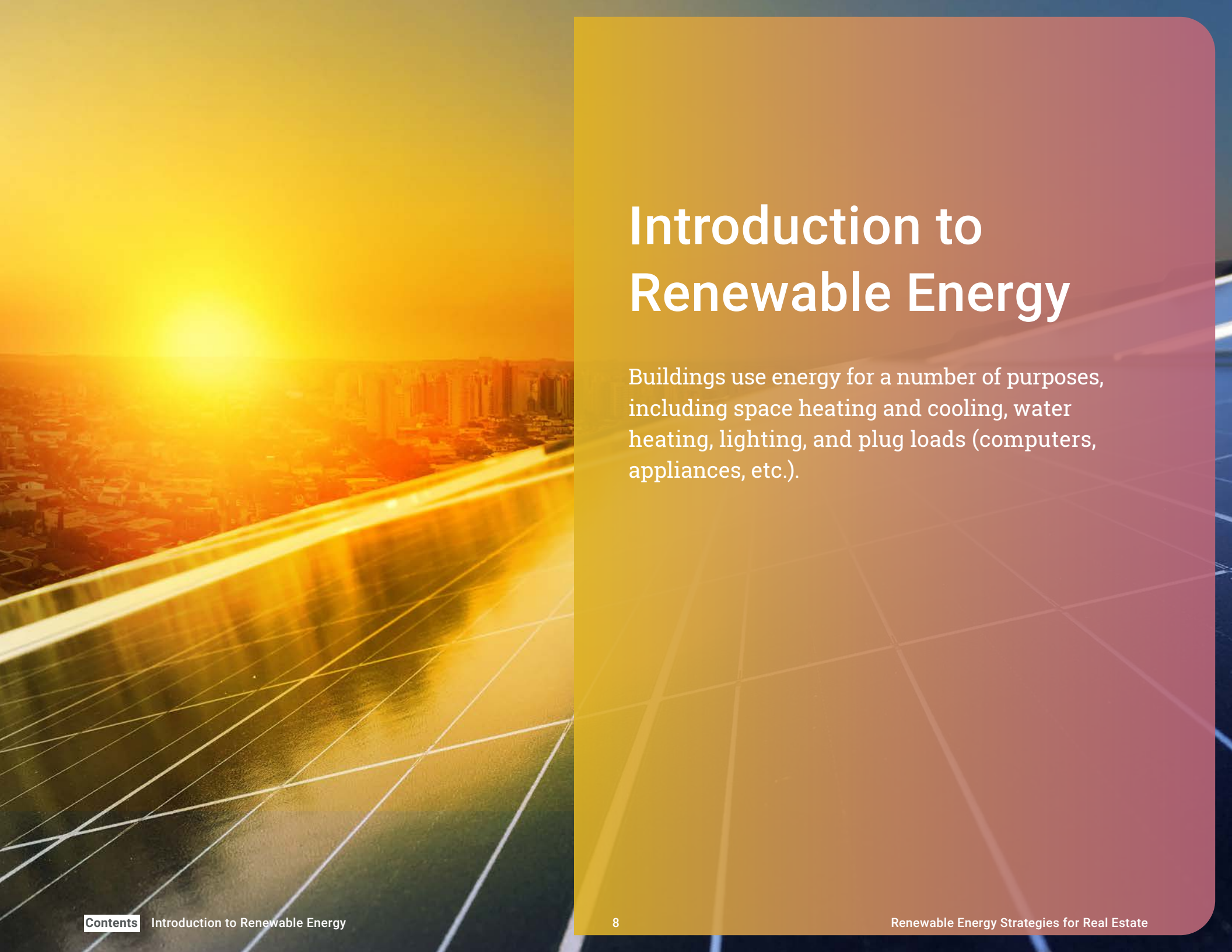
- ## Additionality
  When a renewable energy project generates additional grid capacity, is added to the grid as a direct result of the investment, and would not exist without the actions/investment.

- ## Net metering
  Net energy metering means that overproduction can be sent back through the meter to the grid and credited to the utility account throughout the course of the year. If a system produces more than it used over the course of a year, a credit is issued.

- ## Physical power purchase agreement (PPA)
  Physical PPAs involve a physical transmission of electricity to the electricity grid that is contracted out to a corporate power consumer/offtaker (in the case of real estate, a building owner or its tenants).

- ## Renewable energy credit (REC)
  Commonly used term for energy attribute certificates, which document and track nonpower attributes of renewable electricity generation. Also known as guarantees of origin (GOs) in Europe and I-RECs in a number of countries in Asia, Africa, the Middle East, and Latin America. One REC represents 1,000 kilowatt-hours (kWh) or 1 megawatt-hour of a renewable generator's green attribute.

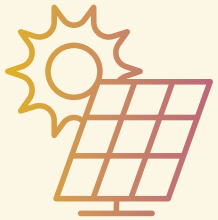
- ## Virtual power purchase agreements (VPPAs)
  VPPAs contract directly with power generators for the electrical output, but the actual power does not physically flow from the generator to the buyer and is instead financially settled (completely independent of physical power supply).



Introduction to Renewable Energy

Buildings use energy for a number of purposes, including space heating and cooling, water heating, lighting, and plug loads (computers, appliances, etc.).

Multiple types of renewable energy can be used to provide electricity to a building or the utility grid, including the following:

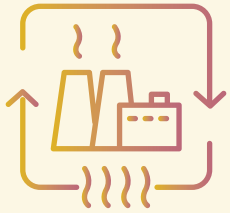


Solar

Photovoltaic (PV) panels convert sunlight into electricity. Many different buildings with available roof space or parking space are able to implement solar panels, from the Burj Khalifa in Dubai to the White House in Washington, D.C.

Wind

Turbines generate electricity from wind. Built-environment wind turbines are wind projects that are constructed on, in, or near buildings. However, wind power is much more common at the utility scale rather than commercial or residential scale.



Geothermal

Ground-source heat pumps use the consistent ambient ground temperature to heat or cool water for heating and cooling purposes. Depending on the design of the system, on-site geothermal systems can supply up to 100 percent of a building's heating and cooling loads.

While these are all renewable energy sources that buildings can integrate on site, for on-site renewables, this report will primarily focus on solar power, which is the most commonly reported form of on-site renewable energy for commercial real estate globally.

Although debates exist currently as to whether nuclear power and hydroelectricity should be considered a source of green energy, this report does not cover either power source.

The Business Case for Renewable Energy

Rising energy prices, declining cost of renewable energy systems, government incentives, new financing tools, and momentum around decarbonization and net zero goals are causing real estate organizations to pursue renewable energy projects at greater scale. The growing business case for generating and/or procuring renewable energy includes the following arguments:

Boosting financial value:

- **Lowering energy costs:** Buildings generating renewable energy can reduce energy costs, secure consistent energy costs, or both. Even if solar is the same cost or even slightly higher than current energy bills, it can serve as a hedge against long-term rising energy costs and price volatility.
- **Earning additional income:** On-site renewable energy projects can generate rent from leased roof space to solar operators/developers, or additional income through green tariffs, selling power back to the grid, or solar renewable energy credits (SRECs). For example, the U.K.'s Smart Export Guarantee scheme allows excess renewable power to be sold to energy companies for 2 to 5.6 pence (US 2.6 to 7.4 cents) per kWh (GreenMatch), which is feasible in utility grids that allow net metering. Link Logistics, a U.S.-based logistics portfolio, generates about a $1 per square foot increase in annual rent through rooftop solar operating leases at distribution centers (Better Buildings Alliance).
- **Accessing available incentives:** There are compelling national, regional, and utility-scale financial incentives for on-site solar projects. See page 19 for a short overview of financing opportunities and incentives. These incentives can substantially decrease system cost and improve financial returns.

Meeting stakeholder expectations:

- **Increasing tenant demand:** Tenants of all building types are now conscious of their own environmental impact. More than 1,900 organizations, including many large office tenants, have set science-based targets—established through the Science Based Targets initiative—to reduce emissions and are starting to track and manage their carbon footprints. Building owners also report that many tenants are asking them for information about renewable energy.

- **Meeting investor requirements:** Investors continue to request that investments maximize efficiency and reduce their environmental impact through energy projects, including on-site renewable energy projects and off-site renewable energy purchases. The total amount of capital with environmental, social, and governance (ESG) commitments continues to increase, and by 2023, 80 percent of investors plan for ESG to be part of their strategy (Cushman & Wakefield's "Green Is Good" series). An increasing number of investors are actively seeking "green" funds in line with their own climate goals and commitments.

Creating community benefits:

- **Increasing affordability:** For low-income multifamily tenants, energy costs can be a burden. Participating in community solar programs supports below-market-rate energy costs and offers renewable energy sources for community residents. In addition, buildings that can show that their energy costs are lower than those of their peers are likely to be more desirable to tenants.
- **Strengthening grid resilience:** Utility infrastructure in many regions is under stress. On-site renewable energy can reduce demand during peak energy consumption times and reduce a building's reliance on the local grid. Grid resilience and reliability will be increasingly critical as the effects of climate change mount.
- **Aligning with local regulations and future-proofing against future regulations:** Cities and countries across the world are developing green building standards to reduce emissions from the built environment. Many of these policies will drive generation of on-site renewable energy or off-site purchases. New York City's Local Law 97 sets strict building emissions standards, requiring buildings to invest in deep energy-efficient retrofits or else rely on renewable energy. Denver, Copenhagen, Munich, and France have also passed legislation that requires green or solar rooftops. For more details on U.S. policies that might affect building-level renewable energy, see the American Council for an Energy-Efficient Economy's State and Local Policy Database.
- **Going beyond renewable energy:** Procuring renewable energy through the grid can have more than carbon and financial impacts. There is also the potential for social, ecological, and community impacts. To learn more about how to procure renewable energy that promotes biodiversity and a just transition, see Salesforce's *More than a Megawatt: Embedding Social & Environmental Impact in the Renewable Energy Procurement Process* report.

Meeting internal targets:

- **Gaining points for green building certification:** Green building certification schemes reward the incorporation of renewable energy use. For example, the U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) certification for Building Design and Construction awards up to three points for renewable energy production and up to two points for green power and carbon offsets.
- **Achieving goals:** An increasing number of real estate organizations are setting net zero targets, science-based targets, and 100 percent renewable energy commitments. After energy efficiency, on- and off-site renewable energy is a key step along the path to net zero. For more information on how renewable energy fits into the pathway to net zero, see page 56.

ENVIRONMENTAL JUSTICE AND RENEWABLE ENERGY

Disadvantaged communities and communities of color disproportionately bear the brunt of climate change, including the air pollution and greenhouse gases from fossil fuel combustion. According to the U.S. Environmental Protection Agency (EPA), environmental justice is the meaningful and fair treatment and involvement of all people in developing environmental policy, regardless of race, income, or background, and will be achieved when everyone enjoys equal access to decision-making and protection from environmental and health hazards.

Investing in renewable energy generation can help reduce energy costs for low-income communities, increase grid reliability, provide jobs, and lower greenhouse gas emissions that can cause community health issues. The switch to renewable energy can support a just transition, equitably distributing the benefits. Companies like Microsoft are already combining their climate mitigation and racial equity strategies by partnering with Volt Energy, a Black-owned solar development firm, to generate 250 megawatts of solar power, with a portion of profits set aside to develop renewable energy in underinvested communities in the United States.

To learn more about the intersection of environmental justice and the real estate industry, read ULI's report *Environmental Justice and Real Estate: Perspectives from Leading Community-Based and Advocacy Organizations*.

"As a responsible investment management company, Calvert looks at financially material E, S, and G factors. Energy and GHG [greenhouse gas] emissions management are the primary environmental factors that we believe will drive outperformance [compared to peers]. Incorporating renewable energy shows not just how a company manages costs, but also how they are taking advantages of opportunities that reduce both energy costs and volatility. By being better able to forecast expenses, companies can also improve capital allocation and their cost of capital. Reducing energy use and GHG emissions can also provide an opportunity for growth through rent premiums from tenants seeking sustainable spaces and from sale premiums and lower borrowing costs from investors seeking sustainable investments."

—Brendan McCarthy, vice president, ESG Research, Calvert Research and Management

Hurdles to Market Uptake

Although renewable energy can add value to a building's or portfolio's bottom line, many commercial real estate organizations have yet to implement a renewable energy project. At the building level, technical limitations can make on-site renewable energy impossible, such as a property without available space or roof structure that cannot hold additional weight. In addition, there can be challenges accessing whole-building energy data to help select the size of a project or perform accurate carbon accounting to help calculate the full impacts of a deal. There can also be perceived challenges with future transactions if the owner is uncertain how the renewables deal will affect a building disposition.

At the portfolio level, there may be strategic limitations to renewable energy deals, including individual asset hold periods that are shorter than potential renewable contracts. As more renewable deals are completed and best practices shared across the industry, these limitations are being overcome through creative deal structures.

Local regulations and utility policies can also play a role in holding back renewable energy installation or procurement, by altering the business case for different deal structures over time. For example, certain incentives and subsidies can play a large role in helping a deal pencil, but can change rapidly, causing the business case to fall through.

For building owners otherwise well positioned for renewable energy, the perception of risk and high upfront costs may hold them back. While a wide range of deal structures exist to help overcome an organization's specific concerns, selecting the right option (or multiple options) can be complicated. This report outlines best practices, key strategies, and project profiles to help organizations make the right choices based on unique market drivers, financial targets, and sustainability goals.

"LBA has been vetting our portfolio for on-site renewable energy opportunities for years. With the increasing momentum toward net zero commitment from stakeholders, we are rethinking our definition of project value and reconsidering renewable energy projects that were previously scrapped based solely on financial metrics."

—Michelle German, director of ESG and sustainability, LBA Realty

On-Site Renewable Integration Opportunities

When considering renewable energy opportunities in a portfolio, building owners often begin by evaluating on-site projects. In markets with high energy costs or with a renewable energy credit market, renewable energy can lower energy costs or generate new income from REC sales or roof leases (see page 43 for more details on RECs). On-site renewable energy has the added benefit of high visibility and communicates an organization's commitment to sustainability.

As noted earlier, this section of the report focuses primarily on solar power.

Identifying the Right On-Site Opportunity

Many real estate owners and investors can use a solar installer, solar broker, or even their local utility providers to help them identify the best opportunities for on-site renewable energy and advise them on the different financing options. Service providers can identify top priorities based on market (local policies and incentives, energy costs) and building (lease length, tenant interest, landlord electrical load, asset age, roof structure, and planned dispositions) conditions. The portfolio vetting is often done free by these service providers. After identifying assets with the best business case, the owner can receive a project quote.

A key piece of the business case for solar can be determining where the electricity goes—whether it will be used on site or used off site and sold to the grid. In the United States, the geographic market will often limit options, as some markets only allow on-site renewable energy consumption while others allow net metering. If the power must be used on site, the best assets are those with a large landlord-managed electrical load, like office campuses or life sciences buildings, and projects need to be sized so that the total energy generated is rarely if ever more than can be consumed and/or stored on site. If there is net metering and the ability to sell excess power back to the grid, a project could generate more energy than needed on site and receive additional income. A number of European countries have feed-in tariffs, a fixed-price incentive for a unit of energy sent to the grid for a set period of time, as well as other generation-based rebate and credit systems. Some U.S. markets that do not allow green power to be sold to the grid, do allow the sale of accompanying RECs, allowing for additional revenue. In markets where this is possible, assets with large rooftops like industrial distribution centers or large retail areas are ideal for solar development.

In addition to the energy, on-site renewable energy generates environmental benefits that can be quantified and claimed by the building owner. So long as the RECs from the generated power are not sold to a third party, the building owner can claim the use of green power, lowering the building's total emissions.

Cities often have the most stringent green building standards, because buildings generally contribute the majority of emissions in urban areas. However, urban areas have limited space for renewable energy infrastructure, especially on commercial office and multifamily buildings where renewable energy would need to compete with chillers, cooling towers, antennas, the shade cast by adjacent buildings, and often an outdoor roof deck to find economical space for renewable energy. Dense urban settings often face policy, zoning, and permitting challenges beyond rooftop availability. For example, in Tokyo, installing solar panels above a rooftop plant area would be seen as technically a roof. This would require the outdoor plant area to be counted as an additional floor on the building and included in floor/area ratio (FAR), potentially increasing the building height, infringing on shadow restrictions, and leading to zoning noncompliance or significant loss of rentable area.

Opportunities by Property Type

A wide range of property types are using renewable energy. Office properties are a sweet spot for many building owners, because they often consume enough energy in common spaces to be offset by a rooftop solar array. Industrial distribution centers have large rooftops and parking areas for solar, but triple-net leases create a challenge because in many markets they would need their tenant to buy the energy generated on site to make the economics of a renewable energy project work. Hotels often have complicated aesthetic rooftops, but the building owner has a benefit of receiving all the energy savings (since the owner pays the entire utility bill for the hotel). Each individual asset in a portfolio should be assessed for suitability before moving forward.

On-Site Geothermal

With increasingly stringent energy performance standards in many urban markets that have limited solar potential, building owners may look to identify other on-site renewable energy opportunities, including geothermal. Currently, geothermal is more frequently reported in Europe; however, fossil fuels are most often used to heat space and water in buildings, so geothermal technology will play a significant role in decarbonizing the built environment.

For on-site geothermal energy projects, consistent temperatures in the earth result in a highly reliable source of heating and cooling. When assessing a building for geothermal opportunity, available space and the physics of the necessary equipment as well as a number of geological factors are important to consider. Geothermal systems can be closed-loop (uses a ground loop to circulate water or antifreeze to and uses conductivity to extract heat with the ground or groundwater source), open-loop (no ground loop, circulates water for heat extraction from local subsurface groundwater), or direct exchange systems (circulates refrigerant through a copper pipe instead of a ground loop).

For an example of geothermal in a commercial building, see the "Iron Mountain Data Centers: Geothermal Cooling System" case study for the U.S. Department of Energy's Better Buildings program.

While still less common than solar energy, building owners interested in renewable energy opportunities continue to consider the technology for future projects based on the local market expertise, available incentives, permitting/zoning, and tenant interest.

Economic Considerations

When reviewing the business case of on-site renewable energy projects, the following are a few key items to consider:

- **Utility rates:** What is the avoided cost of electricity? Specifically, what is the cost of the electricity at the time of renewable energy generation?
- **Materials and installation costs:** What is the cost of the solar panels and other equipment as well as the cost of expert contractors? How much will a long-term maintenance contract cost?
- **Permitting costs, utility fees for approvals and interconnections:** What are the fees to the city or utility when connecting to the grid?
- **Incentives and subsidies:** What incentives or subsidies are available based on location?
    - In the United States, the best tax subsidy for solar is the federal tax credit. As of 2021, it is around 26 percent, but plans are for it to decrease to 22 percent then 10 percent over time. Projects also qualify for federal bonus depreciation. For geothermal heat pumps, there is a 10 percent federal tax credit in the commercial sector. Other states and municipalities offer additional incentives. For more detailed resources on state and local renewable energy incentives, see DSIRE's Database of State Incentives for Renewables and Efficiency.
    - For a list of international incentives, see KPMG International's *Taxes and Incentives for Renewable Energy report*.
- **Utility policies:** Does the location allow net energy metering? Is community solar an option? Is virtual net metering?
    - Net energy metering means that overproduction can be sent back through the meter to the grid and credited to the utility account throughout the course of the year. If a system produces more than it used over the course of a year, a credit is issued. Locations with net metering are the highest priority for many building owners as it can be very lucrative for end users and hosts, but some utilities are moving away from this model.
    - Some U.S. utilities have targets for sourcing total renewable energy, and building owners can sell SRECs to them on the open market. In some cases, REC arbitrage occurs, in which solar projects sell the SRECs back to the grid and purchase lower-cost RECs, improving the economics of a renewable energy project, while allowing the building to make renewable energy claims.
    - Community solar sends renewable energy back to the grid for the utility to sell to subscribed commercial and residential customers. Customers receive a discounted rate and pay the solar developer for the kilowatt-hours they receive.
    - Virtual net metering allows remote loads to be offset, such as a large parking lot solar canopy offsetting a nearby building.
- **Jurisdictional:** What are the fire codes, setbacks, or other local building code and zoning requirements?

To evaluate the economic viability of distributed solar, wind, battery storage, combined heat and power (CHP), and thermal energy storage, see the REopt Lite web tool created by the National Renewable Energy Laboratory (NREL).

Selecting the Right On-Site Deal

A building owner can own and operate renewable energy projects, lease building space to a third party for renewable energy, or use a third-party ownership model like an on-site power purchase agreement (PPA) or solar lease. The potential benefits of each option can be weighed based on tax appetite, tenant lease terms, local utility policies, and desire to claim the RECs.

On-site solar can be paid for upfront and owned by the property owner or could be financed through other options, including a lease, commercial debt, property taxes (using the property assessed clean energy model, or PACE), or through future energy generation from the system (a PPA). Because all nonownership structures charge an effective interest rate to finance a project, owning the project allows the real estate company to claim the full benefit of savings or revenue from the system without the added cost of making financing or service payments to a third party.

Organizations with low to no tax liability, such as nonprofits, religious institutions, and real estate investment trusts (REITs), cannot take advantage of many federal tax incentives and may instead benefit by partnering with an organization that can take advantage of the tax credit to reduce project expenses. In the United States, the federal tax credit available for solar is a major driver for on-site solar uptake, so building owners unable to take advantage of this incentive have a harder time making the business case for renewable energy.

For a guide to selecting the best financing option for your organization, check out the U.S. Department of Energy's Better Buildings Financing Navigator.

Third party–owned solar projects feed energy back to the tenant or utility for sale through community solar, feed-in tariffs, or other PPAs. Using this structure allows owners to limit upfront costs and receive lease payments similar to a tenant lease, but the building owner cannot always claim the project RECs. Figure 1 outlines some commonly cited business models for real estate organizations looking to implement an on-site renewable energy project.

"At JBG SMITH, we prioritize ownership of on-site solar projects in order to realize impactful business benefits: increase the value of the building, realize lower utility costs, and incorporate the energy output into carbon reduction commitments."

—Kim Pexton, vice president of sustainability, JBG SMITH

Figure 1. On-Site Renewable Energy Business Models

Business model	Description	Benefits
Property owner owns system		
Include electricity in tenant gross lease	Building owner is responsible for utility bills, allowing owner to receive full electrical cost savings	Owner receives full energy cost savings, increasing net operating income
Sell electricity back to grid	Grid pays for energy produced, and energy alone can be sold, or energy and RECs can be sold	Allows solar production beyond what can be used on site, and the owner could keep the RECs
Sell electricity to someone off site in your community	Sells electricity to utility through PPA	Community subscribers benefit from lower energy costs, owner receives brand/reputational value
Use electricity for your common area load	Solar energy generation powers common areas on owner's meter (not tenant-metered spaces)	Owner receives full energy cost savings, increasing net operating income
Sell electricity to tenants under net lease	Sells renewable energy directly to tenants through PPA	Uncommon, but lowers tenant energy costs
Third party owns system		
Sell electricity to tenants	Third party sells electricity to tenant at a fixed or escalating electricity rate for a predetermined period of time	Tenant saves money through lower and stabilized energy costs
Sell electricity to utility	Third party leases building space to generate income	Allows for more solar production than could be used on site and sold off site

Adapted from U.S. Department of Energy, Better Buildings, "Promoting Solar PV on Leased Buildings Guide" (2015).

Project Summary

Achieving a Quick Payback through Direct Ownership

COMPANY:
The Tower Companies

BUILDING TYPE:
Multifamily

BUILDING LOCATION:
Silver Spring, Maryland

PROJECT STRUCTURE:
Direct ownership

ESTIMATED UPFRONT HARD-COST INVESTMENT:
$350,000

TOTAL ENERGY GENERATED:
122 kW

(The Tower Companies)

The Tower Companies, a privately owned real estate developer and property management company, installed 122 kilowatts of rooftop solar on Blair House, a 12-story, 310-unit 1960s multifamily building in Silver Spring, Maryland. The solar installation is estimated to generate more than 150,000 kWh annually and about 10 percent of the building's total energy demand.

Tower selects buildings in the DMV (District-Maryland-Virginia) portfolio for on-site solar based on several factors, such as roof age, roof structure and layout, electrical tie-in options, property electricity demand, and interconnection location. The existing roof was made of steel beams and corrugated metal decking (not a concrete deck), requiring the project team to redesign the solar system to accommodate areas of the roof that could not hold the weight of the installation. The solar project was purchased by Tower (direct ownership model) with an upfront hard cost to design, procure, and install of about $350,000. To achieve an after-tax payback of one year, Tower used the financial benefits outlined in figure 2. Properties in Maryland are also able to take advantage of net metering regulations, which allows Tower to receive utility bill credits if renewable energy generation exceeds the electricity meter demand.

Blair House residents can view a dashboard tracking real-time solar generation in the lobby.

Figure 2. Financial Incentives for the Blair House Solar Project

Upfront hard cost	Approximate engineering, procurement, and construction contractor expense	$350,000
Financial incentives	Annual energy savings	$20,000
	SREC sales	10-year SREC agreement
	Maryland Energy Administration rebate program for solar	The rebate program offering changes each fiscal year
	Modified accelerated cost-recovery system bonus depreciation	Benefits are accelerated to year one
	Federal investment tax credit	30% for projects completed in 2019

"Tower's on-site solar programs are structured such that they make great business sense—both financially and environmentally. Since our first solar project in 2014, Tower has completed projects of all sizes, and we've found the numbers can work in a variety of locations and building types."

—Katie Rothenberg, vice president of sustainability, The Tower Companies

Project Summary

Unique On-Site Solar Energy Deal Structure

COMPANY:
LaSalle Investment Management

BUILDING TYPE:
Industrial

BUILDING LOCATION:
Sakai-city, Osaka, Japan

PROJECT STRUCTURE:
Own and lease solar panels to solar company

TOTAL INVESTMENT:
¥214 million (US$1.9 million)

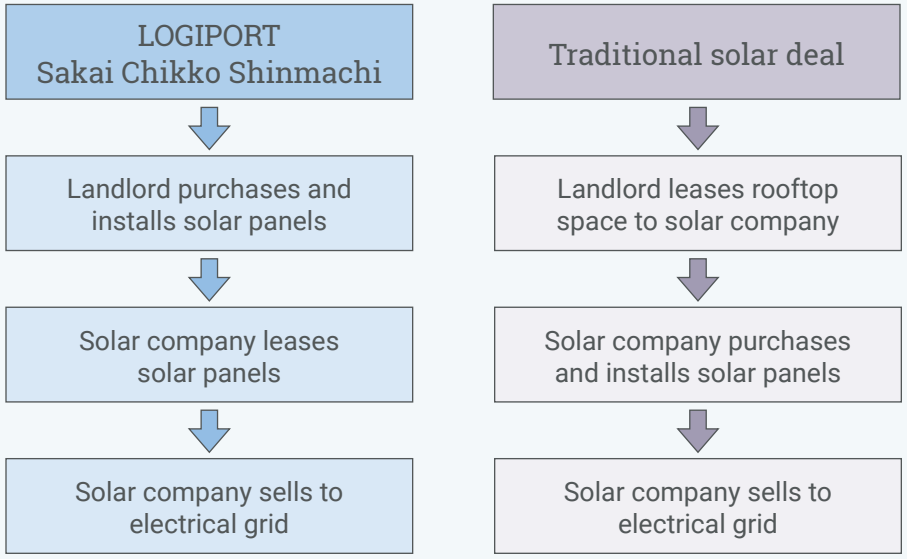
(LaSalle Investment Management)

LaSalle Investment Management's LaSalle Logiport REIT ("LLR," a real estate investment trust established in Japan, or J-REIT) has several environmental objectives, including reducing the environmental impact of its business and its client's real estate holdings. For LLR, on-site solar energy generation is one way to increase revenue in its existing portfolio. Thirteen of the J-REIT's 19 properties have already installed solar panels, generating 17.7 gigawatt-hours of solar energy and 31.3 percent of the portfolio's total energy consumption in 2020. Of LLR's 13 properties that have rooftop solar panels, 12 lease the rooftop space.

At Logiport Sakai Chikko Shinmachi, to maximize revenue, a different deal structure was selected. In this case, LLR purchased and installed rooftop solar panels that can then be leased out to solar power producers. After a ¥214 million (US$1.9 million) investment, the project achieved a ¥20 million (US$174,000) net operating income and 9 percent return on investment.

For traditional rooftop leases, less than 1 percent of revenue is from leasing the rooftop for solar. Sakai Chikko Shinmachi's rent fluctuates based on the total electricity produced and can generate up to about 7 percent of the property's total revenue. While these additional profit margins are enticing for future projects, because of the regulations surrounding J-REITs, this type of deal cannot be used too frequently because non–real estate assets are allowed to be only 5 percent of total asset size and J-REITs cannot operate businesses other than real estate. Solar energy generation is not deemed a direct real estate business in Japan, so Sakai Chikko Shinmachi leases out the solar panels to a separate special purpose company (SPC), acting as the solar power generation operator, and LLR receives fixed and variable rents from the SPC.

Figure 3. A Comparison of Solar Deal Structures



In Japan, feed-in-tariff schemes are common. To motivate the market growth of solar power generation systems, the government set a fixed renewable energy price for utility companies to pay over a 20-year term. Rates are decreasing each term, but as the price of solar decreases, utilities are locked into above-market rates, driving continued uptake in on-site solar.

For either deal type, a large challenge is that on-site solar energy generation is not consumed on site by either landlords or tenants. For organizations like LaSalle with a 2050 goal of global net zero operations, being able to use this electricity on site would be ideal from a net zero carbon perspective. LLR is currently planning to install additional solar panels for on-site consumption in the Logiport Kawasaki Bay property, aiming to reduce carbon emissions.

Community Solar

Community solar generates renewable energy on site and sends it to the grid for sale to commercial and residential customers. In markets with policies setting up community solar, building owners can participate in three ways: (1) host a solar project (third-party ownership); (2) finance and own the solar project and provide energy to the community; or (3) subscribe to the renewable energy generated. Subscribers to the program benefit from a stable and discounted rate on utility bills, often helping reduce energy costs for low- and moderate-income utility customers. The utility receives the RECs from the project, not the solar developer.

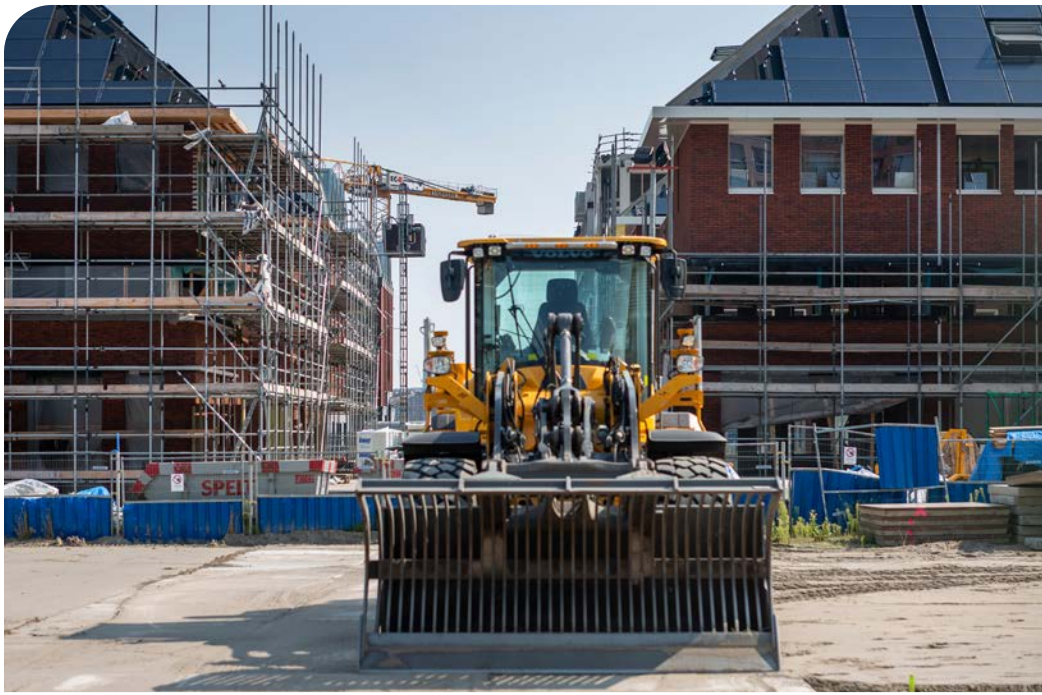
Hosting community solar can generate rent from the leased roof space (either annual rent or an upfront single payment), maximizes the environmental impact by allowing for a larger solar array than is needed for on-site consumption (as many localities otherwise do not allow more solar capacity installed than building demand), and reduce the energy burden for the local community.

On-Site Renewables for New Construction

The easiest and most cost-effective time to integrate sustainability features (including on-site renewable energy) into a new building is during the design phase. Organization-wide specifications relevant to on-site renewable energy for new construction are to establish energy use intensity targets by property type, target emission reductions below a baseline for the renewables to achieve, and evaluate all projects for solar and/or storage potential.

Adding on-site renewable energy projects to new developments can help them achieve green building certifications such as LEED (Leadership in Energy and Environmental Design) or BREEAM (Building Research Establishment Environmental Assessment Method) and meet internal or external energy goals. However, if the economics of a renewable deal such as rooftop solar are not currently worth it, buildings can also be designed to accommodate future projects by making sure a roof can handle the additional weight of solar panels or by running conduit to electrify a parking lot for a future solar array (and/or electric vehicle charging infrastructure). For details on how to minimize future solar installation costs, see the NREL's *Solar Ready Buildings Planning Guide*.

Ultimately, to decarbonize and achieve net zero (and make full use of on-site renewable electricity generation), buildings will need to electrify, moving away from on-site fuel combustion at the building level and away from fossil fuel–burning power plants at the utility level. Electrification of all building systems is most cost-effective during construction. To learn more about the business case for electrification, see ULI's report *Electrify: The Movement to All-Electric Real Estate,* and for technical advice on electrifying buildings, see the New Building Institute's *Building Electrification Technology Roadmap (BETR) summary*.



Design Considerations for On-Site Renewables

After identifying the top opportunities for on-site solar systems, each building will have different design considerations. Solar does not look the same for every building, but typical project terms are long, at 20 to 25 years, so optimizing energy generation upfront is important. When designing a solar array, key considerations for the project team include the following:

- **Building location and orientation:** How much sun will hit the surface of the solar array throughout the day?
  - **Solar array orientation:** How will the array fit onto the building? South or Southwest orientation is usually ideal if the roof is flat and there are no obstructions blocking southern solar exposure.
- **Available space:** Where can the solar panels be placed? Is there space on the roof, grounds, or carport? If there is space on the roof, is the building structurally capable? If the roof is unavailable due to mechanical equipment or other amenity priorities, or to maximize project size, a solar canopy over a parking lot can be another good option and provides an additional benefit of keeping cars cooler. Would building-integrated photovoltaics (BIPV) make more sense for this asset than traditional rooftop panels?
  - **Reserved free space:** How much space does the building need available for maintenance or other equipment? One building owner cited a standard 25 percent of roof space free when installing solar.
  - **BIPV:** BIPV solar energy generating components make up an essential part of the building structure, such as the roof, skylight, or facade. At Boulder Commons, in Boulder, Colorado, Morgan Creek Ventures installed a 575-kilowatt solar array mounted on the roof and on the southeast facade. For energy modeling values of BIPV options at Boulder Commons, see the ULI Tenant Energy Optimization Program's Rocky Mountain Institute case study.
- **Energy consumption:** How much power is the building currently using, and how is it being used (for what building functions)? For buildings aiming to use solar energy on site, this will help size the system to meet demand.
- **Local environment:** Are there trees (shade) or traffic (air pollutants) nearby? Will the array get dirty, which may possibly impact performance?

- **Aesthetics:** Is the project in a historic district or high-visibility area? If yes, building owners may need to work with the local planning department to make sure it does not create an eyesore. Other times, highly visible solar panels can be desirable because they directly communicate sustainability credentials to tenants. Integrating solar into the design from the beginning of a project can make overall aesthetics more pleasing.
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COMBINING SOLAR AND GREEN ROOFS

In Sydney, Australia, a research study compared two solar arrays on building rooftops, one a standard solar roof and the second a green solar roof with foliage. The solar array on the green roof performed better than the standard green roof by 3.6 percent over an eight-month period and by 20 percent at peak times. This increase in performance generated an additional A$2,595 (US$1,891) or 9.5 megawatt-hours' worth of energy. The green roof lowered the temperature of the solar array by up to 20 degrees Celsius. Incorporating green roofs into rooftop solar arrays can provide additional benefits, increasing local biodiversity and reducing stormwater runoff. Recent legislation in France requires all new commercial buildings to at least partially cover rooftops with solar arrays or foliage, so the combination of the two may become more common in the future.

Adding Storage

Energy storage helps improve the overall performance of a renewable energy system and allows the utility grid to better manage fluctuating energy supply and demand from renewable energy. Energy storage systems connect to a renewable energy system, consuming power while charging and discharging electricity back to the building at opportune times, such as when the price of electricity from the grid is high (usually carbon intensive as well) or when the building needs more energy than the on-site renewables are producing.

Energy storage is receiving increasing interest in markets where (1) local regulations allow for it, require it, or incentivize it; and (2) the cost of commonly used lithium-ion battery systems continues to decline. An increasing amount of solar on the grid can create a surplus of daytime energy. Combining solar energy generation with storage can be beneficial for both building economics and grid resilience. Storage may also be done in collaboration with electric vehicle charging stations. The main benefits of energy storage are the ability to lower energy costs by enabling energy arbitrage (buy when prices are low and sell/use on site when grid prices are high) and demand charge management, solving intermittency of renewable energy, and improving grid resiliency by lowering the chance of outages.

LIFE-CYCLE IMPACTS OF SOLAR

All energy sources have life-cycle carbon and environmental implications. Solar panels create renewable and carbon-free electricity; however, their manufacturing is carbon intensive, can be water intensive, and uses hazardous materials and caustic chemicals. Panel manufacturing facilities in countries without strong environmental protections can pollute the surrounding environment. To limit emissions from transportation and environmental impact, some building developers are selecting locally made solar panels.

In addition, solar panels do not last forever (general life span is 25 to 30 years) and to reduce material waste, manufacturers will need to figure out how to recycle them. Prioritizing solar panel manufacturers that offer recycling is a good first step to ensuring that old solar modules do not simply end up in a landfill. In the United States, Washington state has already passed legislation requiring manufacturers to finance the recovery and recycling of panels sold in the state.

DISTRIBUTED ENERGY RESOURCES AND GRID-INTERACTIVE BUILDINGS

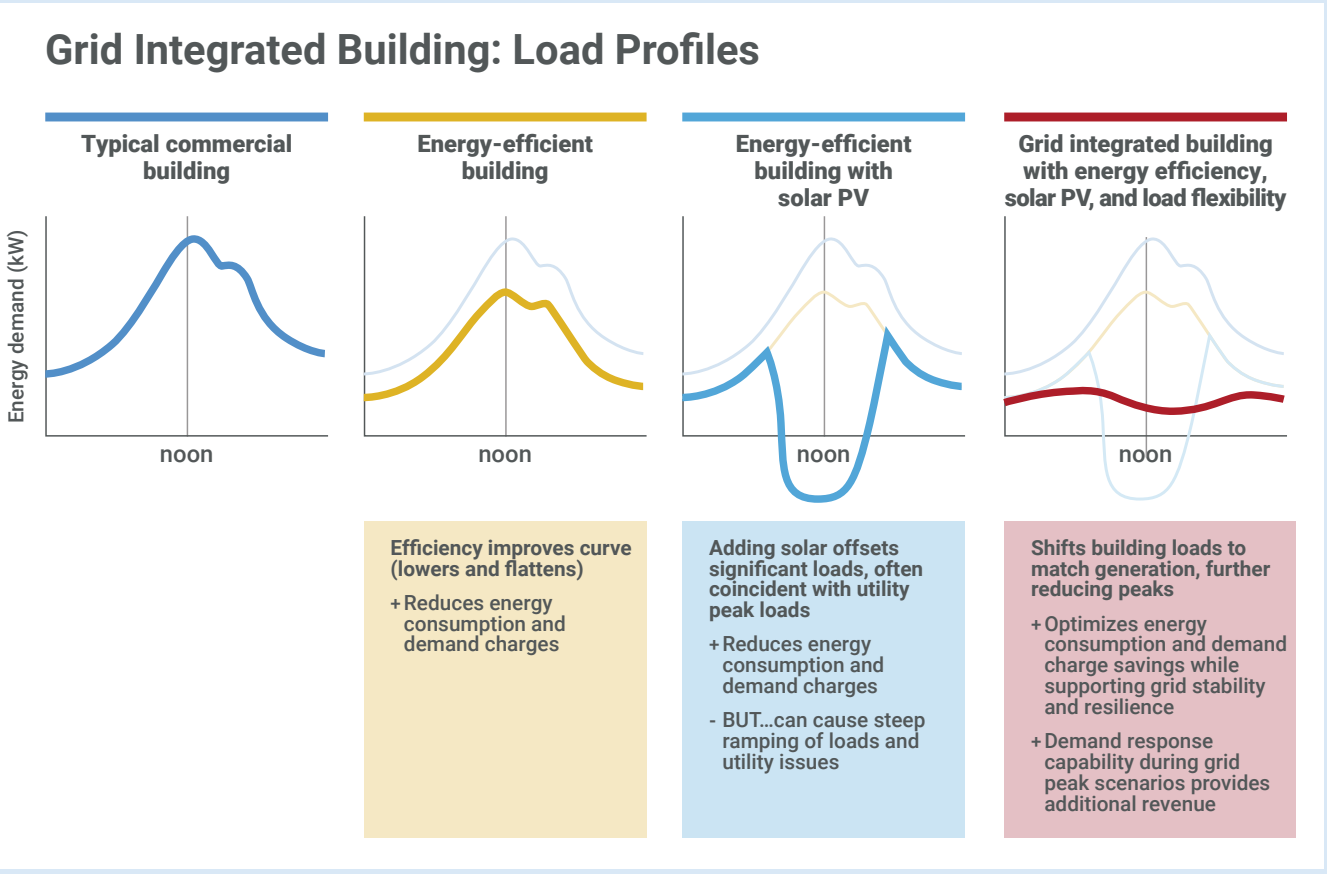
Utility grids were originally developed with centralized generators connected to transmission grids. With more renewable energy on buildings joining the grid every year, an increase in building electrification, and increased extreme weather, along with the variability of renewable power generation timing, utilities will need to find new ways to balance supply and demand.

Achieving grid decarbonization will require moving away from centralized power generation and moving toward the creation of distributed energy resources (DERs) through decentralized systems like on-site solar and storage. One type of DER is grid-interactive efficient buildings (GEBs), energy-efficient buildings with smart technologies that optimize energy use for the utility, tenant comfort, and energy costs. Integrating GEB technologies promotes affordability, resilience, and environmental performance. Figure 4 shows how GEB technologies smooth the building energy load throughout a day.

According to research from the Rocky Mountain Institute, buildings with the greatest cost savings potential from GEB technologies are those in areas with high demand charges, moderate-to-high electricity consumption charges, and time-of-use rate structures.

For more details on developing GEBs, see the U.S. Department of Energy's *A National Roadmap for Grid-Interactive Efficient Buildings*.

Figure 4. How GEB Systems Change the Building Demand Curve



Source: Rocky Mountain Institute, Grid-Interactive Energy Effiicient Buildings (GEBS).

Retrofitting Existing Buildings with On-Site Solar

With 80 percent of buildings expected to be in use in 2050 already in existence today, there is ample opportunity for existing building retrofits to incorporate on-site renewable energy.

When vetting a portfolio of existing buildings for on-site solar systems, roof age, strength, and available space are the primary concerns. The best candidates are often buildings with recent roof replacements. It is not recommended to add solar to a building that needs a roof replacement within five years, because the cost to remove and reinstall the panels during a roof replacement is significant. As such, building owners with roofs that will need replacement at some point during the solar panel life cycle are generally encouraged to replace the roof before installation. If done correctly, rooftop solar will not negatively impact roof integrity so different mounting systems should be selected to meet those needs. Expert solar installers should also assess roof drainage, structural integrity for snow and wind, and local fire codes.

If a building owner plans to own the renewable project, asset managers often consider financing options during the annual capital planning cycle. Once one project is completed, the process is easy to replicate from building to building for buildings in the same local market.

Due Diligence and the Building Life Cycle

As the number of on-site renewable energy installations continue to increase, real estate investors are likely to consider purchasing assets that have preexisting solar panels in place. During the due diligence process, purchasers can obtain and review all contracts, roof leases, and system drawings to understand the deal structure and identify any red flags or potential costs.

As new buildings are added to the portfolio, it is also important to assess their potential for renewable energy systems. Some real estate organizations are already pre-vetting assets during due diligence with their renewable energy consultant, since getting approval to re-roof a recently acquired building is challenging after closing the transaction. Figure 5 includes a list of questions that can be incorporated during the due diligence process to assess current renewable energy assets or the potential for future deployment.

During building disposition, an opportunity exists for the on-site system to be additive to the overall asset value. If a solar lease is generating rent for a period of time, the net present value of this future cash flow can be reflected in the sale price, similar to a traditional tenant lease. If the system is owned outright, the reduced electricity costs and the long-term value of any renewable energy that would be sold to tenants or back to the grid, as well as the future value of RECs generated can also add value to the building at exit. Recent guidance from the Royal Institution of Chartered Surveyors recommends property valuers to consider costs required to meet energy performance standards in different markets, so not having energy efficiency or renewable energy incorporated at a property may lower overall property valuation.

Property Management and Operations

Installing on-site renewable energy systems requires continuous maintenance to operate efficiently and maximize value. In many instances, the system owner (either building owner or third party) is contractually obligated to make sure the system performs at a certain level for its lifetime, so a maintenance plan is important to make sure there is no breach in a PPA, lease, or long-term REC sale agreement.

Figure 5. Renewable Energy Questions to Add to the Due Diligence Checklist

Renewable energy questions to ask during due diligence	Why?
Is there any on-site low-carbon/ renewable technology present at the property? (photovoltaics, solar thermal, biomass boilers, CHP, ground-source heat pump, air-source heat pump, wind turbines, fuel cells, district heating connection, etc.).	To determine whether there are on-site renewable energy systems, either owned by the building or leased to a third-party provider
Has a technical energy audit been performed within the last five years?	To determine feasibility for future renewable energy
Identify electric utility provider and go to utility website. Look for “programs & rebates” or “ways to save energy” for incentive programs. You can also search: https://www.dsireusa.org.	To determine whether there are any available state, local, or utility incentives to support the installation of on-site renewable energy projects
Collect contracts for energy purchased through third-party providers (district chilled water, third party–owned renewable energy systems, co-generation providers, etc.).	To determine whether renewable energy is being purchased for the property

For on-site solar arrays, it can be helpful to conduct third-party commissioning immediately after installation. Especially on large arrays, checking each panel, connection point, and other piece of equipment ensures that the investment achieves peak performance for a cost that is insignificant in comparison to the full project cost.

Solar contractors may include operations and management of the system for an initial period, but it is important to have a long-term operations and management plan in place. This agreement ensures that the array is monitored (can be done remotely and through one or two annual site visits), that all panels remain functioning, and that bad inverters or conduits are identified and replaced quickly by technology experts to ensure long-term performance. While each component of a solar array will likely have a warranty, any equipment replacements outside of that period will generally come out of pocket.

Tenant Leasing

Standard commercial leases assign landlords the responsibility of maintaining the property but assign the majority of utility costs to the tenant, creating a split incentive where investing in sustainability measures is not financially beneficial for either party. To overcome the split incentive and drive investment in sustainable building features that add value for both the landlord and tenant, green lease clauses can be added to a standard lease.

Green lease clauses can address a wide range of actions that make a building more efficient. Figure 6 provides example lease language that addresses the installation and/or purchase of renewable energy. These example clauses can be used as a starting point when updating a standard lease form. As more tenants request spaces powered by renewable energy and landlords look to address their scope 3 emissions, versions of these clauses will likely become more standard.

RESILIENT SOLAR PHOTOVOLTAIC SYSTEMS

With climate change causing increased extreme storm strength and frequency, it is important to minimize equipment damage and system recovery time. For design specifications that boost system survivability identified from recent hurricanes, see the U.S. Department of Energy's Federal Energy Management Program best practices in "Solar Photovoltaic Systems in Hurricanes and Other Severe Weather" and NREL's *Solar Photovoltaics in Severe Weather: Cost Considerations for Storm Hardening PV Systems for Resilience*.

Figure 6. Examples of Green Lease Clauses

Theme	Source	Clause
Green power purchasing for RECs	U.S.General Services Administration: "High Performance Lease Criteria and Sample Lease Language"	At least [50/100] percent of [the building's][Tenant's] electricity shall be purchased from renewable sources. Where direct green power purchasing is not available from the utility, use Renewable Energy Credits (RECs) or carbon offsets. For the purposes of this lease, "renewable sources" [shall] [shall not] include nuclear-generated power.
Reduction of carbon intensity	City of Sydney: BBP Leasing Standard Template Clauses	The parties [may/will] purchase or use [insert/a percentage, as agreed between the parties], of GreenPower, low carbon electricity or renewable electricity to reduce the carbon intensity of the Base Building or Premises.
Purchase of on-site renewables (tenant perspective)	Institute for Market Transformation/U.S. Department of Energy: Green Lease Library	Tenant may install solar panels on the building, and Tenant is entitled to all benefits to be derived from such installation, including any incentives and credits and any revenues resulting from power generation.
Purchase of on-site renewables (landlord perspective)	Institute for Market Transformation/U.S. Department of Energy: Green Lease Library	Tenant shall be entitled to place electrical generating equipment on the Building's roof pursuant to the terms and conditions set by the Landlord. All of the terms of this Lease shall be applicable to Tenant's Generating Equipment as if the Generating Equipment were part of the Premises, but Tenant acknowledges that the Generating Equipment is not part of the Premises. The Generating Equipment and rooftop shall not be used for any other purpose without Landlord's written consent. Tenant shall bear all of the cost and expense of designing, purchasing, installing, operating, maintaining, repairing, removing, and replacing the Generating Equipment, and for repairing and restoring any damage to the Building or to Landlord's or any other person's or entity's property arising therefrom. The Generating Equipment shall be installed and maintained by Tenant in a manner reasonably acceptable to Landlord. Nothing herein grants Tenant any right to access the roof of the Building unless accompanied by an employee of the Building Manager or other representative of Landlord, except that access shall be permitted in emergencies. Tenant's rights to place Generating Equipment on the rooftop are nonexclusive.

Project Summary

On-Site Project Profile: Long-Term Value from On-Site Renewable Energy

COMPANY:
Heitman

BUILDING LOCATION:
Slough, Berkshire, England

PROJECT STRUCTURE:
Combining energy efficiency and renewable energy to achieve net zero

TOTAL INVESTMENT:
28 kW

(Heitman)

Heitman, a global real estate investment management firm, carefully considers ESG principles during the investment process. This provides opportunities to create value, reduce risk, and enhance investment returns. Heitman is also committed to reducing operational carbon emissions of the private equity portfolio under its control to net zero by 2030. Acquiring assets that have implemented on-site renewable energy projects is one step along the pathway to Heitman achieving its goal.

Space Station in Slough, England, is an 86,000-square-foot self-storage facility, converted from a former industrial warehouse and comprising self-storage units and tenanted offices. In 2012, 28 kW of roof-mounted solar panels were installed to help reduce the property's energy bills, protect against future increases in electricity, and reduce reliance on fossil fuel–generated energy sources.

An investment of £60,000 (US$78,000) was made in the solar panels, and the system saves an estimated £11,000 (US$14,000) on annual energy bills. Energy bill reductions come from feed-in tariffs, which allow the property to sell generated energy back to the grid. Even without incentives, the project payback period was six years.

During project development, a few important considerations affected size and installation. A comprehensive review of the roof integrity was important, and care had to be taken to ensure the roof remained watertight. The size of the installation was also limited by the amount of power the grid could receive. Although the roof would have allowed installation of more solar panels that could have enabled double capacity, the local substation has a generation limit of 50 kW, and the remaining generation was accounted for by other projects.

Since 2012, the system continues to save on energy costs, and the panels have only required minimal maintenance. The system also reduces the overall greenhouse gas emission impact on site and exports additional renewable energy to the grid. The Space Station portfolio currently has systems installed at five facilities totaling 205 kW of renewable energy capacity. As investors and potential self-storage customers become more focused on environmentally conscious building attributes, facilities integrating carbon mitigation strategies will be viewed as more marketable over time.

> "Beyond our efforts to improve energy efficiency, using on-site renewable solar power meaningfully reduces our carbon footprint and also our exposure to price volatility in the energy market."
>
> —Laura Craft, senior vice president, head of global ESG strategy, Heitman

Project Summary

On-Site Project Profile: Scaling Up On-Site Solar

COMPANY:
Prologis

BUILDING TYPE:
Industrial

BUILDING LOCATION:
California and New Jersey

PROJECT STRUCTURE:
Standardizing solar systems across eligible distribution centers for lease customers

TOTAL INVESTMENT:
Paid by Prologis

TOTAL ENERGY GENERATED:
305 MW

(Prologis)

A global owner, operator, and developer of logistics real estate, Prologis incorporates the global energy team into Prologis Essentials, a platform to help its customers (building tenants) access various services and solutions for their warehouses. This platform seeks to resolve customer pain points, from racking and forklifts to meeting renewable targets and accessing renewable energy.

After seeing customer interest in purchasing renewable energy, Prologis Global Energy launched SolarSmart, a program that allows Prologis to size solar projects to accommodate customer consumption, specifically in California and New Jersey. Prologis can leverage roof space, customer desire, and 14-plus years of internal experience developing solar. So far, Prologis has installed 305 MW of solar power, with a global goal of 400 MW of solar capacity by 2025. According to the Solar Energy Industries Association, Prologis has the third most on-site installed solar capacity among U.S. corporations.

The Prologis portfolio is ideal for solar development, with large industrial distribution center roofs and consistent energy consumption across tenants. Even if a customer moves out, lighting and basic materials handling are common across all users, ensuring that projects are sized appropriately. Using baseline energy consumption data from the global portfolio, Prologis can build a standard solar system in about nine months from initial conversation to project delivery. Customers sign offtake agreements for the energy on the same timeline as their building lease.

To identify eligible buildings, Prologis reviews asset characteristics, including roof age, and tracks relevant renewable energy policies and incentives. The SolarSmart program started with customers in California and New Jersey, where net metering allows customers to get credit throughout the year for excess power produced, which is subtracted from the overall annual energy bill. With a constantly changing regulatory landscape, Prologis is actively developing solar in other U.S. markets, including Arizona, Illinois, Maryland, and Nevada, as well as internationally in the Benelux countries, China, Germany, Italy, Japan, and the United Kingdom.

Prologis also hosts community solar projects in some markets. In New York City, 40 percent of community solar energy offtake can be commercial and 60 percent residential. For these projects, all 40 percent of commercial offtake is purchased by Prologis building customers and the other 60 percent by utility subscribers in the New York City boroughs.

Prologis customers are often companies with carbon or renewable energy targets. Although the goal is set at the corporate level, the responsibility to achieve the goal is put on the customer's local facility manager. The SolarSmart program supports facility managers in creating turnkey solutions so they can focus on other challenges such as supply chain delays and employee satisfaction. Going forward, Prologis plans to standardize battery storage and fleet electric vehicle charging as well to support both customer and grid resilience.

Off-Site Renewable Energy Procurement

For many real estate organizations aiming to achieve net zero, energy efficiency improvements and on-site renewable energy installations will not be able to meet the full energy demand of a building.

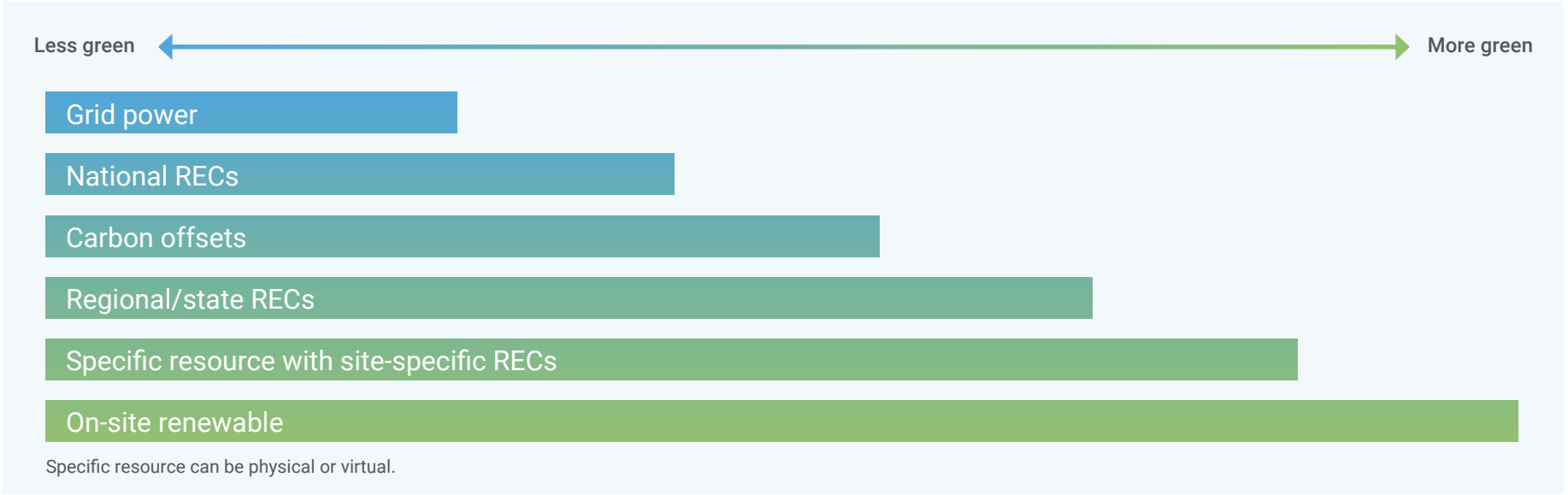
Figure 7 shows that while the greenest option is on-site renewable energy, a number of off-site green power options can be considered as part of the pathway.

The purchase of off-site renewable energy is complicated because of the utility grid's complexity and the many options for buying green power. Centralizing power procurement for a set of buildings can stabilize costs and even obtain more favorable rates. Purchasing renewable energy in bulk can offset the slight increase in cost for green power.

Renewable energy consultants see the greatest business case for off-site renewable power from organizations that have set a sustainability goal related to renewable energy. As more organizations move toward decarbonization, deal size and volume of activity continue to increase. Similar to on-site renewable energy projects, there are multiple deal structures to consider.

Off-site renewable energy is still a new concept for many in the real estate industry; however, for those looking to get involved, there are many ways to be a part of the conversation, whether through trainings or case study sharing. Organizations like the Clean Energy Buyers Association (United States) and the RE-Source platform (Europe) provide forums for energy customers seeking to procure clean energy across the globe. In addition, many vendors offer standardized services that can screen portfolios for green power opportunities and negotiate the contracts.

Figure 7. Ranking Energy Options by Level of Green



Source: Resource Energy.

Utility Green Power Programs

The easiest method of procuring green power at the building level is to take advantage of green power programs of regulated utilities or deregulated markets with retail choice. These programs allow a building to purchase some or all of its power supply from local renewable energy sources connected to the utility grid. This power is almost always sold at a premium over "brown-power" retail rates to cover the incremental cost or fund the utility's investment in future renewable energy projects. These deals are not complex, and this energy can be purchased by organizations of all sizes and levels of expertise; however, it is recommended for them to consider whether the purchased renewable energy is additional to the amount utilities are required to produce by law.

One such program in regulated utility markets is green tariffs, where utility regulators allow the utility to negotiate a long-term green power contract (for both the RECs and electricity) for an individual organization or multiple large organizations to make a large energy purchase.

BEYOND ADDITIONALITY

"Additionality" means that a renewable energy project generates additional grid capacity, is added to the grid as a direct result of the investment, and would not exist without the actions/investment. More and more firms find this attribute of off-site renewable energy to be important to have a greater level of green and to avoid potential risks of greenwashing. However, a new idea associated with off-site renewable energy purchases is that organizations should also consider "emissionality," which compares the specific emission reductions from different renewable energy projects, leading organizations to focus on locating projects where the grid is the dirtiest.

Every organization is different: for example, a REIT with a national office portfolio has access to different resources than a small family-owned business with three buildings on one utility grid. Some in the industry are now encouraging organizations early in their journey toward renewable energy to begin getting off-site deals done by looking at projects with the strongest economics and socializing the concept internally. Once deals are complete, an organization can begin figuring out how to market to tenants and the community. The purchase type and emissionality or additionality can then be assessed as goals and capabilities get more advanced.

Energy Attribute Certificates

Energy attribute certificates (EACs) document that the energy consumed comes from specific sources. EACs for renewable energy are commonly known as renewable energy credits (RECs) in North America, guarantees of origin (GOs) in Europe, and I-RECs in a number of countries in Asia, Africa, the Middle East, and Latin America. One REC represents 1,000 kWh or 1 megawatt-hour of a renewable generator's green attribute.

REC pricing is not consistent and varies based on technology (solar RECs, often called SRECs), location, cost of finance, level of project development, allocation of risk, local incentives and regulation, and risk mitigation structures. RECs are bought annually and often have some flexibility (Green-e certified RECs can be bought either six months before the calendar year or three months after to ensure all energy consumption of a building/portfolio is accounted for).

The Center for Resource Solutions' global Green-e certification is a common third-party program to verify renewable energy products. Many organizations sourcing RECs on the open market require their purchase to be Green-e certified. A number of organizations like the Gold Standard, Carbon Registry, and RE100 have also developed protocols and standards for RECs.

According to RE100, making a credible claim requires the following criteria:

- **Credible generation data;**
- **Attribute aggregation;**
- **Exclusive ownership (no double counting) of attributes;**
- **Exclusive claims (no double claiming) on attributes;**
- **Geographic market limitations of claims; and**
- **Vintage limitations of claims.**

An REC is tracked by identification number and can be considered "retired" once it is claimed (either by sale or use for internal carbon accounting). REC retirement is confirmed by regional tracking systems that use unique serial numbers for each REC. RECs can be either unbundled or bundled. Unbundled RECs are when the renewable energy attribute and the power itself are disaggregated and sold separately. Unbundled RECs are typically cheaper and do not depend on local markets. Bundled RECs sell the power and credits together in one transaction.

For now, many areas have no rules or regulations requiring real estate RECs be purchased in the same grid as a building or portfolio. In fact, RECs purchased to satisfy net zero goals are often from locations outside the local grid due to high costs in some areas. However, this may change in the future because some recent legislation, including New York City's Local Law 97, requires any RECs purchased to meet the emissions standards be limited to energy generated or connected to the New York City grid (zone J load zone).

Global Green-e certified renewable energy credit purchases continue to increase year over year. The Clean Energy Buyers Alliance also tracks global renewable energy deals, and in 2020 50 percent of energy buyers were new to the market; the IT sector represents the highest procurement volume, and real estate has historically not made up a large share of the market.

Some real estate organizations with existing on-site solar projects that feed into the grid often started out selling the SRECs; however, as reporting requirements increase and SREC sales hurt the abilities to make sustainability claims, trying to retain RECs for corporate carbon accounting/goals has surged again.

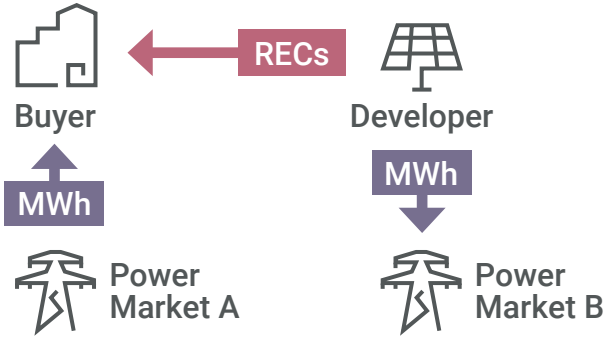
When making decisions about renewable energy purchases, it is important for an organization to understand the claims being made and any potential risks. Once a claim or public press release is made that a building or portfolio is powered 100 percent by renewable energy it can be hard to walk that back, even though REC prices will fluctuate over time. If buying RECs is a piece of a carbon neutrality goal, organizations can consider a longer-term purchase to protect against price exposure. In addition, the more efficiency and on-site kWh reductions, the fewer RECs need to be purchased.

If organizations are concerned about making green claims, many countries have consumer protection guidance available online (Australia, United Kingdom, United States).

Power Purchase Agreements

Power purchase agreements for renewable energy are typically structured as physical or virtual (also known as financial PPAs). Selecting between these two options depends on pricing and location. Both allow for the purchase of large volumes of electricity through a single transaction.

Figure 8. Comparison of Physical and Virtual PPAs

Type	Physical PPA	Virtual PPA
		
Energy settlement	Buyer receives and takes title to physical energy, responsible for coordinating delivery and scheduling	None (strictly financial)
Financial settlement	Buyer agrees to fixed price (including RECs) through supplier or directly to seller	Contract-for-differences settled directly with seller
Geographic flexibility	Limited to projects located in regional grid footprint	More flexibility—projects can be in the United States
Project linkage	Strong—direct match of project production with customer facility usage	Not as strong—no physical delivery

Source: Enel X.

There are also multiple methods of procurement, including sourcing from a single vendor, using an informal bidding process with several potential providers, a formal competitive bidding process, online reverse auctions, or aggregation of multiple renewable projects (solar + wind).

Once building owners finalize the PPA deal, they can use various funding sources to pay the annual costs. Some are considering passing the costs on to the individual portfolio funds. Others, if the lease language allows it (those with green leases, or with no triple-net leases in the portfolio), can pass through at least a portion of the costs as an operating expense to tenants, which can be included in their rent. However, it depends what accountants and auditors feel comfortable passing through to tenants.

Physical Power Purchase Agreements

Physical PPAs involve a physical transmission of electricity to the electricity grid that is contracted out to a corporate power consumer/offtaker (in the case of real estate, a building owner or its tenants). The project developer and offtaker(s) agree to set a price (or pricing structure) over the course of a contract that can last five to 20 years. With a pricing structure, the rates can escalate over time, but generally at a lower rate than traditional utility escalation, thereby strengthening project financials.

Similar to a leased on-site renewable energy deal, no upfront capital is required and the installation is funded and owned by a third party. PPAs can generate additionality by providing a guaranteed offtaker, making a project more investable and supporting the construction of new renewable assets.

POLLINATOR-FRIENDLY SOLAR

Solar farms cover a wide range of land. The standard ground-mounted solar site is developed over gravel or lawn grass. To maximize the benefits of solar projects, many organizations are beginning to procure pollinator-friendly solar, where native and pollinator-friendly vegetation is planted around and under the solar array to combat the disappearance of habitat for critical pollinators like bees and butterflies. Pollinator habitat increases the population of critical species in the ecosystem, improves soil and water quality, and has been shown to improve yields in neighboring agricultural lands.

To incorporate pollinator-friendly solar into the off-site procurement process, find sample language at the Center for Pollinators in Energy.

Virtual Power Purchase Agreements

Virtual power purchase agreements are a bundled option for purchasing RECs. Like physical PPAs, VPPAs contract directly with power generators for the electrical output, but the actual power does not physically flow from the generator to the buyer and is instead financially settled (completely independent of physical power supply). VPPAs include a strike price, or the price per megawatt-hour that the buyer agrees to pay the project owner. While they do lower price volatility, one potential downside of VPPAs is that building owners are essentially betting on the market: if the market cost of electricity is lower than the strike price, the building owner must still pay the full amount. As energy prices continue to fluctuate due to a number of factors, risk can be difficult to assess.

VPPAs are easily scalable and often a good fit for large and national portfolio purchases, because they lack geographic limits and can be redistributed throughout a portfolio as properties are added or sold. New properties can purchase additional RECs on the open market and kWhs associated with properties that have been sold can be put back in the general VPPA bucket for redistribution within the portfolio. Sizing the deals appropriately so that total consumption is matched with renewable energy and minimizing annual true-up costs to achieve net zero or another carbon goal, while also not overspending annually, can be a challenge. Detailed carbon accounting is necessary to accurately estimate future consumption.

For building owners that may want to divest in five to 10 years, a 20-year contract can be considered a risk for disposition. However, if a building is sold, there are ways to make sure that a contract is transferrable between owners.

Project Summary

Off-Site Project Profile: Purchasing 100 Percent Renewable Electricity in Mainland China

COMPANY:
Hang Lung Properties Limited (through local subsidiary in Kunming)

BUILDING LOCATION:
Yunnan Province, China

PROJECT STRUCTURE:
Purchase of renewable energy to replace grid electricity

TOTAL INVESTMENT:
No investment—reduction of current energy costs for owner and tenant (expecting roughly 10 percent savings in 2022)

(Hang Lung Properties Limited)

"The Spring City 66 transaction was completed in months, affirming that Hang Lung can be both disciplined and fast in executing an important initiative, and providing a quick win for our long decarbonization journey. We plan to build on this landmark achievement."

—John Haffner, general manager–sustainability, Hang Lung

Hang Lung, a builder, owner, and manager of commercial properties in Hong Kong and Mainland China, is increasing its purchase of renewable energy to achieve the company's sustainability targets, including a goal of meeting 25 percent of its mainland China portfolio electricity demand with renewable energy. Although both on-site and off-site opportunities are being considered, the potential for on-site clean energy is often limited, so the Hang Lung sustainability team began exploring off-site renewable energy purchases.

Spring City 66, a LEED Gold commercial complex (enclosed mall and office tower) in China's Yunnan Province, officially finalized a deal to purchase 100 percent renewable energy for electricity in late 2021. Hang Lung prioritized the direct purchase of renewable electricity (over simply purchasing renewable energy certificates), ultimately procuring 57,800 megawatt-hours of electricity per year from solar, wind, and hydro sources. This purchase offsets annual electricity consumption for both tenant and landlord operations and reduces emissions by 46,471 metric tons per year.

Yunnan's power exchange is set up to enable this type of energy purchase, but the deal was still complex to execute. Hang Lung worked with CLP Group, a trusted energy wholesaler, also based in Hong Kong, but still needed to select a retailer. The potential retailer pool was prequalified to include only high-volume annual electricity transaction companies with good credit profiles, and the final vendor selection was ultimately based on price. Internally, the project team also needed to engage and educate multiple departments to obtain sign-off, including finance, legal, central purchasing, the property team, and top management.

Based on its historical use, and allowing for expected increases in occupancy, Hang Lung estimated its 2022 electricity consumption and provided the retailers this information to support the transaction. The company then chose the lowest-cost offering among the prequalified retailers. Because this deal will be renewed annually, if future energy efficiency projects take place at Spring City 66, the total amount of electricity purchased can also be reduced, saving additional costs.

Hang Lung also has several tenants with their own sustainability goals, including some committed to RE100 (100 percent renewable electricity). At Spring City 66, Hang Lung looks forward to engaging current and future tenants about how the purchase of renewable energy is both sustainable and cost saving. For the first year of the purchase, tenants will pay less for their regular electricity bill. Because renewable energy costs may fluctuate in the future, Hang Lung expects to communicate with tenants about their goals and cost sensitivities before making purchase decisions.

After Spring City 66, 14 percent of Hang Lung's Mainland China developments will be powered by renewable energy. The property's location in Yunnan is already served by a highly renewable energy grid, but switching to 100 percent renewable energy still has a significant impact on Hang Lung's 2025 clean energy goal. Only one more transaction in a mainland China property is required for Hang Lung to meet its 2025 renewable energy goal, and Spring City 66 provides a strong proof of concept for the larger Hang Lung portfolio.

Project Summary

Off-Site Project Profile: Landlord-Tenant Collaboration

COMPANY:
Transparent Energy

BUILDING LOCATION:
Chicago, Illinois

PROJECT STRUCTURE:
Tenant and landlord combine energy loads for green energy purchase

TOTAL INVESTMENT:
3% to 5% reduction in energy costs

For one building owner, a tenant in a triple-net lease established the goal of reducing its carbon emissions in line with the Paris Accord by purchasing 100 percent renewable energy for its offices by the year 2030. To achieve this goal, the company had already begun purchasing Green-e certified RECs to cover 100 percent of electricity use at its corporate headquarters, a significant number of floors of the building owner's class A office tower in Chicago. The RECs cover the tenant's direct energy use in its space, including plug loads and lighting, but not the HVAC system and common areas of the building, which were paid and controlled by the building owner. In addition, the RECs were "unbundled," or purchased separately from the energy that a renewable generator produces. Although widely used, unbundled RECs lack visibility and direct traceability to the source, and the tenant would prefer a more direct purchase of renewable energy; however, its energy load is too small for a separate PPA.

Simultaneously, the building owner/asset manager is in the process of completing a renewable energy strategy and developing its own carbon reduction commitments. While it expects to procure a renewable PPA for its portfolio in the future, it is not ready to contract a portfolio-wide solution and has not procured renewable energy for the HVAC system or other common areas at this class A office building.

While the tenant and building owner have similar goals, working to address the carbon impacts of the spaces they control created challenges of scale. Transparent Energy, a ULI Greenprint Innovation Partner and the tenant's renewable energy broker, proposed a solution in which both building owner and tenant work together. By combining the loads of both the building and the tenant space into a single competitive sourcing event, contracts for 100 percent renewable electricity were competitively bid on by retail energy suppliers and geographically relevant renewable projects. This supply contract combines the ease and security of a traditional retail electricity contract with the breakthrough of directly sourcing from a specific selected renewable project on a more traditional retail supply contract. These innovations provide transparency, which the tenant was seeking at a price point that is better than the tenant or the asset manager would achieve independently.

The resulting contracts save both the tenant and the landlord about 3 to 5 percent in overall electricity costs. In addition, the shortened three-year term allows the property to participate in the building owner's potential portfolio-wide PPAs in the future, in accordance with its renewable energy strategy, supporting short-term clean energy goals and creating a bridge to long-term solutions.

"What do you do when a major tenant has clean energy goals that do not align with the goals or actions of the property? With net zero carbon pledges flourishing across the country and around the world, this lack of alignment is becoming a problem in commercial real estate. As a ULI Greenprint Innovation Partner, Transparent Energy is proud to have found a way for two parties in this situation to come together to meet their needs—a true 'win-win.'"

—David Braun, vice president, partnerships and renewable project origination, Transparent Energy

24/7 CARBON-FREE ENERGY

With different markets using different grid energy sources, even throughout the day, not all kilowatt-hours generate the same environmental impacts. While an organization may purchase renewable energy to offset total usage over a specific time period, variability in renewable energy availability and production (e.g., solar production only during the day, wind production only when it blows) means that electricity consumption was likely not powered by renewables at all times of day.

According to the United Nations, 24/7 carbon-free energy means that every kWh of electricity consumption is met with carbon-free electricity sources, every hour of every day, everywhere. For organizations to achieve 24/7 carbon-free energy, renewable energy must be available to purchase at all times of day, requiring a substantial increase in renewable energy available for purchase. Technology will also be needed to track energy use, match it with available renewable energy for purchase, and forecast energy use to ensure that future demand is met. Finally, energy storage will play a key role supporting a shift in electrical load during peak renewable energy production. Corporate tenants like Google have already committed to 24/7 carbon-free energy in all global data centers and office campuses by 2030, while real estate firms are in early stages of implementing this type of renewable energy project.

Project Summary

Off-Site Project Profile: Purchasing 24/7 Carbon-Free Electricity

COMPANY:
Brookfield Properties

BUILDING LOCATION:
New York, New York

PROJECT STRUCTURE:
Bundled energy and renewable energy certificates to replace grid electricity

TOTAL INVESTMENT:
$0.11 per square foot

(Brookfield Properties)

"Brookfield Properties' plan to provide 100 percent renewable electricity at One Manhattan West is just the first step in carrying out our commitment to achieve net zero carbon by 2050 across our entire portfolio."

—Michael Daschle, vice president, operations, Brookfield Properties

In January 2022, Brookfield Properties signed a five-year contract to purchase 100 percent of the electricity needs of One Manhattan West from New York–based renewable energy providers. The deal is one of the largest intrastate renewable energy agreements for a single building in New York City, and it makes One Manhattan West the first building in Brookfield Properties' New York portfolio to meet all its electricity needs with renewable energy. Purchasing 100 percent renewable electricity also directly supports Brookfield Asset Management's broader goal of achieving net zero carbon emissions by 2050.

The purchased RECs are generated from hydropower facilities owned by Brookfield Renewable, one of the largest renewable energy providers in the state, which owns and operates more than 70 hydropower facilities and three wind farms in New York state, accounting for nearly 900 megawatts of renewable generating capacity, enough to power 440,000 homes annually. The cost of the RECs represents an increase to the building's electricity costs of about 9 percent (on an annual basis, about $350,000). The added costs, about $0.11 per square foot, are shared on a pro rata basis between the base building and tenants according to parameters in each tenant's lease. Because many Brookfield tenants now have their own sustainability goals, tenants have supported this purchase and many new requests for proposals from prospective tenants now include a requirement to confirm the ability for the building to provide the tenant with renewable energy.

The New York Generation Attribute Tracking System already tracks the generation and purchase of RECs to ensure RECs are only purchased once. However, to further improve the authenticity of the renewable attributes of the electricity provided to the property, Brookfield will use ClearTrace, a blockchain-based carbon accounting technology platform, to digitally match the property's electricity consumption with energy and associated RECs generated from renewable energy sources on an hourly basis, creating auditable records showing 24/7 carbon-free electricity consumption. ClearTrace also connects to One Manhattan West's building management system to track real-time energy consumption. A tenant facility manager can even log onto the platform and check its own energy consumption over time and have a record showing how its specific electricity load was powered through renewable energy.

Because of its location in New York City, One Manhattan West is subject to Local Law 97, which mandates carbon emissions standards for the city's buildings. While this legislation is a driver for Brookfield to consider renewable energy, the RECs purchased in this deal do not meet the city's current standards, which only count renewable energy generated in the city or delivered directly into Zone J, the New York City energy trading zone.

The initial REC purchase is for a period of five years. Brookfield plans to reassess the availability and cost of RECs over time for One Manhattan West and as the company considers scaling up its renewable energy purchasing strategy. To fully achieve its net zero goal, Brookfield will also need to account for carbon emissions driven by the use of district steam at the property.

Carbon Offsets

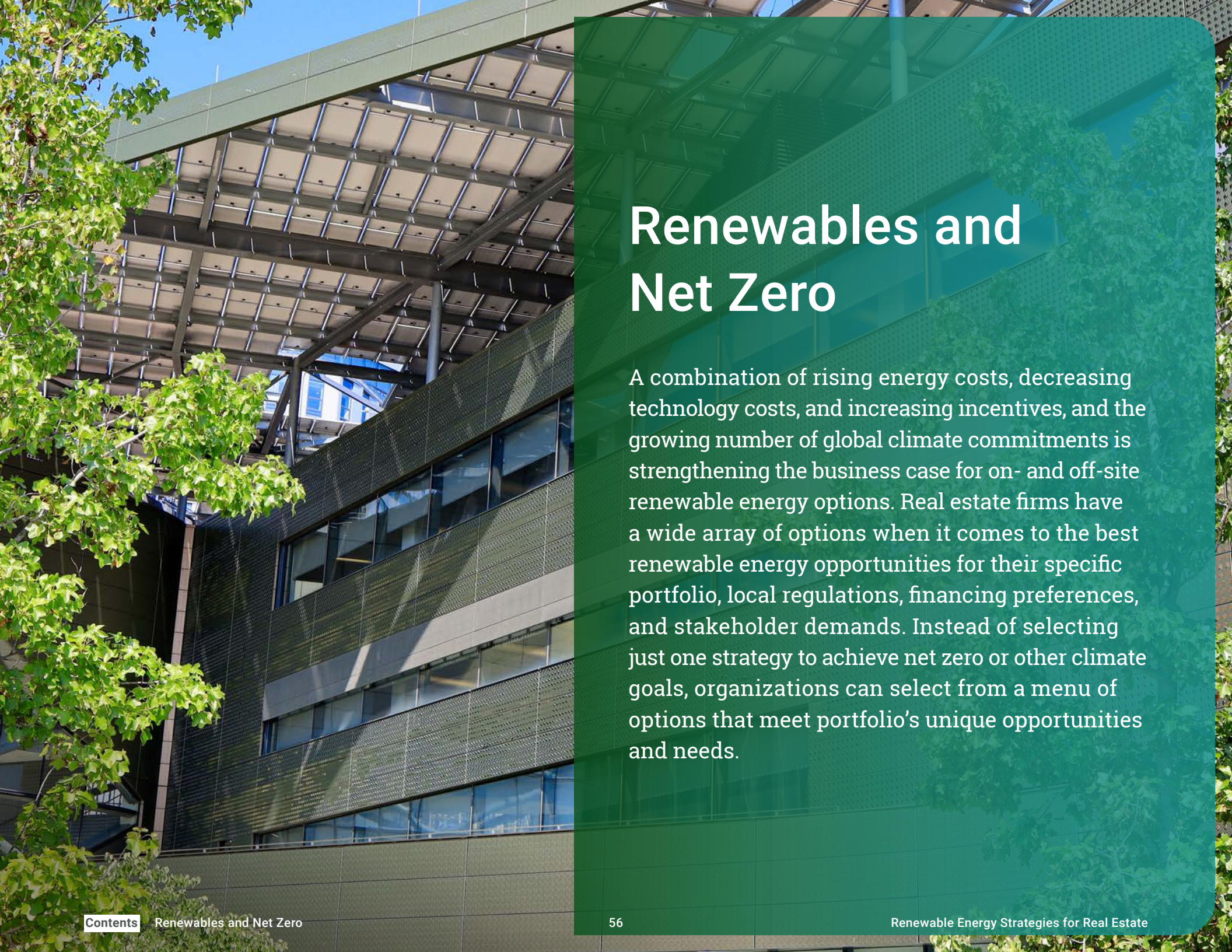
Carbon offsets are a method of financing activities that avoid/reduce emissions, increase carbon storage, or remove emissions from the atmosphere. Carbon offsets are the only way to offset non-electric emissions such as scope 1 emissions from fuel combustion or embodied carbon, because renewable energy, EACs, and green power can be applied to electric consumption only. Unlike renewable energy purchases, offsets are purchased in metric tons of carbon dioxide emissions. When purchasing offsets, key considerations include the total volume, the project timeline, project location, and project vendor.

A wide range of carbon offset opportunities exist. Many in the real estate industry prefer the selected offsets to be located in their region of business or aligned to the business of real estate. Examples of offset projects include landfill gas-to-energy, forest preservation, and hydrofluorocarbon reduction from spray foam.

There is a growing conversation about setting standards for carbon offsets. Some accredited providers, such as the American Carbon Registry, Climate Action Reserve, Gold Standard, or Verified Carbon Standard, issue, certify, and track high-quality offsets. Green building frameworks also set offset standards. The United Nations also has a Carbon Offset Platform, which can be used to certify to the Edge Zero Carbon certification. These offsets contribute to sustainable developments in communities across the world while also improving health, education, and access to energy.

Supporting Tenants in Making Corporate Carbon Claims

An increasing number of tenants are setting climate commitments, tracking their carbon footprint, and reaching out to their landlord for green power purchasing options. Building owners already purchasing RECs/offsets for a portfolio's total energy consumption (scope 1, 2, and 3) can market that benefit to tenants, creating no need for tenants to purchase additional RECs. Building owners receive an annual attestation letter from the REC and offset partner/provider, which outlines what was purchased and can be submitted to industry organizations such as the Climate Registry for third-party verification along with total consumption. If a tenant requests verification of the purchase for its specific space, building owners can share the portfolio attestation, confirm the tenant's total energy consumption was matched through third-party verification, and apply the square foot percentage to the building total.



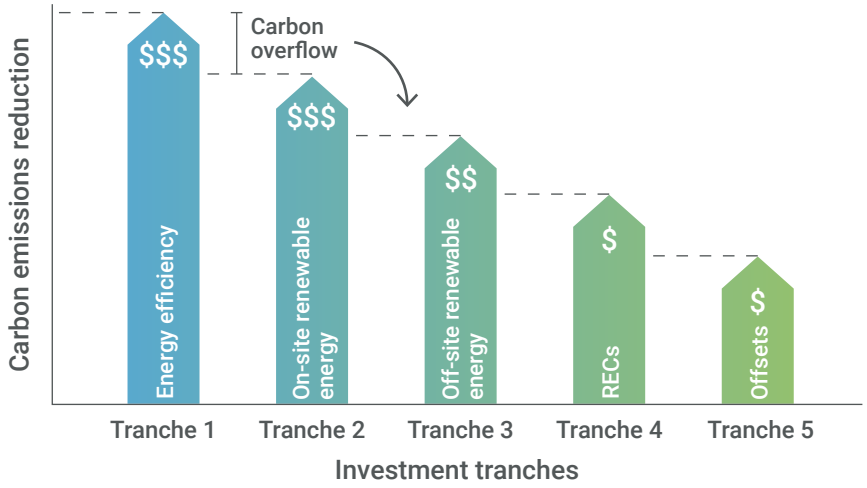
Renewables and Net Zero

A combination of rising energy costs, decreasing technology costs, and increasing incentives, and the growing number of global climate commitments is strengthening the business case for on- and off-site renewable energy options. Real estate firms have a wide array of options when it comes to the best renewable energy opportunities for their specific portfolio, local regulations, financing preferences, and stakeholder demands. Instead of selecting just one strategy to achieve net zero or other climate goals, organizations can select from a menu of options that meet portfolio's unique opportunities and needs.

Renewable energy is an important piece of the net zero equation; however the pathway to net zero does not start there. As shown in MetLife's MetZero Carbon Cascade diagram (figure 9), energy efficiency is often the first step to be optimized because it has the highest impact and return on investment.

For every kWh saved through energy efficiency, a kWh of renewable energy does not need to be generated on site or purchased off site to achieve net zero. In the hierarchy of carbon investments, the next greatest impact is on-site renewable energy, which can be a revenue generator. Then off-site renewables, from green utility energy and bundled RECs to unbundled RECs to offsets. Finally, for buildings currently using fuel combusting energy sources, electrification will also be necessary to fully decarbonize at the building level.

Figure 9. Hierarchy of Carbon Investments



Source: MetLife's "Laying the Foundation: Carbon Neutrality in Real Estate Investment."

MAXIMIZING ENERGY EFFICIENCY

For more details on how to identify a pathway to maximize energy efficiency, consider the following resources:

- *The ULI Blueprint for Green Real Estate*: uli.org/greenprintblueprint;
- ULI Tenant Energy Optimization Program: tenantenergy.uli.org;
- European Commission Energy Efficient Buildings: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings_en; and
- Making the Business Case for Energy Efficiency in Commercial Buildings: https://betterbuildingssolutioncenter.energy.gov/toolkits/making-business-case-energy-efficiency-commercial-buildings.

Project Summary

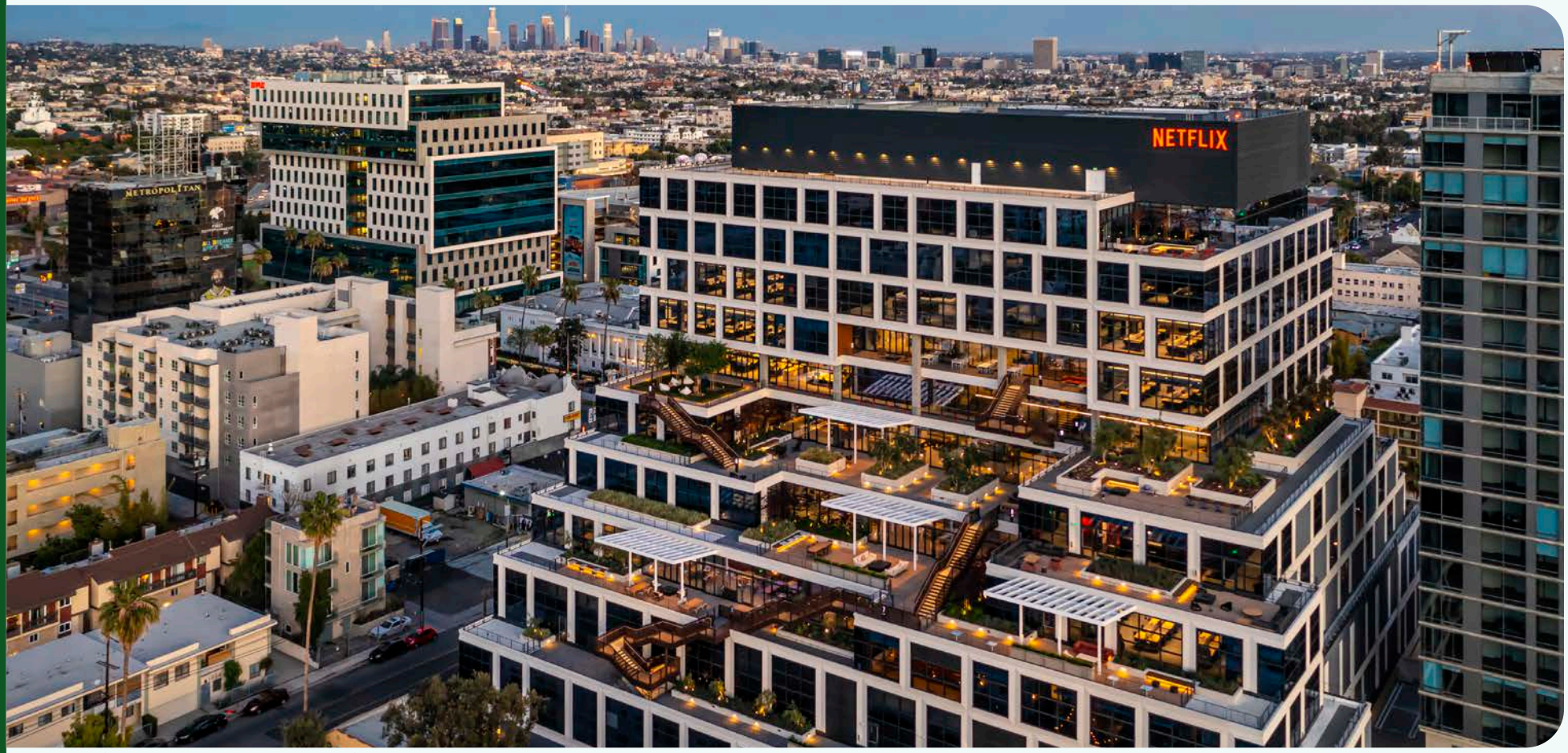
On-Site Project Profile: Renewable Energy as Part of the Pathway to Achieve Net Zero Carbon

COMPANY:
Hudson Pacific Properties

BUILDING LOCATIONS:
West Coast

PROJECT STRUCTURE:
Combining energy efficiency and renewable energy to achieve net zero

TOTAL ENERGY GENERATED:
600 MWh in 2021



(Hudson Pacific Properties)

Hudson Pacific Properties, a real estate investment trust (REIT) with over 19 million square feet (1.8 million sq m) of office and studio properties, believes that climate change is one of the greatest risks to the environment and recognizes real estate's critical role in being a part of the solution. Reducing the portfolio's carbon footprint has always been the primary focus of Hudson Pacific's Better Blueprint environmental sustainability strategy.

In 2020, Hudson Pacific achieved its carbon neutrality goal five years ahead of schedule, making the REIT one of the first major landlords in North America to achieve this important milestone. Hudson Pacific achieved carbon-neutral operations through a four-part strategy:

- **Energy efficiency:** Hudson Pacific makes every effort to reduce on-site energy consumption and resulting greenhouse gas (GHG) emissions as much as possible while operational and engineering teams work toward a target to reduce like-for-like energy consumption by 10 percent from a 2019 baseline. To identify energy reduction opportunities and gain insight into building performance, Hudson Pacific uses real-time energy management software and has invested in a mix of capital and operational projects that includes but is not limited to using LED lighting, installing variable frequency drives, and doing equipment retrofits.
- **On-site renewables:** All new developments and major repositioning projects are required to deploy at least one form of on-site renewable power. Traditional rooftop solar panels are installed and operating at three sites, meeting between 1.5 and 10 percent of a given property's annual electricity needs, and solar feasibility assessments are being conducted at additional properties across the portfolio. In addition to rooftop solar, Hudson Pacific installed the first large-scale commercial application of building-integrated photovoltaics (solar panels built directly into the facade of the building).
- **Off-site renewables and unbundled renewable energy certificates:** Many properties purchase carbon-free electricity from local utilities such as CleanPower SF, Hetch Hetchy Power, Peninsula Clean Energy, and Silicon Valley Clean Energy. Beginning in 2019, the company converted all remaining electricity in its portfolio to 100 percent renewable sources by purchasing unbundled RECs from a wind farm in Texas, which effectively eliminated all Scope 2 emissions from electricity consumption. Hudson Pacific is committed to maintaining 100 percent renewable electricity across its operating portfolio indefinitely and aims to reduce its reliance on unbundled RECs by enrolling more properties in local green power plans.
- **Carbon offsets:** The remaining Scope 1 GHG emissions, primarily generated by natural gas used to heat buildings, are offset by verified emission reduction credits from a landfill gas-to-energy project in Illinois; the resulting carbon offsets are Verra Verified Carbon Standard certified.

To continue making progress, Hudson Pacific set a new, validated science-based target to reduce absolute Scope 1 and 2 GHG emissions by 50 percent by 2030 from a 2018 baseline (before accounting for RECs or offsets). Going forward, Hudson Pacific plans to reduce its reliance on RECs and offsets by prioritizing energy efficiency and direct procurement of clean power from local utilities. The company is also considering innovative technologies that drive decarbonization through energy efficiency, electrification, on-site renewables, and/or energy storage. In addition to reducing Scope 1 and 2 emissions, Hudson Pacific will measure all material Scope 3 GHG emissions annually, including but not limited to embodied carbon in all development, redevelopment, and major repositioning projects—all of which are required to set project-specific embodied carbon reduction targets.

Hudson Pacific has been thrilled to lead the way in establishing a clear path to carbon-neutral operations for real estate portfolios and believes in the importance of continuously evaluating ways to improve this path, especially through strategies that drive additionality of new renewable infrastructure.

"We are incredibly proud that we achieved our carbon-neutral operations goal five years ahead of schedule. Now we're focused on reducing our reliance on RECs and offsets through a decarbonization strategy that invests in local green power plans, strong energy efficiency programs, and innovative proptech solutions."

—Natalie Teear, senior vice president of innovation, sustainability, and social impact, Hudson Pacific Properties

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