

Profiting from the Sun

How Building Developers Can Unlock the Country's Largest Potential for Renewable Energy - Quickly and Profitably



A Point Energy Innovations White Paper



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TABLE OF CONTENTS

EXECUTIVE SUMMARY

SECTION 1

Net Zero Energy Market Update

SECTION 2

“Cost Recovery” - Creating an ROI for Commercial Building PV Systems

SECTION 3

Financing PV System Investments

SECTION 4

Getting a Building NZE Ready: Energy Efficiency & Solar Basics

SECTION 5

PV Systems and Net Zero as a Competitive Edge

APPENDIX

RESOURCES

ABOUT POINT ENERGY INNOVATIONS



Credit: Dennis Schroeder / NREL



EXECUTIVE SUMMARY

Profiting from the Sun

How Building Developers Can Unlock the Country's Largest Potential for Renewable Energy - Quickly and Profitably

When entrepreneurs sense an unmet need, they try to find a way to profitably meet it. Our nation needs more sustainable energy and a growing number of development companies are finding ways to profitably meet that need. In the same spirit, we hope this white paper is meeting an unmet need by providing more information on how to profit from the sun. However, we do deviate from the model by distributing this paper without charge. We join with pioneering developers and entrepreneurs in our effort to catalyze a market for rooftop solar on offices, which will ultimately create jobs, satisfy energy needs sustainably and make a profit.

The purpose of this publication is to walk commercial real estate developers through tried and true options for financing and recouping investments in rooftop solar on office buildings.

NET ZERO ENERGY MARKET UPDATE

We are in the midst of a major shift in how we generate electricity. Over the last 40 or 50 years, traditional energy generation such as coal and natural gas power has continued to increase. However, solar photovoltaic power modules have dropped in price from \$100 down to \$1, and this has changed everything. By 2020, energy analysts expect that solar generated electricity will be at or below the cost of utility supplied power in over half of the US. The potential for PV generated electricity on the 80 billion square feet of commercial building roof area in the US is 305 TWh/year, or 8.2% of all US electricity needs.¹

A group of developers who are early adopters of PV systems are leveraging the lower costs of PV systems to be able to offer their tenants affordable and renewable electricity. We spoke with many of these developers for this white paper. These developers are finding that PVs on buildings are providing three benefits.

- 1 Developers see PVs as a way to meet green criteria for their building.
- 2 Developers have found ways to recover the cost of and profit from PV systems.
- 3 Developers are using PV systems to lower vacancy rates or increase leasing rates.

Net zero energy buildings, or buildings that make all of their own energy, are a popular pursuit in the green buildings market, but there is also a place for buildings that only meet part of their energy needs with PV systems. Partially solar powered buildings and near net zero buildings also reap many of these same benefits.

FIVE WAYS TO RECOVER COSTS FOR SOLAR BUILDINGS

Developers are using a number of strategies for recovering the costs of including solar on their buildings. The most common cost recovery mechanisms and strategies fall into five categories.

- ◆ Use a gross lease, modified gross lease or full service lease
- ◆ Institute a green surcharge or green lease
- ◆ Sell PV-generated electricity directly to tenants
- ◆ Take advantage of Property Assessed Clean Energy (PACE) bonds
- ◆ Lease or loan the roof to a third-party solar company

¹ Rooftop Solar Photovoltaic Technical Potential in the United States, A Detailed Assessment. National Renewable Energy Laboratory, 2016. www.nrel.gov/docs/fy16osti/65298

FIVE WAYS TO FINANCE PV SYSTEMS

Developers are able to take advantage of a variety of financing mechanisms and incentives that reduce capital expenditures or facilitate cost recovery options. Including standard debt financing, developers leverage five common financing and incentive categories.

- ◆ Direct purchases of PVs
- ◆ Equipment leases
- ◆ Property Assessed Clean Energy (PACE) financing
- ◆ Power Purchase Agreements (PPAs)
- ◆ Federal Investment Tax Credits (ITC) and Accelerated Depreciation (MACRS) and Renewable Energy Credits

ENERGY EFFICIENCY & SOLAR BASICS

As with solar, there is a healthy, rapidly developing market for energy efficient building systems. From lower energy cooling to LED lighting, energy efficiency has the potential to reduce energy bills at costs even lower than the cost of PV systems. Developers are finding that efficiency is critical to reaching net zero or near net zero targets. Many of the same financing and cost recovery mechanisms available for solar are also available for implementing efficiency measures in existing and new buildings.

PV SYSTEMS AND NET ZERO AS A COMPETITIVE EDGE

Developers and building owners find that solar PV systems on buildings have multiple benefits that are compelling to prospective tenants. Solar can be attractive for developers wanting to distinguish their buildings in the market, especially during a market downturn. Lease up times, occupancy rates and rents all stand to benefit from increased attention to high-performance designs and features, and developers are increasingly able to capitalize on the demand for green buildings with their marketing and messaging strategies.



Credit: Scott Bryant Photography

Solar panels on the roof of net zero energy Hanover Page Mill office building in Palo Alto, CA.





SECTION 1

Net Zero Energy Market Update

- ◆ The Facts - Falling Solar Costs and Competitive Solar Generated Electricity
- ◆ The Opportunity - How Developers are Profiting from Solar PV
- ◆ The Big Picture - The Solar Roof Resource
- ◆ The Net Zero Target
 - Net Zero Energy +
 - California's Commercial Building NZE Requirements - 2030 and beyond
- ◆ Featured Developer: Jim Gaither Jr.



Credit: Roman Piaskoski

THE FACTS

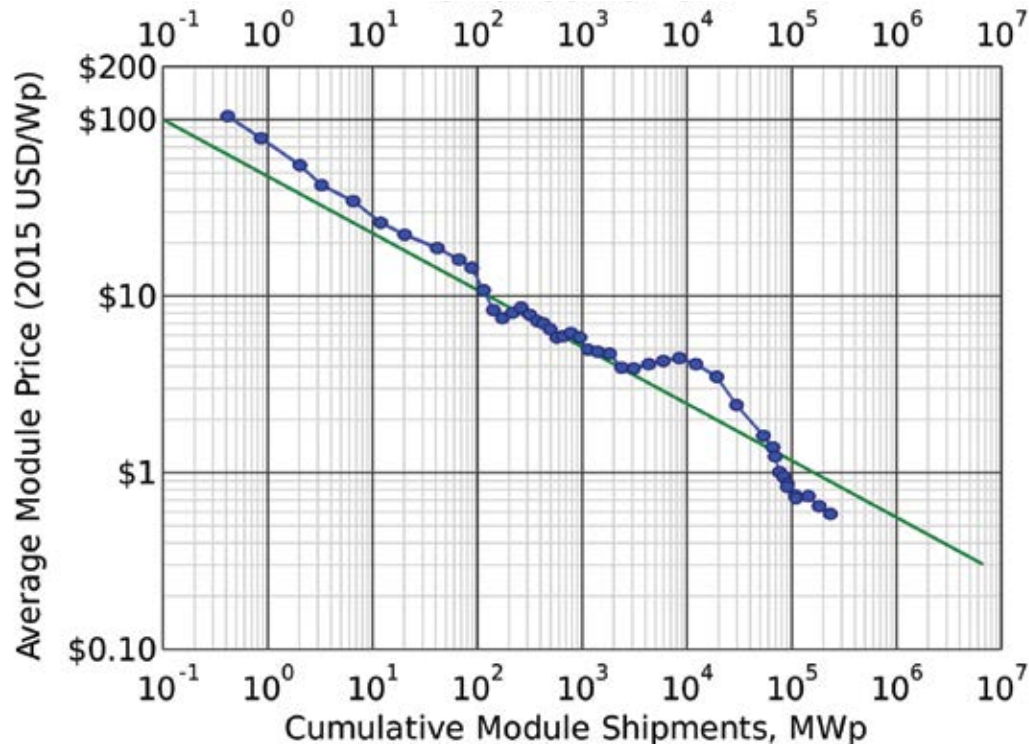
FALLING SOLAR COSTS AND COMPETITIVE SOLAR GENERATED ELECTRICITY

In 2012, *The Economist* published an article that first coined the term Swanson's Law. This law states that the price of solar photovoltaic modules tends to drop 20% for every doubling of cumulative shipped volume. The law is named after Richard Swanson, who is the founder of SunPower, one of the world's larger manufacturers of solar panels.

This stunning decline in the price of solar photovoltaics (PVs) is only the beginning of the story. Installers have been able to lower the final installed price of PV systems through more efficient installation practices, lower cost inverter systems, automated design software and streamlined customer acquisition. Forecasts predict PV system costs will decrease at least 50% in the next five years.²

² US Solar Price Brief H1 21016: System Pricing, Breakdown and Forecasts. Greenwich Media Research: <http://www.greentechmedia.com/research/report/us-solar-pv-price-brief-h1-2016>

Swanson's Law or The Learning Curve of Photovoltaics



(Image: By Delphi234 - Own work, CC0 (Creative Commons), <https://commons.wikimedia.org/wiki/File:Swansons-law.svg>)

PV systems on the roofs of buildings or in parking lots next to buildings are still somewhat more expensive than industrial-sized systems in the desert. But commercial-building-based PV systems have two distinct advantages. First, they generally do not need to include land costs. Second, they do not need new power lines running to a remote location. Because commercial building PV systems are much larger than typical residential based PV systems, these two economies give the possibility of an economic optimum value for commercial building PV systems.

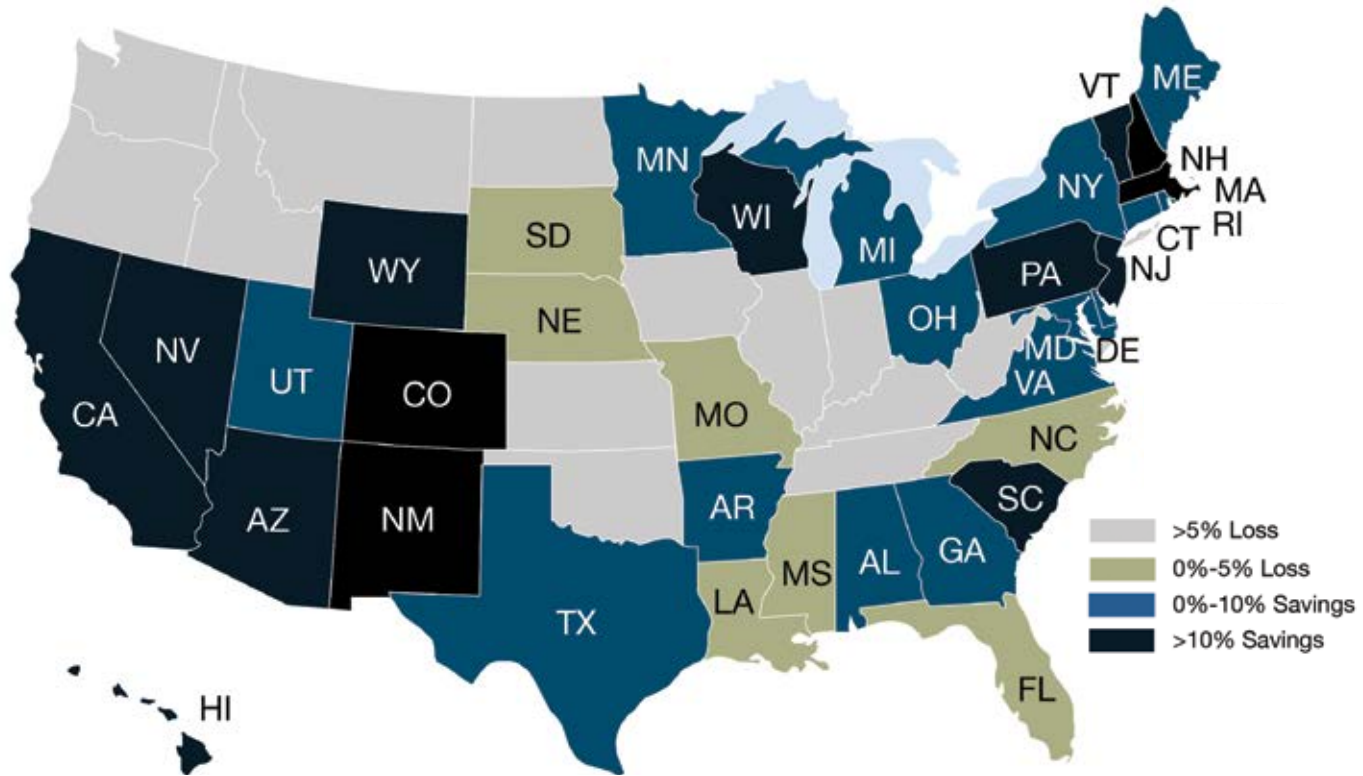
When trying to understand how the cost of electricity generated by PV systems compares to the price for purchasing electricity from a local utility, it is best to use the levelized cost of electricity (LCOE). Calculating the LCOE of a PV system gives us a cost of the electricity generated by PVs in \$/kWh (dollars per kiloWatt hour). Because of the favorable economy of scale for commercial building PVs, the commercial building LCOE is lower than the cost of grid electricity in several states and we expect it to be lower in over

half of the US states by 2020. The phrase “grid parity” describes the point at which the LCOE of a PV system is equal to the cost of the grid-generated power. For commercial buildings grid parity occurs when the cost of PV generated onsite, or the LCOE, is equal to the cost of electricity purchased from the local utility.

For developers, the fact that PV electricity can be generated at or below utility costs opens the door to providing tenants a green benefit at a savings. In addition, it is possible to find ways for developers to profit based on the spread between the solar and utility cost.

The LCOE of solar systems depends primarily on the solar resource for that location and the cost of installing the system on that building. Today many parts of the US can see LCOE numbers in the \$0.09 to \$0.11 per kWh range.³

³ US Solar Price Brief H1 21016: System Pricing, Breakdown and Forecasts. Greenwich Media Research: <http://www.greentechmedia.com/research/report/us-solar-pv-price-brief-h1-2016>



By 2020, in over 50 States, PV generated electricity will be cheaper than the grid.
 This 2014 map shows residential, but commercial will be similar. Credit: Genentech Media Research



Credit: NC Solar Center



Credit: Prologis

THE OPPORTUNITY

HOW DEVELOPERS ARE PROFITING FROM SOLAR PV

As part of the research for this white paper we reached out to a number of developers around the US. We asked: How are you profiting from solar on your commercial building? Their responses were diverse but three recurring themes emerged.

- 1 Developers see PVs as a way to meet green criteria for their building.**
Tenants in many markets now prefer green or LEED rated buildings. Development agreements with cities often require buildings meet LEED targets. In both of these cases, PVs can be a straightforward and economically beneficial method to meet or exceed green criteria.
- 2 Developers have found ways to recover the cost and profit from PV systems.**
Developers need to find ways to profit from every dollar invested in a project. This white paper details the primary methods developers have used to recover and profit from their investment.
- 3 PV systems can help lower vacancy rates or increase leasing rates or speed tenant acquisition.**
Ideally, all features add to a building's leasability and leasing rate. Several of the developers we contacted have found ways to lease buildings more quickly and, in some cases, at higher rates than standard buildings with no PV. One developer determined that a reduction of vacancies by 2% over a 20-year period would have a net present value of more than double all of the savings on energy costs they reap from PV.

THE BIG PICTURE

THE SOLAR ROOF RESOURCE

What if the use of solar on commercial rooftops took off? According to a 2016 study, published by the National Renewable Energy Lab, 8.13 billion square meters—roughly 80 billion square feet—of rooftop

are suitable for solar in the US. Commercial building roofs, which account for 25% of the total roof area, have the potential to generate 8.2% of all US annual electricity sales.⁴

Table ES-1. Estimated Suitable Area and Rooftop PV Technical Potential by Building Class

Building Class (Building Footprint)	Total Suitable Area (Billions of m²)	Installed Capacity Potential (GW)	Annual Generation Potential (TWh/year)	Annual Generation Potential (% of National Sales)
Small (<5,000 ft ²)	4.92	731	926	25.0%
Medium (5,000 - 25,000 ft ²)	1.22	154	201	5.4%
Large (>25,000 ft ²)	1.99	232	305	8.2%
All Buildings	8.13	1,118	1,432	38.6%

Source: NREL

⁴ Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment, National Renewable Energy Lab, 2016, <http://www.nrel.gov/docs/fy16osti/65298.pdf>

The same study found that California has the greatest potential to offset electricity use with solar. In California, rooftop PV could generate 74% of the electricity its utilities sold in 2013. Other states also have encouraging potential. According to the study, a “cluster of New England states could generate more than 45% because these states’ low per-capita electricity consumption offsets their below-average solar resource. Washington, with the lowest population-weighted solar resource in the continental United States, could still generate 27%. Some states with below-average solar resources (such as Minnesota, Maine, New York, and South Dakota) have similar or even greater potential to offset total sales compared to states with higher-quality resources (such as Arizona and Texas).”

While the technical potential of rooftop solar is theoretical and doesn’t account for the limitations of the grid and current transmission infrastructure and technology, the study shows how we can begin to see our rooftops as a massively overlooked resource for electricity generation.



Rooftop of the Bullitt Center, one of the nation’s largest solar powered net zero energy commercial office buildings, in sunny Seattle. Credit: Benjamin Benschneider



The six-story net zero energy Bullitt Foundation in Seattle.
Credit: Benjamin Benschneider

THE NET ZERO ENERGY TARGET

New rules in California have brought net zero buildings to the forefront of decision making about new buildings, at least on the West Coast. While there are many definitions, net zero energy (NZE) buildings generally are defined as those that make enough energy onsite to equal the energy consumption of the building. (See the appendix for more definitions of NZE.) Most building owners and developers who are contemplating solar on their roof are attracted to the idea of the zero energy building. However, taller buildings or buildings in the shade of other buildings that cannot meet the goal of NZE could often still profit from some solar on the roof or nearby parking. Many developers take this route instead of the NZE route. This, combined with highly efficient design, is commonly referred to as a “near net zero” energy building.

Whatever definition we use or amount of solar PV on the roof, the developer’s perspective on financing solar and recovering costs of solar is the same. Finance rates and lease rates do not care if the percent of solar is 50% or 100%. In fact, with changes to net metering, as we describe in section 4, some developers might be better off financially by not targeting net zero. The exception, however, comes when marketing a building.

It is always easier for a customer to understand, and more compelling for a developer to be able to say, that 100% of the building energy or electricity use is covered by the solar PV system. Each developer needs to weigh the options when deciding the PV system energy goals.

While net zero buildings currently make up a small fraction of the overall green building market today, Navigant Research projects worldwide revenue from net zero buildings will grow rapidly over the next two decades and reach \$1.3 trillion by the year 2035. Net zero energy buildings are the fastest growing sector of the green building market.⁵

⁵Zero Energy Buildings, Energy Efficient Products and Services for Net Zero Energy and Nearly Zero Energy Commercial and Residential Buildings: Global Market Analysis and Forecasts, Navigant Research, 2012.

CALIFORNIA'S 2030 COMMERCIAL BUILDING NZE REQUIREMENTS

Since the 1970s, California has led the nation in energy efficiency and renewable energy codes for buildings. California's current building energy code roadmap requires that new residential buildings meet the net zero energy standard starting in 2020 and new commercial buildings starting in 2030. California heavily leverages energy efficiency in order to make net zero energy feasible and more cost effective. The California definition of NZE takes into account the fact that electricity is constrained and expensive on hot summer afternoons when the grid experiences peak demand. PV generated electricity provides its greatest output at the same time as the grid peak and is thus more valuable. Because of the value PV adds, California requires fewer actual PV panels to meet its definition of NZE.

From the developer's perspective, the California codes will be a driver for the rest of the country. Developers, especially in California, are trying to stay ahead of the requirements. A building that meets new codes well before they are implemented can have bragging rights that can attract tenants and result in higher occupancy, faster.

JIM GAITHER JR.

Principal

Hanover Page Mill Associates



Reasons to Lease Solar Equipment

Jim Gaither Jr. and his father Jim Gaither decided that sustainability and solar power should drive redevelopment of their family-owned commercial property in the Stanford Research Park of Palo Alto, California. Upon completion, the 90,000 square-foot office building achieved LEED Platinum for Core & Shell in 2016. Solar PV on the roof and carports are expected to make the building net zero electric after the first year of full occupancy in 2017. (The building has gas boilers for heating.)

The Gaithers looked at a variety of creative options for financing solar and decided that rather than purchase PV, they would enter a seven-year true solar lease with an option to buy at fair market value at the end of the lease term.

For this project, located within the City of Palo Alto Utilities [CPAU] district, the building was approved for the City's PV Partners program providing a cash rebate for solar electricity production over a five-year period. In addition under the terms of their leases, the tenants agreed to pay the landlord for the solar electricity they consume at the building. The rate tenants pay is equal to the rate structure assigned to the building by the CPAU.

Why did you decide to take the extra steps to add solar to your building when no one else around you is doing this?

There are a handful of solar arrays in the area, but I understand we are the first commercial spec office building to pursue net zero electric in Palo Alto, and one of the first in California. There are three main reasons we pursued solar:

- ◆ We are long-term owners with a long-term investment horizon.
- ◆ We think market forces will favor sustainability.
- ◆ We wanted to provide outstanding levels of health and comfort to tenants.

We're an owner/operator with a long-term interest. We wanted something that would be competitive now and for many decades in the future. When the economy cools off, which buildings will maintain occupancy? Vacancy is so painful...having to pay operating expenses and making loan payments while not getting any rent. We predict market forces driven by building codes, in addition to social and political changes, will favor sustainability and that sustainable buildings will be more competitive through time.

We make our decisions by very straightforward metrics: healthy rents at the high end of the market and low vacancy. From a real estate point of view,

we made a good choice. We pre-leased to an anchor tenant two years in advance of occupancy, with a very healthy rent number under a long lease term. (The building is fully leased to a prominent law firm, Morgan Lewis, and to the investment bank Morgan Stanley.)

How does comfort fit in with your metrics?

My father and I have experienced offices and conference rooms that were pounded by the sun and very hot, not to mention terrible HVAC systems blasting air at us out of very loud vents. When we learned we could achieve comfort with passive design features and off-the-shelf yet highly sustainable HVAC components, we wanted to do it. If people like our building they will want to stay. That meets one of our key metrics for success: low vacancy.

Are there any other unexpected factors that create competitive advantage to doing a near net zero building?

Entitlements—the approval process with local government, in our case the City of Palo Alto. We found the City overall to be very supportive of the sustainable design features and the solar array and we received our entitlements in less than a year.

In addition, we found our sustainability objectives carried weight with our construction lender and

permanent lender. Although a lender's primary concern is that a commercial property is leased to credit-worthy tenants, the lenders we worked with clearly wanted a LEED Platinum and net zero electric building in their portfolio.

While our tenants were clearly drawn to this building due to sustainability features, they had a difficult time with having to pay for solar electricity, thinking that solar panels provided “free” power. In hindsight, it might be a better business model to simply tell tenants that solar panels are a major capital investment, and that tenants need to pay a flat green energy electric fee as part of their operating expenses.



Graduate students in Peter Rumsey's Stanford energy class get a rooftop tour of the net zero energy Hanover Page Mill building.

A 2.27 megawatt solar installation completed in 2015
at Prologis Rancho Cucamonga Distribution Center 1,
Rancho Cucamonga, CA. © Woody E. Photography 2015.





SECTION 2

Cost Recovery - Creating an ROI for Commercial Building PV Systems

- ◆ How Split Incentives Get in the Way
- ◆ What is Cost Recovery?
- ◆ Cost Recovery through Gross Lease, Modified Gross Lease or Full Service Lease
- ◆ Cost Recovery through Green Surcharge or Green Lease
- ◆ Cost Recovery by Selling PV Generated Electricity to your Tenant
- ◆ Cost Recovery through Property Assessed Clean Energy (PACE) Bonds
- ◆ Lease or Loan the Roof
- ◆ Featured Developer: Kevin Bates

HOW DO SPLIT INCENTIVES GET IN THE WAY?

Why are so few real estate developers building offices with solar for sale or lease?

While some elements of green buildings have no impact on construction or CapEx costs, there is no getting around the fact that PV systems, however cheap, do add cost to a building. But, solar PVs can lower or eliminate the electric bill. The question is, for whom? For building owners who occupy a building they build, the savings on utility bills easily and quickly pays for the investment in solar. However, when a building owner leases to tenants who pay the energy bills, there's very little incentive to incorporate energy efficiency and renewable energy. Owners pay for the added value and tenants benefit, creating a split incentive. But developers are now finding ways around this split incentive so both tenants and building owners can reap the benefits of having solar on their building.

WHAT IS COST RECOVERY?

Developers need to cover the cost of everything they include on a building, from a door to a roof. They hold solar to the same standard. One way to get past the split incentive is to raise the lease rate on solar buildings.

However, in most markets where triple net leases (NNN) prevail, lease rates are set exclusive of energy costs. If a developer with a PV system on the roof is in a competitive market, the lease rate needs to be in line with other developers. They need to find other ways to recover the cost of the PV system outside of simply raising the lease rate.

The strategies for a developer to recover the costs of adding solar vary and are still emerging. Nonetheless, developers around the US have successfully found and implemented several options for solar PV cost recovery, including, for example, creative leases, surcharges and selling electricity to tenants. Depending on the option the developer selects and the final terms, the developer can pursue either a breakeven cost recovery or a profit-oriented cost recovery. In both cases, indirect profits that come from higher occupancy rates, increased ease of leasing and, in some cases, higher rents are often far greater than any of the possible profits from cost recovery mechanisms such as surcharges.

COST RECOVERY THROUGH GROSS LEASE, MODIFIED GROSS LEASE OR FULL SERVICE LEASE

The most straightforward way for a developer to recover the cost of a PV system is through a gross lease or full service lease where the landlord pays all of the utility costs. In these leases, the benefit from any lowered utility costs resulting from solar or energy efficiency goes directly to the landlord. Tenants compare prices of leasable space knowing that energy costs are included. In essence, the landlord can charge lease rates as if they include standard energy costs even though the actual energy costs from solar are low or non-existent. In most markets in the US, because PVs can generate electricity at costs lower than the grid, developers can recover more than the simple cost of the investment in the PV system. In these cases developers can make a profit by investing in energy efficiency and PV.

This approach works better in some markets than others because if you are in a market where triple net leases (NNN) prevail, gross leases might appear uncompetitive to the average tenant. Some might also worry about tenants who waste energy because they don't have to pay the bill. Developers have handled this by setting a limit on the amount of electricity included

in the lease, requiring the tenant to pay for any usage above the limit.

One variant on this where there are significant common spaces managed by the developer/owner (like a large mall) is to match the PV with the common space needs. The solar electricity is then used directly by the developer, which reduces or eliminates costs.



Entry way at Hanover Page Mill, Palo Alto, covered in solar panels.
Credit: Devcon

COST RECOVERY BY SELLING PV GENERATED ELECTRICITY TO YOUR TENANT

While it is customary in many lease agreements for tenants to pay utilities for electricity, sometimes it pays to break tradition. Some developers have found it possible to meter and charge tenants for the electricity that they use even if it is generated by solar on the building. This does require a special circumstance or finesse. Some electric utilities see this as direct competition to their regulated monopoly business model. Some states have rules prohibiting it, or require special licensing. Nonetheless, developers have asked for and gotten permission from utilities and regulators. Obviously, this is less difficult in situations where a not-for-profit municipal utility or co-op are providing electricity. A for-profit utility often cannot object if the developers set the electricity price in such a way that they are not generating a profit from the electric charges to tenants. This idea still does make sense for developers because many tenants would be excited to get the green electricity or possibly slightly lower cost electricity and throwing in solar can help on leasing and occupancy rates.

Each state has different rules for electricity sales and developers wanting to structure deals with utilities should consult a lawyer familiar with these local rules.

One of the reasons to make sure the utility is willing to cooperate with this type of agreement is that the utility will manage net metering of the electricity created at the building. The benefits from net metering are important to the economics of the project.



Credit: Eastdil

COST RECOVERY THROUGH PROPERTY ASSESSED CLEAN ENERGY (PACE) BONDS

Property Assessed Clean Energy (PACE) funding is unique in the way that it allows owners and developers to recover costs of solar investments. The triple net lease (NNN) is the most common type of commercial building lease in many markets. This type of lease allows the landlord to directly pass operating expenses, including property taxes, on to tenants. Because PACE financing payments go through the property tax bill, landlords can pass these costs onto tenants in the same way as standard property taxes.

Another advantage of PACE loans for financing is that developers can use them for both solar systems as well as energy efficiency upgrades, including a new roof. PACE provides a single point to both finance upfront soft costs (architectural, engineering, permits, etc.) and recover hard costs for energy efficiency (HVAC, water and envelope (doors, windows), seismic upgrades (in CA) and PV systems. Efficiency couples well with solar because energy savings provide a lower cost path to reduced energy bills when compared to solar.



A 2.27 megawatt solar installation completed in 2015 at Prologis Rancho Cucamonga Distribution Center 1, Rancho Cucamonga, CA. © Woody E. Photography 2015.

LEASE OR LOAN THE ROOF

Because of the Renewable Portfolio Standards (RPS) that obligate many states to produce a certain amount of energy from renewables (in California, for example, it will be 33% by 2020) utilities are looking for ways to meet those requirements. If the utility installs solar on land it owns or leases, the utility potentially must also install transmissions lines. If the utility installs solar close by, the lines will be less expensive. In a few cases utilities have leased well-sited rooftops for solar installations instead.

For example, in 2008, Southern California Edison leased 607,000 square feet of roof space at the Prologis Kaiser Distribution Center in Fontana, CA. This was one of the first instances of a utility leasing a third party rooftop for solar. According to the *Denver Business Journal*, SCE installed a 2.4 megawatt solar installation here. Prologis and PG&E then partnered on another project in Portland where PG&E installed 1.1 megawatts of solar on three Prologis warehouses.

Since these first deals, Prologis has done many more. According to the company's 2015 Sustainability Report, Prologis has 150 MW of rooftop solar. The majority of that has been transacted under roof lease arrangements, where a third party (often a utility),

leases roof space for 20 years and owns the power plant as an investment. The investor utility pays rent monthly to Prologis for the space, and in most cases, the energy produced goes into the grid, although some installations are net metered with some or all of power produced feeding into the building. Utilities aren't the only ones interested in owning distributed solar plants. Third party investors and solar developers with large real estate holdings in the area also make these deals.

This is a promising idea, but some state third-party solar ownership policies can be a financing barrier for this kind of distributed solar. Developers should also weigh the cash from the lease versus the risks, including structural integrity risks and insurance issues. It may be hard to schedule solar installations and maintenance on manufacturing facilities if downtime is required. Warehouse buildings may be among the most fitting for this kind of lease arrangement.



Entry way at Hanover Page Mill, Palo Alto, covered in solar panels. Credit: Eastdil

KEVIN BATES

President

SHARP Development



Making Near Net Zero Profitable

As a commercial real estate developer in Silicon Valley, Kevin Bates has individually developed or rehabilitated 48 buildings totaling over 2.5 million square feet; renovated in excess of 1 million square feet of interiors; and finalized agreements and ground leases for over 1 million square feet of space on 65 acres of land.

Kevin has developed three successful near net zero office buildings in Silicon Valley. The buildings are built to a net zero energy bill, and so far are performing. He frequently presents on the projects at green building and green business conferences and widely shares his profitable business model. We spoke with him about his approach.

Why did you buy rather than lease your solar on your projects?

We've been able to finance the cost of the purchase. The cost of debt right now for us is very low. So that ends up being less expensive because we can borrow against the building to buy it.

How does lease up time affect your interest in doing solar and net zero energy buildings?

It's not only the solar that makes them lease up faster; it's the health and wellness piece. People want the daylighting and the high air quality.

Normal lease up time is about 18 months. The first building we did we leased it in 3 to a Fortune 100 company. The next building we did, we didn't quite get done with the demo of the existing interiors before we leased it to a two trillion dollar company. We are now leasing these buildings before we are even finishing them.

Can you explain how your lease helps you cover the cost of installing solar?

The first two buildings were full service leases, so we would get all the benefits of the solar, which means we pay also the power bill. We designed for net zero, so we didn't expect a bill. On this third building, we

are probably going back to a triple net lease form and that just directly gives all of the the PV benefit to the tenants. We thought it was going to be really difficult to get the tenant to understand the benefits of operating the building at net zero energy, but we've found that's not necessarily the case. They understand that they are not going to have a power bill, so they are willing to pay the higher triple net lease rates to get that benefit.

How much solar is cost effective for you?

We need to generate 80% of the energy we use to have a zero bill at the end of annual billing cycle. We're not just throwing solar on the rooftop. We're doing a lot of work insulating the building, putting in fans, keeping thermal mass available, changing out the glass to electrochromic. We naturally daylight so we don't have artificial lights on in the day time. So we're doing a bunch of things cost wise to drive that energy use intensity (EUI) down as much as we can to minimize our PV array size.

“ This way of developing a building gives us the ability to affect hundreds of people’s health and wellness in a positive way...”

What are the top 3 reasons you feel it's worth it for you to include solar and energy efficiency?

First, this way of developing a building gives us the ability to affect hundreds of people's health and wellness in a positive way that doesn't cost anything. It's actually more profitable. Second, it's healthy for the planet, which needs a lot of help right now. The third thing is it reduces your risk of ownership. When the market goes down—and the markets are down more than they're up—I think they are more likely to stay occupied. It's another way to differentiate yourself in the market from normal conventional real estate.

How much more does it cost you to make a net zero building?

A PV array is costing \$12 a square foot. The entire cost to make these buildings net zero energy and really super healthy is about \$50 a square foot more than the conventional way of building. If you just keep one tenant, then you've almost doubled that.

So, when the market goes down you are going to get less rent, but you are going to stay leased and that makes a big difference. And that's not something people look at when the markets are strong. They just look at how much they can make now.

Credit: The Tower Companies





SECTION 3

Financing PV System Investments

- ◆ Financing PV Through -
 - Outright Purchase
 - Equipment Lease
 - Property Assessed Clean Energy (PACE)
 - Power Purchase Agreement (PPA)
 - Solar Investment Tax Credit (ITC)
 - Modified Accelerated Cost Recovery System (MACRS)
 - Renewable Energy Credits (RECs)
- ◆ Financial Implications of Net Metering
- ◆ Featured Developer: Eugenia Gregorio

Combining these cost recovery strategies with a variety of financing options as well as financial incentives can make solar systems even more affordable.

Traditionally, the only way to pay for energy equipment on a building was a capital outlay by the building owner. It turns out, there are a lot of ways to finance these systems and developers are leveraging them.

DIRECT PURCHASE

Purchasing PV systems outright can make sense for owners and developers who have access to adequate capital. Some owners have adequate cash on hand but borrowing money at low interest rates is the more common option. Outright purchases make sense if the owner/developer has a positive tax liability and can take advantage of tax credits and accelerated depreciation. When developers build a new building or undertake a major renovation of a building, they (at least, the entity that owns the building, often an LLC) typically have several years of negative cash flow that do not result in tax liabilities. If that is the case, the developer is not able to realize tax benefits of the ITC and MACRS until much later in a project's life. (See below for information on ITC and MACRS tax benefits.)

Outright purchases are simple and pair well with cost recovery through a variety of gross lease options. Green surcharges and gross leases allow for the landlord to realize the benefits of the system. For new buildings when the tax liability is often negative for the first several years, tax credits can be carried forward. But they have a lower net present value compared to situations where they can be used immediately. Outright purchases also work well with PV systems that are retrofitted onto existing buildings.

EQUIPMENT LEASE

Equipment leasing companies are widespread in the US business marketplace. Businesses can lease IT equipment, heavy equipment for construction sites and even office furniture. Equipment leasing is an especially attractive way to acquire PV systems if you are a developer who has no tax liability. The leasing companies specialize in leveraging tax structures to drive good economics.

When a developer leases a PV system, the leasing company gets to take advantage of the tax credits and depreciation benefits. While the leasing companies pass their cost of money on to the leasee, their cost of money is lower thanks to the tax incentives. This arrangement results in a lower lease payment for the building owner. Most equipment leasing companies structure their financing in the five- to ten-year range.



Credit: Dennis Schroeder / NREL

PROPERTY ASSESSED CLEAN ENERGY (PACE) FINANCING

PACE is gaining traction in many states as a financing mechanism for owners/developers building energy efficiency or renewable energy systems into buildings. As we mentioned in Section 2, there are distinct advantages from the cost recovery perspective.

The PACE program, first legislated in California in 2008, is based on assessment financing, an existing system states created long ago to pay for infrastructure projects, such as schools, road lighting, etc., that benefit the public good. When a building owner uses PACE financing the costs of the system are assessed to the property and are paid as part of property taxes on that specific property. When a building is sold, that assessment stays with the building and is passed on to the new owner. In this way the developer/owner, does not take on the cost directly and can pass the costs onto tenants through standard mechanisms in triple net leases (NNN) and pass the cost along to the new buyer. PACE applies to both existing buildings and new construction.

Since 2008, PACE has passed in 33 other states, including DC. Once a state passes the legislation, then cities and counties can issue a bond. That's the

public side. The private side is the capital, which is what private lenders like California's CleanFund, for example, handle. CleanFund lends directly to owners and developers, using their own money, rather than raising money through 'brokers'. According to Chris Robbins, Managing Director at CleanFund, "We're seeing opportunities with PACE in situations where there's a NNN lease, high electricity usage and a big electric bill. Given these situations, the investment is typically cash flow positive from day one and depending on how much of the assessment you can pass through, approaches a negative cost of capital."



Credit: Eastdil

A PACE loan through CleanFund takes 90 days start to finish (albeit, they just closed their fastest financing, in 34 days, in September). PACE can cover the complete cost of an upgrade if there is a clean energy/water/efficiency component and can help accelerate retrofits over a portfolio. Lenders like CleanFund are growing in many states as PACE becomes a popular way to finance solar and efficiency projects.

Developers should look at the cost of PACE financing compared to traditional financing. In a low-interest rate environment, PACE financing might be more expensive, but with the pullback in the debt markets, there is a widening gap that needs to be filled by expensive equity or mezzanine financing (or much more cost-effective PACE financing). Nonetheless, it is attractive to developers and owners because of the prospects of cost recovery through a NNN lease. In many cases, because it's an assessment, it stays with the building and does not require repayment when a building is sold, it is not considered a loan. This often allows the owner to maintain precious capital for more accretive uses (like buying another building).



Credit: Dennis Schroeder / NREL

POWER PURCHASE AGREEMENTS (PPAS)

Even though the price of solar panels, and components, continues to drop so that purchasing solar is much more affordable than it used to be, many developers still choose to use third party financing of PV systems. One well-tested and longstanding financing alternative is power purchase agreements (PPAs). In these agreements third party companies who specialize in solar systems will finance, own and maintain a PV system on the building's roof and sell you electricity at costs similar to or below utility electricity costs. This is the model that SolarCity (now part of Tesla) and several other solar companies have made famous. The length of these agreements is typically 20 years.

The PPA provider is the solar system owner and, with its financial partners, is able to take advantage of the tax benefits from ITC and MACRS. At the end of the agreement, the solar company will offer to sell the system to the building owner at a reduced cost. In this case the building owner does not own the solar PV system until after the end of the agreement period. For building owners, this provides the lowest cost of entry and lowest annual operation cost and allows any type of cost recovery to be cash flow positive immediately. Since the PPA provides a set rate for electricity, many

building owners choose the PPA option as a hedge against volatile or rising electricity costs. The hedge may not help costs in the short run, but over the long-term it may save money and will always make budgeting predictable.

While there are many advantages to a PPA, especially if you don't have the cash to purchase your solar system, some disadvantages include the fact someone else owns your equipment and that means you have less control over it. If the cost of electricity goes below the set rate, the solar provider is making money off the set rate and the building owner will be paying more. But in most locations, there is little chance that electricity costs will go down.

PPAs do allow for a smooth cost recovery mechanism with tenants. Essentially, the cost of the PPA each month can be passed onto tenants much like the cost of energy from the utility. The only issue is that it is difficult for the developer or owner to create profit from this model unless it's through being able to use solar as a marketing tool to get an earlier priced deal or a better tenant.

FEDERAL SOLAR INVESTMENT TAX CREDIT

While the solar Investment Tax Credit (ITC) is not a financing mechanism, it is worth mentioning because it does impact all of the available financing mechanisms in one way or another. The federal solar Investment Tax Credit is significant at 30%. The US Congress recently extended the tax credit at the current rate until 2020, providing certainty for upcoming solar projects. In 2020 it will decrease to 26 percent and to 22 percent in 2021 and finally to 10 percent in 2022 and beyond.

Local solar incentives, rebates and credits are available through local utilities and vary by region. Twenty-nine states have a Renewable Portfolio Standard (RPS) that requires a certain amount of the state's energy to come from renewables. In California, the RPS requires 33% of electricity to come from renewable energy by 2020. Tax and other incentives help states fulfill their RPS requirements. These policies have helped grow and advance the solar industry and are in part responsible for innovations and lower costs of solar technology.

Tax incentives are generally designed to be phased out. Many times legislators will extend or create new incentives, but starting solar projects before generous

federal tax incentives expire can ensure access to credits for your project.

Some owners and developers do not have a tax liability at the end of the year. This is a problem for claiming the ITC. Without tax liability, tax credits are worthless. A building owner could bank the credit and use it in a future year. However, most choose to use third party equipment financing or PPAs in order to get the advantage of the ITC. The third party company who provides the PV is able to claim the ITC and the lower cost of the system is then passed on through a lower cost equipment lease or PPA.

The two best sources for tax credit and local incentive information are the Solar Energy Industry Association (www.SEIA.org) and the Database of State Incentives for Renewables & Efficiency (<http://www.dsireusa.org>).

SOLAR SYSTEM - MODIFIED ACCELERATED COST RECOVERY SYSTEM (MACRS) RULES

The Modified Accelerated Cost Recovery System (MACRS) is the U.S. tax depreciation system created by the Internal Revenue Service. Under MACRS, property owners are allowed to deduct the depreciation of any equipment or buildings over a specified time period. Fortunately, under current tax code, the MACRS depreciation of solar PV systems is taken over five years. This allows building owners or developers who install PV systems to rapidly depreciate the cost of the solar system and reduce the amount of taxable income by the depreciation of that year. Because of this, owners are able to get to profitability on their solar investment more quickly. This is a form of financial incentive that can be helpful for companies that have tax liabilities.

When property owners also claim an Investment Tax Credit (ITC) for equipment, the owner must reduce the project's depreciable basis by half the value of the 30% tax credit. This means the owner is able to deduct 85% of his or her tax basis.⁶

⁶ www.seia.org/policy/finance-tax/depreciation-solar-energy-property-macrs



Credit: Steve Proehl Sun Light & Power

SELL RENEWABLE ENERGY CREDITS (RECS)

Renewable Energy Credits (RECs) are an abstract concept that has been monetized. However unusual, some developers have been able to leverage RECs to recover part of the cost of solar PV systems on buildings. Basically, a REC is a certificate that represents one megawatt hour of electricity generated from renewable energy. It's easiest to understand if you think of a solar power plant in the desert. If a company or individual cannot buy sufficient renewable energy on their building or from the electricity company, they can pay an added cost to buy RECs equivalent to the energy they use to be able to claim that at least part of their environmental impact of energy use was offset by renewables. The buyers of RECs are buying the environmental benefit of renewable energy but not the energy itself.

When a building generates electricity on-site with a PV system, the owner of the building can sell RECs for that system but then the developer is not allowed to claim the environmental benefit of the renewable energy generated. If marketing this building to prospective tenants, the developer would technically have to downplay the PV system on the building. Developers can use RECs as cost recovery mechanisms but purely from an energy and cost

perspective and not from an environmental one. The price of RECs varies widely from state to state from a few dollars per REC to several hundred dollars per REC.

For a more detailed but clear explanation of RECs see: <http://www.wri.org/publication/bottom-line-renewable-energy-certificates>



The Millennium building's rooftop PV. Credit: The Tower Companies

FINANCIAL IMPLICATIONS OF NET METERING

Net Metering is one of the key elements of the financials of a PV system. So called “retail net metering,” the long standing system where utilities purchase excess solar electricity at the same cost as the utility customer normally purchases standard electricity is coming under fire from utilities. Currently full net metering, where utilities pay customers the full retail rate for the excess electricity they generate, is available in about two thirds of the US states. Most of the other states allow utilities to purchase the excess electricity at avoided cost rates similar to what they would pay if the utility had bought the electricity on the open wholesale market. These wholesale rates are usually about one quarter to one half of retail rates. This arrangement, where the owner of the PV system only gets the wholesale cost, makes most solar systems less economical.

There is a move to restructure net metering in most states to accommodate a purchase back of excess electricity at a rate in between retail and wholesale rates. This will change the economics and the way developers approach PV systems. Many of the utility customers who install systems before this change may be able to preserve the more attractive retail price metering. New systems will be held to a lower buyback

price. When developers size PV systems for wholesale net metering, they will want to look at systems that meet 20% to 50% of the building’s monthly or annual energy use. With this type of system, during the day when the PVs are generating electricity the building will use most if not all of the electricity on site. The energy meter will not need to run backwards and the utility will not need to purchase the excess electricity, except perhaps on weekends if the building is not occupied. Nonetheless, the economics should still be favorable in most utility territories.

The best way to anticipate these changes is to consult an energy specialist who can run different scenarios for a given project to avoid excess power generation that utilities purchase at prices much below retail prices. In some cases, as the price of lithium ion batteries drop, commercial building-scale batteries will begin to make economic sense to ensure that all the solar-generated electricity is used on site.



Credit: SunPower

EUGENIA GREGORIO

Vice President –
Strategy & Sustainability
The Tower Companies



Washington, DC's First Solar Office

In 2014, The Tower Companies ("Tower") completed the first solar photovoltaic (PV) installation on a large, class A office building in Washington, D.C. The system size is 30kW and is visibly located on the roof terrace of The Millennium Building, a 12-story property located in the downtown business area of the District of Columbia.

Tower made an upfront cash purchase of 60% of the total cost of the solar project. The building owner acquired the remaining funding through a sale of three years of Solar Renewable Energy Certificate (SREC) to Direct Energy Solar, formerly Astrum Solar. Additionally, Tower took advantage of the MACRS Accelerated Depreciation and the 30% Federal Investment Tax Credit for solar PV projects.

During the project's payback period of approximately five years, 75% of the total initial investment was recovered in the first two years through the 30% federal tax credit, upfront SREC sales, accelerated depreciation, and electricity avoidance. Additional SREC sales, depreciation, and electricity savings will return the remaining balance over the next three years.

Why did you do solar? Why was it worth it to you?

We've been interested in doing a solar project since I joined Tower almost six years ago and the numbers just finally made sense. The cost of the panels had decreased in price and the financial incentives fell into place.

We felt that there was less of a risk in a project with a five-year payback since the company has a long term perspective and plans to maintain the same portfolio of buildings.

Why purchase rather than lease your solar panels?

The array isn't huge at 30kW and generates approximately 40,000 kWh per year. That's enough to power three of the elevators at The Millennium Building, the property where the solar PV system is located. When you take into account the upfront costs and the benefits of owning the system versus having someone else install and own the system, it absolutely makes sense to own - if you have the available funds. When you don't own the system, you are not eligible for the 30% federal tax credit, accelerated depreciation, and SREC sales, which were all very important pieces to make the project financially viable. At the end of the day, we consider the PV system part of the building now and similar to a new piece of equipment that will help reach our 20% by 2020 energy efficiency goals.

How did the SRECs work as part of your payback?

The project cost was approximately \$100,000 for the design and installation of the 30 kW array. In an effort to buy down the initial cost of the project, Direct Energy Solar - formerly Astrum Solar - purchased three years' worth of SRECs at the start. This decreased the initial cost of the project by almost \$40,000. The second term of the SREC contract includes a fixed-rate agreement guaranteeing Tower SREC sales for 12 additional years.

Explain relationship between your tenant and the building's electricity bill and your lease?

In the Washington, D.C. area, it's not standard to apply a triple net metering approach to multi-tenant commercial office buildings. The most common lease agreements are based on a modified gross lease so that tenants in the building only pay increases in annual operating expenses, from their specific base year. It's also based on the square footage leased. Also, electricity usage for the building is just one line item in the operating budget. For example, if the total annual operating costs at a building increases, compared to a certain tenant's base year, the tenant would only pay the difference. If the costs stay the same or decrease, the tenant wouldn't pay anything additional for operating costs. By following energy

efficiency best practices, we have helped reduce the overall operating costs for the buildings, which directly benefit our tenants.

Do you sell any electricity back to the utility through net metering?

The Pepco interconnection process require that we install a net-meter but our solar PV array is small enough that we use all of the generation daily and aren't able to push anything back to the grid.

Do you get a premium or faster lease up time because of the solar?

The Millennium Building, in particular, is almost always 100% leased so we can't directly tie the solar project to rent premiums. However, we do consider the project a great showcase for brokers to use and an attractive talking point on tours with prospective tenants - they love it. I do think that many of our existing tenants feel proud to be leasing space from a building owner that is committed to sustainability and to reducing operating costs. It may also attract new tenants who have similar values. My hope is that the solar array stands out so that prospective tenants will remember our building more than the building next door.





SECTION 4

Getting a Building NZE Ready

Energy Efficiency & Solar Basics

- ◆ Unlocking a Building's Potential Through Energy Efficiency
 - Why Efficiency?
 - Efficiency in Existing Buildings
 - Efficiency in New Construction - The Design Process
 - Envelope + Glass
 - Low Energy HVAC
 - Lighting
 - Cost Recovery for Efficiency
- ◆ Solar PV System Basics
 - Determining your solar budget
 - Net Zero/Near Net Zero/Partial Solar
 - Sizing PV Based on Best Financial Outcomes
 - Batteries & Storage
 - Net Zero in California
- ◆ Featured Interview: Michael Polentz



The 52-story New York Times building used efficiency measures to reduce electricity use by 24% and heating and cooling by over 50%. Credit: Virginia Cahill

UNLOCKING A BUILDING'S POTENTIAL THROUGH ENERGY EFFICIENCY

WHY EFFICIENCY?

Why would a developer want to make a building more efficient? Like solar PV systems, energy efficiency is subject to the split incentive problem. If the developer or building owner makes a building more efficient, in many circumstances, the tenant will reap all of the benefits. Nonetheless there are many reasons to make buildings more efficient. Some of these reasons include:

- ◆ Meeting energy codes
- ◆ Getting points from the USGBC's LEED rating system
- ◆ Lowering tenant or landlord energy costs, depending on triple net versus gross lease
- ◆ Building environmental branding

Plus...

- ◆ More efficient buildings more easily achieve Net Zero Energy
- ◆ Energy efficiency is, usually, lower cost than solar PV systems

When it comes to getting returns on investments for energy efficiency, there are two major factors to consider. First, many energy efficiency strategies

can be low or no cost to the owner. For example, simply buying more efficient LED lighting can have no additional cost when compared to standard fluorescent lighting. Second, energy efficiency benefits can help buildings lease more easily and can result in lower energy bills for tenants that can be worked into leases. In addition, many of the cost recovery strategies developers use for solar PV systems also apply to efficiency improvements, including PACE funding, equipment leases and full service leases.

In our experience, we see buildings with PV systems also leverage energy efficiency at relatively high levels. Developers see efficiency and PV systems as part of a package that lowers or eliminates tenants' energy bills and thus makes it easier to justify any recovery payments in the lease.

Why efficiency first? Beyond the financial motivations, saving energy through daylighting and natural ventilation, orienting for light and breezes, insulating—all of these design elements that lead to lower energy use also create more comfortable and pleasing spaces that set your building apart, appeal to tenants and decrease your vacancy. They are also powerful employee recruiting and retention tools for many tenants.



NREL's Net Zero Energy Research Support Facility. Credit: Dennis Schroeder / NREL

EFFICIENCY IN EXISTING BUILDINGS

Energy efficiency applies to existing buildings in many surprising ways. The first is that when upgrading equipment at the end of its life, the added cost of purchasing more efficient equipment is often next to nothing. Building owners often do not plan for this. When a piece of equipment breaks, it is simply replaced in kind, often times with a sense of urgency instead of forethought and planning. The other hidden opportunity in commercial buildings is the way the building is controlled. Most buildings waste a tremendous amount of energy through lights or HVAC systems that do not turn on and off at the right time. With the next generation of LED lighting emerging, there is also an abundance of low cost lighting and daylight retrofit options in existing buildings.

Owners often prefer to wait until tenants turn over before changing such things as lights, but central equipment such as HVAC systems can be upgraded while spaces are still occupied. The best arrangements for cost recovery for efficiency in existing buildings are PACE financing or full service leases, although direct purchase still has better overall economics.

EFFICIENCY IN NEW CONSTRUCTION - THE DESIGN PROCESS

For a low energy design to succeed on a budget, the building owner and developer need to set clear goals about energy use targets at the beginning. A common mistake people make is deciding to add on “green” to a conventional design. This ends up costing more and causes the design team to miss opportunities to create the best design that integrates renewables and other green features, including water saving or water recycling measures. Power systems such as solar should never be an afterthought.

Conventional buildings usually follow a linear design process where specialists pass the design from one specialty to the next, say from the architect to the mechanical engineer. Integrated design processes, where all the team members collaborate all the way through, have been more successful for better designs and for keeping costs down. Bringing in your engineer as early as possible can influence your design to require far less engineering in later phases. Taking integrated design to the next level, some developers have begun working with a highly collaborative integrative project delivery process (IPDP) that has proven to keep costs down and also helps ensure on-time delivery.

ENVELOPE + GLASS

The envelope is the exterior shell of the building. A tight and well-insulated envelope is one of the secret ingredients in an energy-efficient building, yet glass buildings remain very popular among developers. Building owners and tenants may think they want to work in a sleek glass office but once they actually move in they find the windows are either way too hot or way too cold and the sun's glare makes it difficult to see their monitors, their work and their colleagues. Office workers in these glass spaces often end up taping cardboard or paper over the windows to keep out the sun. The all glass buildings have much heavier heating and cooling requirements as a result of this constant need to temper the hot or cold coming through the glass. With double and triple paned glass and designs that allow in a lot of light but avoid the all-glass façade, we can have an efficient envelope and a comfortable space and still have views.

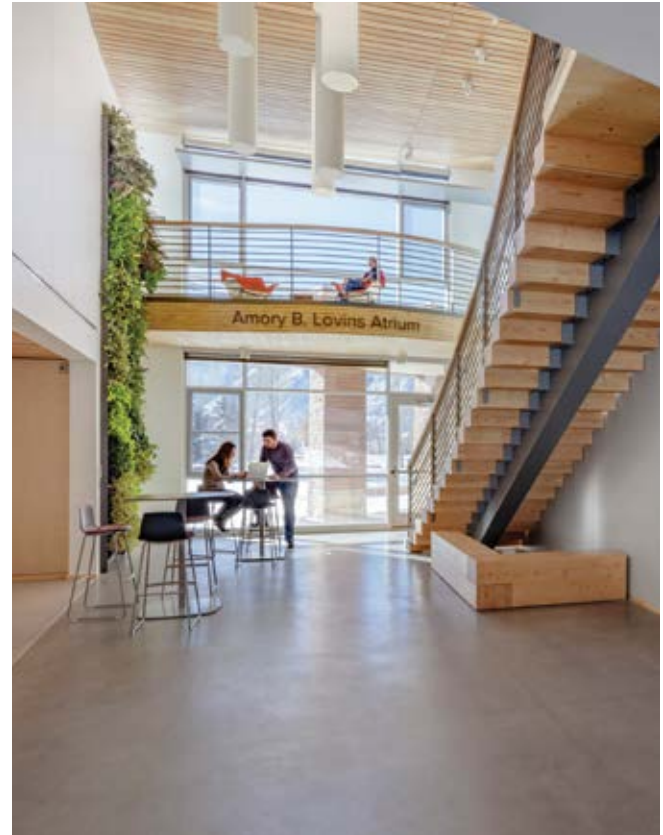
LOW ENERGY HVAC

Heating, ventilation, and air conditioning systems are the core mechanical systems for every building. When it comes to energy savings, the best HVAC is no HVAC. The second best HVAC is a small HVAC system. The way to reduce mechanical systems is to reduce heating and cooling loads in a building. Intelligent design can mean it's possible to reduce or eliminate the chillers a building usually requires, for example. This goes back to passive design and tight envelope and integrates the concept of natural ventilation and natural heating and cooling. When you can systematically bring cool outdoor air into a space at the appropriate time and release warm air, your heating and cooling system doesn't have to work as hard and it can have fewer pumps and fans and it requires less energy to operate them. It's also healthier to breathe fresh air than recirculated indoor air.

Fat pipes installed at soft angles throughout a system reduce friction and require less energy to move air and water throughout a building. This may seem like a simple concept but most building system designs still incorporate skinny pipes installed at sharp right angles, which require more pumps and fans to propel air and water through the pipes.

Heat exchangers can capture waste heat from a building and circulate that warm air to cool parts of the building. Geothermal systems capitalize on the constant 55-degree temperature of the earth to circulate water through pipes that cool hot spaces and warm cool spaces. Commonly, geothermal systems attach to radiant floor systems or chilled beam systems, where the pipes are above or below a space. Flushing a building with cool night air is also a very low energy way to cool off a space using nature.

An intelligently designed HVAC system also has tight control over multiple zones within a building. Low-energy diffusers can send warm or cool air to specific rooms and spaces, increasing occupant control over temperature.



Credit: Tim Griffith, courtesy of ZGF Architects

LIGHTING AND DAYLIGHTING

Natural light is the nicest and most efficient kind of light. Our eyes are designed to see in natural light, and while lighting technology has come a long way, no artificial light is as pleasing to our eyes and skin as natural light. Natural light is also healthier.⁷ Of course, it is also free of charge, provided by the sun, and comes with views to the outside. Views are connected to wellbeing. Instinctively, we like to be able to see out and see nature. Views of nature are pleasing to us and add to our comfort level. When energy efficiency and comfort come together in this way, the benefits for building a high-performance office are greater than merely operating at net zero energy. Your occupants are more comfortable and productive and likely to want to renew their stay.

When we do require artificial light, for example for task lighting and for nighttime, we can now use super energy-efficient LED (light emitting diode) lights. The advent of this technology has dramatically reduced lighting's energy requirements.

COST RECOVERY FOR ENERGY EFFICIENCY

We don't discuss cost recovery for energy efficiency as often these days because minimum levels of energy efficiency are required in the building code in many states. Another driver for energy efficiency is US Green Building Council's LEED rating system. Tenants often find LEED and other features of green buildings more attractive than standard offices. While a formal reliable calculation of return on investment in green does not exist yet, there is an inherent understanding in the market that the investments into these features of a building will pay for themselves. And, done carefully by an experienced team, the incremental cost is often surprisingly low.

In addition to the inherent benefits of low energy buildings, there are explicit ways to recover investments in energy efficiency. Perhaps the most straightforward way is a full service lease where the building owner covers all energy costs. In this way, the incentives for investment are aligned. If a building is in a market dominated by gross leases, the best cost recovery strategies include PACE financing, green surcharges in place of passing on energy costs, and in some cases, equipment leases.

⁷The Economics of Biophilia. Terrapin Bright Green, 2014.
www.terrabinbrightgreen.com/reports/the-economics-of-biophilia/



Credit: Nic Lehoux for the Bullitt Center

SOLAR PV SYSTEM BASICS

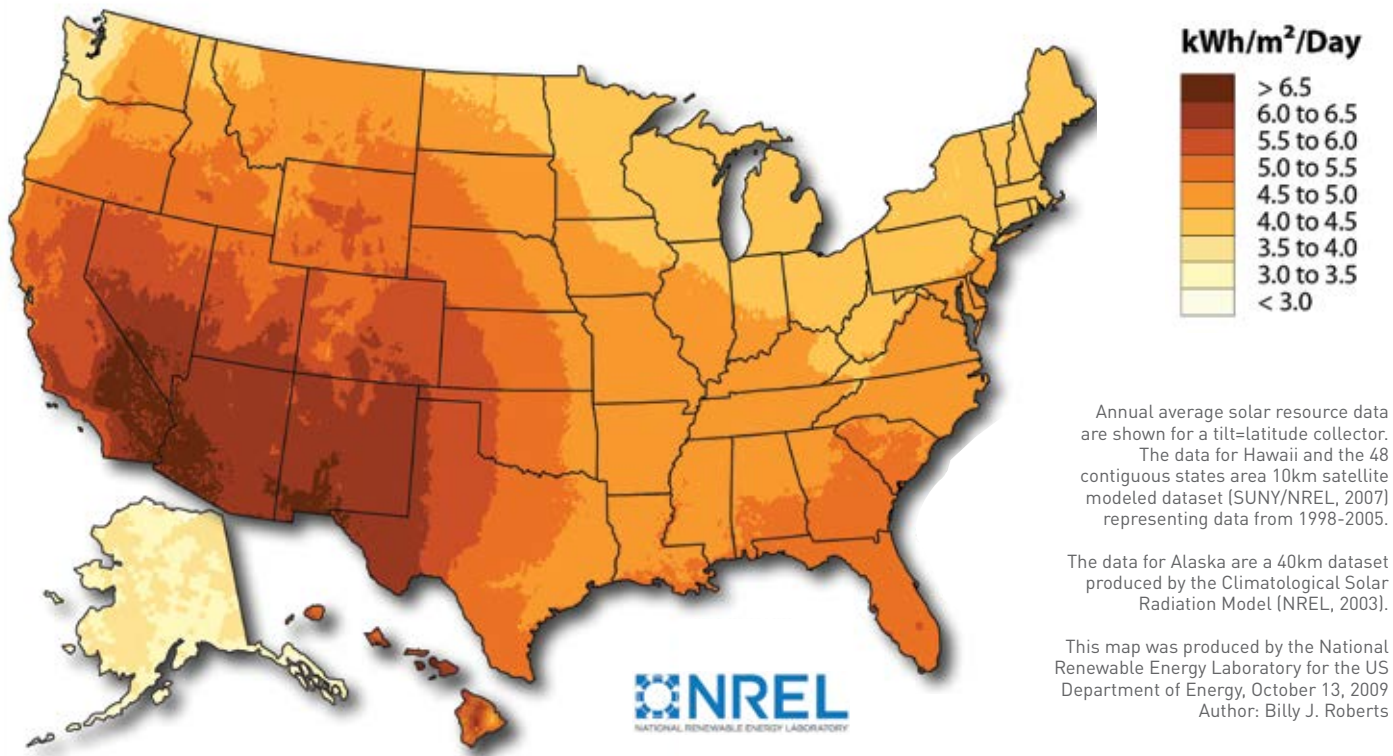
DETERMINING YOUR SOLAR BUDGET

In general, your roof size and orientation determines the amount of solar you can install. You might also have a parking garage or parking lot where you can place additional PV panels, or an area for a standalone ground array. The amount of energy you can potentially generate from these spaces tells you if it is possible to get to net zero energy for your building.

Some developers have felt that getting to net zero energy is a critical part of marketing their building. In that case the solar PV capacity creates a solar budget that the building must be designed to meet. Often this requires a clear focus on the efficiency of the building in order to meet the budget. (The more efficient the building, the less solar you need to hit net zero.) For buildings that are one to two or even three stories, meeting the budget is fairly straightforward. But meeting the energy budget in buildings that are four stories or more can be difficult if not impossible. In these taller buildings, owners often place solar over parking and do not try to reach a net zero goal.

Buildings that are part of a net zero energy district may not reach net zero alone but rather as part of a community where the renewable energy all the buildings produce/use averages out to be zero over the course of a year.

Photovoltaic Solar Resource of the United States



NET ZERO/NEAR NET ZERO/PARTIAL SOLAR

Based on the solar “resource” available at the site, meeting all of a building’s energy use might or might not be possible. There is a mistaken idea in the green buildings community that if a building is incorporating renewables and isn’t aiming for net zero it isn’t valuable. For many reasons, including financial viability, some buildings might not be able to reach net zero energy goals. These buildings are often referred to as “Near Net Zero” or, simply, partial solar buildings. A building that meets half its energy use with on site solar is certainly better than a building that has no solar whatsoever.

SIZING PV BASED ON BEST FINANCIAL OUTCOMES

Building based PV systems rely on various versions of net metering with the utility. Net metering allows the electricity meter to run backwards when a building is generating more energy than it uses. Net metering, where the utility buys back electricity at the same price that it sells it to the customer, is not allowed in many states and is being phased out in the other states. In most states, we anticipate that the buy back price for solar generated electricity will be somewhere between the retail and wholesale price of electricity. In California, commercial retail electricity rates are in the \$0.15/kWh range. Wholesale rates, what the utilities

pay large scale grid producers, are in the \$0.02/kWh to \$0.04/kWh range. The expected compromise utility purchase rate of solar generated electricity is in the range of \$0.08/kWh.

Any discrepancy between the utility purchase rate of solar and the normal retail rate, does encourage owners of buildings to avoid generating more electricity than they can use at the time of generation. Because of this, many developers will consider generating only part of the annual energy needs with PV. In essence, they will be “near net zero” or partially solar powered. This, in fact, fits well with the available solar budget in buildings more than two stories tall.

BATTERIES & STORAGE

In states that have not instituted net metering or where there is a widening gap in the net metering payment rates, batteries and energy storage might make sense. The cost of battery storage is dropping rapidly and should continue to do so. When a building generates more energy than it can use it may make sense to store it. Storage will be more financially viable in areas where net metering is not present but rates are high, such as Hawaii, or areas where there are high peak electricity pricing signals.

Many solar buildings also have charging stations for electric vehicles (EVs). EVs that charge at solar charging stations are cleaner than EVs that charge at stations where the power is provided by the grid, which can be a mix of fossil fuels, hydro, nuclear and renewables. EV batteries can also provide a storage place for excess energy solar panels generate at certain times. If you have installed charging stations on your property, you can also consider selling your excess power to electric vehicle drivers.



Credit: KCPL

NET ZERO IN CALIFORNIA (WHAT IS TDV, COMING 2030 REQUIREMENTS)

California is going to require all new commercial buildings be built to net zero energy standards starting in 2030. The energy code will require the buildings be very efficient, making it easier to meet the net zero standard. There will be exceptions for tall buildings. The California version or definition of net zero is unique in that it does take into account the time dependent valuation (TDV) of electricity. Because it is more expensive to meet electricity demand at peak times, the California energy code uses TDV to encourage the most energy savings during peak times. Most peaks happen on sunny hot days, especially in the afternoon. TDV makes net zero easier to meet.



Credit: Steve Proehl Sun Light & Power

MICHAEL POLENTZ

Partner

Manatt, Phelps & Phillips, LLP



Negotiating a Solar Deal

All real estate deals require legal and financial expertise and as solar deals become more common, there are common precedents for selecting the least hassle, least expensive and most lucrative arrangements.

Manatt, Phelps & Phillips, LLP is one legal firm that handles a lot of solar deals in California. Many other real estate firms are developing this expertise. We asked Michael Polentz to walk us through some of the legal basics of investing in solar.

From a legal perspective, what are the easiest ways for developers to recover costs of solar?

The larger discussion point on the economics of solar goes back to the split incentive problem that has driven a wedge between landlords and tenants in triple net (NNN) leases for many years. For example, the tenant will typically pay the utility bills directly under a NNN lease, and thus, the tenant will see the primary benefit from the installation of solar through a reduction in utility expenses. Moreover, in most instances the cost of the solar constitutes a capital improvement under a NNN lease that falls on the landlord (and not the tenant) to cover.

There are models that avoid or mitigate the split incentive problem and entrepreneurial landlords are using them in the current marketplace. These include, but are not limited to, (1) solar leases and solar PPAs, (2) gross or modified gross lease structures, (3) cost sharing arrangements between landlords and tenant when collaborating for a more energy efficient building or premises; (4) incentivizing the tenants to participate in the overall efficiency/sustainability model; (5) higher rents for sustainable premises and buildings; and (6) longer lease terms that help with the capital cost amortization if the landlord is funding the purchase and installation of the solar.

What are the implications of PPAs vs. selling electricity or a green surcharge?

There are legal restrictions and hurdles that limit when and how a party can sell electricity. The easy distinction is that a PPA involves a third party provider that purchases, installs and operates the solar systems and sells the electricity generated to the landlord or the tenant. Potential risks arise, however, if the landlord wants to “sell” the electricity to the tenant in California because any person or corporation that provides a regulated service to or delivers a regulated commodity to the public or any portion thereof for which any compensation or payment is received becomes a public utility under California law. As you might expect, landlords do not want to be deemed public utilities and will therefore often be reluctant to jump into this structure. There are exceptions for solar power; however, these exceptions are limited under existing laws. The statutory language relates to any corporation that “directly or indirectly” delivers or sells “heat” or where the solar electrical power is distributed by the producer, especially for its own use or its tenants.

The challenge is that this exemption does not address the following potential areas: (1) where the reseller/ property owner or manager is not the producer of the solar electrical power; (2) where the power is

delivered and consumed outside the property where it is produced or immediately adjacent thereto; (3) where the sale is to more than two corporations (except for shopping centers with central plants or mobile home parks); (3) where the sale is to a utility in the first instance; (4) where the solar power is commingled with utility-based services (i.e., where the solar power supplements utility service), and (5) where the reseller charges more for the commodity and service than the sum of the actual costs of the components of the service (a mark up).

The good news is that there are ways to avoid these pitfalls (assuming the landlord is not attempting to charge more money for the power than the local utility would charge), but it requires landlords and tenants work closely with their respective legal advisors when preparing the leases.

“There are models that avoid or mitigate the split incentive problem and entrepreneurial landlords are using them in the current marketplace.”

Credit: Steve Proehl Sun Light & Power





SECTION 5

PV Systems and Net Zero as a Competitive Edge

- ◆ Improving Lease Rates and Occupancy
- ◆ Using Solar PV to Increase Net Operating Income
- ◆ Marketing Net Zero and Solar Buildings



Credit: Warren Gretz / NREL

IMPROVING LEASE RATES AND OCCUPANCY

Developers can profit from solar on their buildings even without improved leased rates or more continuous occupancy. Nonetheless, if there is an increase in lease rates or occupancy, developers can multiply profits from solar several fold. To date, there is no definitive study on the leasing rates and vacancy of commercial buildings with PV systems. However, studies have shown both of these areas improve in buildings rated green by the LEED system. A recent paper by the Appraisal Institute reviewed several studies that found rental premiums from 2% to 27% for buildings that were either LEED rated or Energy Star Certified. Even if the rental premium for a building with a solar PV system were on the lower end of that range, the impact is significant and can improve the profits derived from the solar investment.

Owners and developers have found that tenants prefer green buildings for their better health and comfort and their environmental responsiveness. Over the long-term, when there are market downturns, developers who made the effort to create higher performing buildings with solar might find their buildings stay occupied when others won't. Adding solar and pursuing lower energy designs is becoming an effective way to distinguish a building in a crowded market.

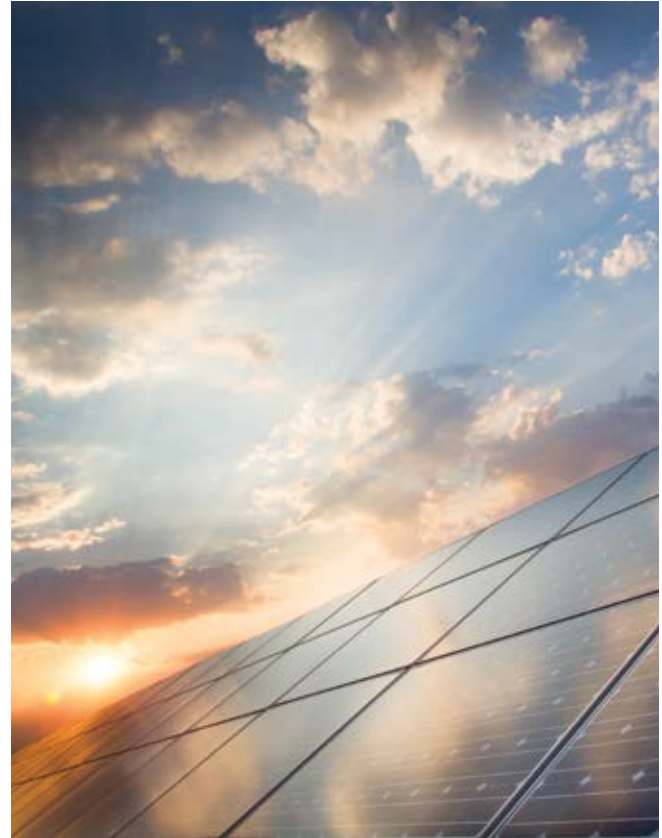
USING SOLAR TO IMPROVE NET OPERATING INCOME

Net operating income (NOI) is highly linked to energy costs and lease costs. Developers use NOI as a strong measure of a building's value. NOI strategies that reduce a building's energy expenses have a direct relationship to increasing building value.

For example, if expenses for a building are 25% of gross income after vacancy costs, and energy costs are 30% of expenses, elimination of the energy bill through a net zero PV system, will add 10% to the NOI.

One simple metric that some developers use to assess energy and PV projects on buildings is to divide the NOI by the cap rate in order to quantify any increase in the current market value of the building as a result of the project.

Building owners undertake significant projects in order to increase NOI. Solar can be a simple way to improve NOI. Outright purchase or financing of PV systems can improve NOI quickly. Equipment leases and PPAs can increase NOI if PPA payments or equipment lease costs are lower than the expected energy bills. Improved occupancy rates and lease rates can also figure directly into NOI. Lower vacancy and high lease rates increases NOI.



Credit: Foxbat

ENTITLEMENTS, UPZONING AND FOSTERING COMMUNITY SUPPORT

Developers work closely with cities and local communities to acquire necessary entitlements for their projects. Increasingly, cities are under pressure to reduce emissions, and developers know how difficult it is to get a project approved when it carries negative environmental impacts. Adding solar to a project is a convincing indicator of a developer's desire to create a responsible project with community benefits. Cities strive to support projects like this and some municipalities are more willing to grant entitlements and upzoning more expeditiously for green projects. Solar is a visible indicator to the entire community that a building's developer is a good corporate citizen and solar can add a powerful storyline to your building.

Quicker entitlements and upzoning are not simply "soft" benefits. Consider, what is the cost of capital for carrying the building an extra three months while waiting for paperwork? What is the cost of missing an upcycle? Three months can mean the difference between getting a deal done in this cycle, versus waiting years for the next cycle to unfold.

MARKETING NET ZERO AND SOLAR BUILDINGS

Developers find that solar PV systems on buildings can have multiple benefits that are compelling to prospective tenants. Here are some of the main messages a building owner or developer may use in order to have a conversation with prospective lenders and prospective tenants about a low energy, high performance solar powered space.

- ◆ Green buildings are healthier and more comfortable for occupants because they incorporate natural light, and natural ventilation and many may also incorporate a connection to nature and use non-toxic materials.
- ◆ Tenants will have no energy bill if they run the building right. That's a big savings.
- ◆ Today's workforce is increasingly made up of individuals who are concerned about environmental issues. They want to work in places that care about their employees' health and about being green. Studies show the majority of younger workers are very concerned about climate change and the environment and many have shown, by advocating that their college campuses divest from fossil fuels and by giving up cars in greater numbers, that they want to do their part to reduce emissions. Low energy and solar powered buildings appeal to this audience of innovative workers.

- ◆ Green buildings, especially net zero energy buildings, with some passive heating and cooling and ventilation and capacity to tap into renewables are more resilient and safer for occupants when there are power outages due to natural disasters and extreme weather events. They heat up and cool down much slower than average, for instance. Many green buildings also incorporate water savings or recycled water strategies, which make them more attractive to business as future water shortages and drought conditions ensue.
- ◆ Green buildings often garner attention from the press. Developers often spend a significant amount to advertise a new building in order to generate interest in the building and lease it more quickly. Developers who have developed green buildings are often able to get significant local real estate press at no cost that can offset marketing budgets. This press is regarded as more neutral, or credible, and is well received.



Lobby of the Net Zero Energy 1400 Hanover Page Mill office building.
Credit: Devcon

APPENDIX

Classifying Buildings with On-Site Renewable Generation

WHAT IS A NET ZERO ENERGY BUILDING?

Various definitions of the phrase “net zero energy” appear in professional design and construction circles and the buzz words can be a little confusing. Here is a quick run down of the most common variations on the definitions of the terms Net Zero Energy, also called Zero Net Energy.

NET ZERO ENERGY, IN CALIFORNIA: The California Energy Code, Title 24, requires that all new commercial construction in California be net zero energy performance by 2030 (and all new homes by 2020). These new buildings will get their power primarily from solar energy, but they may also purchase/use carbon offsets to achieve the standard. The more energy efficient the building design, the less energy the building needs and the easier it is to reach a situation where an affordable amount of renewables can generate enough energy to power the whole building, making it net zero energy. (California’s code will also require energy efficiency design upgrades for retrofits at the time of sale.) Once California’s buildings prove this new standard, states around the nation

will follow suit with an increasing number of net zero energy developments.

NET ZERO ENERGY BUILDING CERTIFIED: The International Living Future Institute (ILFI) through its Living Building Challenge program, certifies verified Net Zero Energy buildings, around the world. ILFI requires buildings that receive this certification to submit one year’s worth of performance records as proof that the building actually operates at net zero energy over the course of the year. (Offsets and purchases of renewable energy credits are not allowed under this definition.)

ZERO NET ENERGY: Sometimes California codes, developers and the New Buildings Institute use the phrase “Zero Net Energy.” It’s the same thing as Net Zero Energy. (NBI is a non-profit that educates around green design and tracks and catalogues ZNE/NZE buildings in a comprehensive online database.)

NET ZERO COST: Developers sometimes use this phrase when they have a solar building where the solar, on average, zeros out the building’s utility bill over the course of a year. This building may not technically be producing quite as much or more energy as it consumes over the year but if the cost of energy is covered by the production and sale from

the renewables on the building it is a net zero energy cost to the owner. This cost elimination is possible in places that allow net metering, where building owners can sell solar-generated electricity back to the utility during times the building produces an excess of what it consumes. (Most states allow net metering.) Even without net metering, if tenants operate their building at net zero energy use, the cost will be zero.

About Net Metering and what it will look like in the future

Net metering is a policy that is in place in 42 states. In those states, residential and commercial solar customers must provide a meter as part of their interconnection agreement with their utility. The metering agreement allows them to use the grid and allows them to send electricity to the grid. Under net metering they receive compensation at retail electricity rates for the power they supply to the grid.

Making sure this is a fair deal for both utilities and solar providers is controversial. Utilities adjusting to a new energy landscape are seeking rules to ensure solar customers pay their fair share for their grid access and maintenance. In California, solar providers will likely receive lower sellback rates and pay a feed-in tariff in the future. Nearly every state is in the

process of adjusting net metering policy. In Hawaii and Nevada, utilities and state legislators have managed to eliminate net metering and kill solar development. Most other states are maintaining net metering but adjusting rates to satisfy utility concerns. Proposed policy changes include adjusting the value of solar in relation to the amount providers are sending to the grid, adding feed-in tariffs to pay for grid upkeep, and other state by state nuances.

Developers in states with net metering have been able to significantly reduce their PV installation costs by selling electricity back to the grid to pay for their panels. Net metering may not always provide payback at the current rates, as states sort out their policies. However, for many projects that use the solar they produce for their own facilities instead of buying electricity, the savings on utility bills is still good compensation and payback, even without net metering. Unless your building is regularly generating more electricity than it consumes, net metering may not affect your project.

To keep up to date on net metering policies in each region of the country, check University of North Carolina's Solar Policy Outlook tracker, updated quarterly.⁸

⁸ 50 States of Solar (updated quarterly) by The NC Clean Energy Technology Center and the Meister Consultants Group. https://nccleantech.ncsu.edu/wp-content/uploads/50States_Q22016_ExecSummary-1.pdf

Definition of Terms for Non Developers

NET PRESENT VALUE (NPV): The difference between the present value of cash inflows and the present value of cash outflows. If the NPV of a prospective investment is positive, then it should be accepted – negative and it should probably be rejected.

CAPITALIZATION RATE: Capitalization rate is the rate of return on a real estate investment property based on the income that the property is expected to generate. The capitalization rate is used to estimate the investor's potential return on his or her investment. Thus, Capitalization rate= Net operating income/ Current market value.

NET-NET-NET (NNN) LEASE: A lease, also called a “triple net” lease, which makes the tenant responsible for all of the operating costs in the space in addition to the rent, including the utility bills. The name “triple net” comes from the tenant’s obligation to pay three types of costs: taxes; insurance; and maintenance.

FULL SERVICE GROSS LEASE: This lease places the costs spelled out in a typical triple net lease (see above) plus other costs such as utility bills and janitorial services in a bundle that is included in the base price of the lease.

MODIFIED GROSS LEASE: This lease works like a Full Service Gross Lease (see above) with costs included in the base price of the lease, however it excludes utilities and janitorial.

GREEN LEASE: A green lease may have many caveats that encourage the office tenant to reduce energy use, waste or water use. It may specify how the tenant operates the space’s lighting, HVAC and shading. It may specify the time of day for janitorial services (to save electricity). It may also include an obligation for the tenant to pay for solar power generated on site. Sometimes green leases allow a certain amount of free energy up to a limit and the tenant agrees to pay for energy they use above the limit. This is especially common in buildings aiming to operate at Net Zero Energy.

SPLIT INCENTIVE: A common scenario where a tenant’s lease makes the office tenant responsible for the energy bills in the space, disincentivizing the building owner or developer from investing in energy efficiency measure or renewable energy measures that would lower the energy bill. Developers overcome the split incentive by passing the cost of investing in efficiency or solar on to the tenant through surcharges or by selling them the electricity that is being powered on site by solar.

RESOURCES

SOLAR ENERGY INDUSTRIES ASSOCIATION

Trends, costs, data on commercial solar
www.seia.org/research-resources/solar-industry-data

THE 50 STATES OF SOLAR

A Quarterly look at America's Fast Evolving Distributed Solar Policy
Authored by the NC Clean Energy Technology Center, University of North Carolina
nccleantech.ncsu.edu/wp-content/uploads/50-States-of-Solar-Q3-FINAL_25.pdf

IMPLEMENTING SOLAR IN LEASED BUILDINGS: MILLENNIUM BUILDING CASE STUDY

betterbuildingssolutioncenter.energy.gov/resources/implementing-solar-leased-office-buildings

BUILDING RENEWABLE PORTFOLIOS WITH COMMERCIAL-SCALE SOLAR

Solar Industry Magazine, January 2009:
www.prologis.com/docs/Prologis-sim0901.pdf

HOW TO CALCULATE AND PRESENT DEEP RETROFIT VALUE

Rocky Mountain Institute
www.rmi.org/retrofit_depot_deepretrofitvalue#calculateform

PROMOTING SOLAR PV ON LEASED BUILDINGS GUIDE, BARRIERS AND STRATEGIES

Department of Energy, October 2015
betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Promoting-Solar-PV-on-Leased-Buildings-Guide-.pdf

GREEN LEASE LIBRARY

www.greenleaselibrary.com

BETTER BUILDINGS CHALLENGE

betterbuildingssolutioncenter.energy.gov/

ROOFTOP SOLAR PHOTOVOLTAIC TECHNICAL POTENTIAL IN THE UNITED STATES: A DETAILED ASSESSMENT

National Renewable Energy Lab, 2016
www.nrel.gov/docs/fy16osti/65298.pdf

NEW BUILDINGS INSTITUTE

Tools, guides, research and policy information for building owners, developers and design teams pursuing net zero energy.
newbuildings.org

TERRAPIN BRIGHT GREEN

Resources and studies on biophilia and green design.
www.terrapinbrightgreen.com



Peter Rumsey and the developer Jim Gaither Jr. on the roof of the 1400 Page Mill Road Net Zero Energy Building.

ABOUT POINT ENERGY INNOVATIONS

At Point Energy Innovations we feel that Building Owners and Developers are the key decision makers that drive buildings to be more efficient, healthy and sustainable. By working directly with this group, together we can make great strides in improving buildings. With half of the sustainability of buildings relating to the building systems, engineers communicating directly with owners and developers can yield high performing and affordable results. As a team, Point Energy Innovations strives to understand and speak the same language as building owners. Only when we find common ground and a common language will there be true progress towards fundamentally better buildings. We work with building owners and developers in the quest to achieve optimal solutions that maximize return on investment.



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“It’s really kind of cool to have solar panels on your roof.”

- BILL GATES, WIRED



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