On-Site Solar Energy Guide – Retail Real Estate

Summary

Interest is increasing in on-site solar energy as a method to lower net greenhouse gas emissions and hedge energy costs in buildings. Although not yet a strategy that can be fully standardized across building portfolios within the U.S. or globally, it is likely that at least one application is suitable for many retail real estate owners as a strategy for immediate financial gain as well as preparation for future opportunities and obligations.

As in real estate, the location of on-site solar installations is key to optimizing benefits and returns. Geographic variability of sun resources and state incentives are the key factors.

A number of deployment models and financing options have evolved to meet the needs of commercial building owners exploring an on-site solar energy application. This evolution is likely to continue as governments focus on climate change and energy security.

Continuing efficiency improvements along the supply chain and stabilization of incentives are expected to bring the cost of solar electricity to grid parity levels in the U.S. by 2015 or 2016.[1] Grid parity is defined as the point where energy from photovoltaic-produced solar power costs the same as that delivered by the local utility. This could occur two to three years earlier in the event of a penalty for emitting carbon dioxide.

Technologies

There are two categories of solar energy technologies used on commercial building sites: Solar Electric (Photovoltaic) and Solar Thermal. Both technologies can be used on a single building.

Solar Electric (Photovoltaic)

Photovoltaic (PV) systems use semiconductor materials that convert sunlight into electricity. If connected to the transmission grid, they not only generate physical electricity, but also produce renewable energy certificates (RECs) with monetary value.

The most common category of PV is crystalline photovoltaics, representing approximately 85% of the market, versus the newer thin film category at 15%.[2] There is disagreement as to whether thin film share will increase, based upon the assumed pace of advancements required in efficiency, substructure, installation and power production.

Emerging technology includes incorporating PV into roofing materials, windows, and even painted surfaces. Other areas being pursued include on-site storage systems, solar hybrid lighting, semiconductor material alternatives and nanotechnology.

Solar Thermal

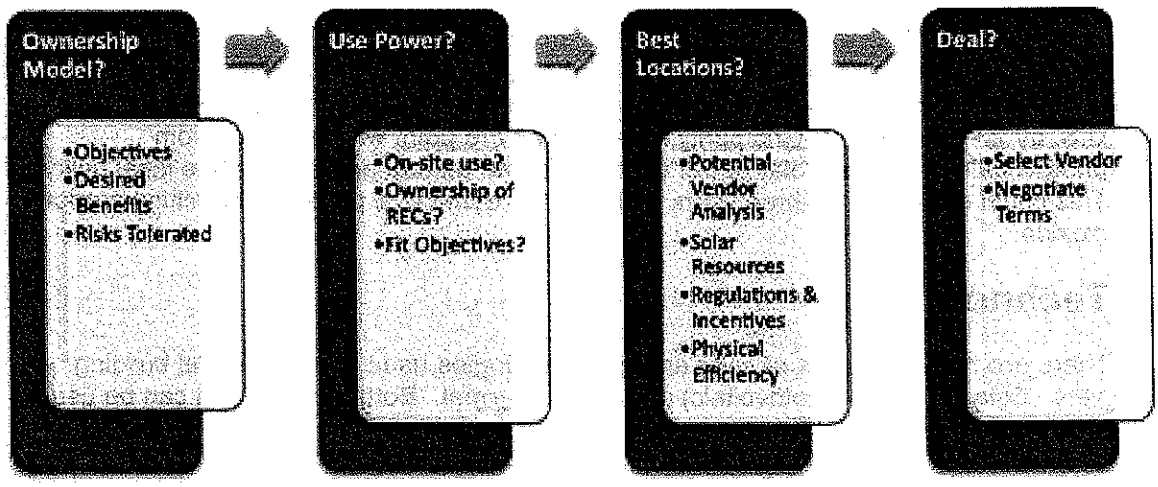
Solar collectors absorb the sun's energy to provide low-temperature heat, using air or water to transfer heat to its destination. Solar thermal is most commonly used to heat swimming pools and is not often found in commercial buildings.

Active thermal space heating systems use electric fans to transfer and distribute pre-warmed ventilation intake air collected in a series of flat, hollow panels or chimney systems. Passive solar involves the strategic placement of thermal mass materials such as stone and concrete in building designs to store energy during the day and release it during cooler periods.

While a popular residential application, solar thermal water heating is not widely used in commercial buildings, and is most typically found in small restaurant formats.

A newer more specialized form of solar thermal technology showing long term potential for large facilities is the absorption chiller, a closed-loop system that converts solar-heated water into air conditioning.

On-site Solar Decision Framework:



Business Models

There are two power ownership categories – Direct Ownership and Third-Party Ownership – each with different financing and power use options.

Direct Ownership

In direct ownership, the building owner invests in an on-site solar project, and consumes or sells the power as it is produced.

Power ownership has some challenges. Government regulations such as net metering limitations restrict the amount of excess power that can be sold to the grid in most States. Electricity storage technology to save power for later use on site is not yet viable. Thus there may be no economic benefit to net energy produced, impacting investment payback.

Financing options include direct corporate or dedicated financing, secured lending, leasing, vendor financing or an energy savings performance contract offered by an energy services company (ESCO).

Third-Party Ownership

In third-party ownership, the building owner hosts an investor's solar asset installation, and either purchases power under a long-term solar power purchase agreement (PPA) or charges rent under a lease. Both agreement types are typically for a 20-year term.

A PPA can be structured with or without an ESCO savings performance provision. Under a lease, ownership of the solar energy generation asset and the power and RECs generated by the asset typically belong to the solar power tenant. When reviewing leasing alternatives, it is important to understand which party is able to benefit from the federal and state incentives and which is burdened with the operating costs of the solar energy generation asset.

Third-party ownership options have become popular because they do not require the building owner to invest capital and they require less in-house expertise to implement than direct ownership. Through these options, tax advantaged entities including real estate investment trusts (REITs) can enjoy a power price or rent that reflects the tax credit enjoyed by the third-party owner.

As solar power companies position for market share as the industry broadens, an option agreement model has recently emerged as a variation of the roof lease.

Objectives

In selecting a model, the building owner must define its objectives and understand risk trade-offs. Common objectives include:

- Reduce energy costs
- Hedge energy costs
- Generate a new income stream from underutilized asset (i.e. roof)
- Reduce greenhouse gas emissions (and financial impact of potential legislated limits or penalties)
- Enhance brand reputation
- Realize benefits of tax-based incentives (if taxable entity)

Benefits by Business Model Chart:

	DIRECT OWNERSHIP OF POWER		THIRD PARTY OWNERSHIP OF POWER	
BENEFITS	**USE OF POWER**	**NO USE OF POWER**	**USE OF POWER**	**NO USE OF POWER**
Energy Cost (relative to commercial rates)	YES, from federal and state incentives, and grid peak demand shaving	NO	YES, possible under a power purchase agreement (PPA)	NO
Energy Cost Hedge	YES	NO, unless site owner retains the right to use power at some point in the future	YES, depending upon the tariff option negotiated	NO
Revenue	DEPENDS upon availability of peak demand response incentives from local utility provider	NO	YES, if hosting arrangement includes lease fees	YES, if hosting arrangement includes lease fees
Greenhouse Gas Emissions	DEPENDS upon retention of RECs	DEPENDS upon retention of RECs	DEPENDS upon retention of RECs	NO
Brand Enhancement	YES, from publicity and sometimes visibility benefit (Note: Green power use can only be claimed if RECs are retained)	YES, from publicity and sometimes visibility benefit (Note: Green power use can only be claimed if RECs are retained)	YES, from publicity and sometimes visibility benefit (Note: Green power use can only be claimed if RECs are retained)	YES, from publicity and sometimes visibility benefit (NO green power can be claimed)
Tax Incentives	DEPENDS upon taxable entity status of site owner (Note: May limit REITs)	DEPENDS upon taxable entity status of site owner (Note: May limit REITs)	NO, unless third party passes through own tax benefits in energy pricing	NO, unless third party passes through own tax benefits in higher rents
Energy Reliability	YES, during productive hours at reduced demand	NO	YES, during productive hours at reduced demand	NO

Chart adapted from World Resources Institute's Harnessing Nature's Power: Deploying and Financing On-site Renewable Energy), "Benefits Summary: On-Site Solar Energy by Business Model"

Understanding Cost

Under a third party ownership model, it is possible to avoid direct capital and operating costs entirely. However, because the initial system cost impacts the economics offered, it is helpful to understand cost and cost trends whether a building owner favors direct or third-party solar asset ownership.

Initial Costs

Since the 1970's, the price of PV modules has decreased by a factor of more than 20.[3] However, photovoltaic equipment still has a very high initial cost of $5 to $10 per Watt,[4] and component replacement is expensive. A system scaled for a large format retail building (150 to 400 kW) typically costs $1 to $3 million.

Prices are decreasing due to growing supply, efficiency improvements along the supply chain, and design for lower installation cost. A key cost component is silicon, the same semiconductor material dominating the electronics and computer industries. The supply of silicon manufacturing capacity is increasing, and, as material waste is reduced through innovations in solar cell wafer manufacturing processes, costs are likely to continue to decrease.

Operating Costs

Operating costs are attractive and more predictable than other forms of energy. There is no fuel cost, low maintenance costs, and PV systems are durable, offering a 20-30 year useful life.[5] Because of the high value and long life, it is important the solar asset owner adequately insure the equipment against damage and loss.

Electricity Costs

Regulation is starting to increase the price of traditional energy fuels, making on-site energy pricing comparatively more attractive. While potential greenhouse gas regulations impacting fossil fuel costs such as cap-and-trade remain to be seen, state "Renewables Portfolio Standard" (RPS) regulations are driving surcharges on grid electricity. Pricing already reflects "system benefits charges" in the states with the earliest target dates obligating traditional utility providers to reach a prescribed renewable fuel supply percentage.

Solar electricity is not subject to the price swings common to other fuel types, thus can be used as a price hedge.

Understanding Benefits/Savings

The primary environmental benefit of solar energy is reduction of carbon dioxide emissions associated with the combustion of fossil fuels necessary to consume them. Carbon dioxide and other greenhouse gas emissions are widely accepted as likely contributors to global climate change. In addition, unlike many other forms of electricity generation, solar does not require water. As clean water shortages become more prevalent, this may become a significant consideration.

The primary financial benefits of on-site solar energy are rental revenues or lower, more predictable energy costs, and peak demand response revenue offered increasingly by utility providers. There is also an economic benefit to society from the job creation associated with distributed solar generation asset manufacturing and installation.

The productivity of solar energy systems, financially as well as environmentally, is highly dependent upon location.

Cost/Benefit Analysis

The return on on-site solar is highly variable, and involves many factors, particularly on the benefit side of the equation.

The cost factor with highest impact is the decision whether to own the solar asset directly or contract through a third party. Other significant cost factors include manufacturing efficiency, power conversion efficiency of the product, and installation efficiency.

Benefits depend heavily on location. Although the payback period can be 15 to 20 years without incentives, the most popular commercial locations for on-site solar offer a savvy system owner a financial payback of five to 10 years, including installation and maintenance. Product design, installation design and agreements in place with states, utility districts and financiers differentiate returns experienced by solar asset vendors and owners. Timing can also impact returns due to changes in electricity rates from the local utility, regulations in force and economic incentives moving in tandem with achievement of State or local utility district goals.

SIMPLE FINANCIAL PAYBACK CALCULATION:

$$\frac{\text{(TOTAL SYSTEM COST AFTER INCENTIVES) + (MAINTENANCE COSTS x EQUIPMENT LIFETIME)}}{\text{(ANNUAL SYSTEM kWh PRODUCTION) x (LOCAL ELECTRIC RATE COST PER kWh)}}$$

NOTE: MOST OWNERS WILL WANT TO INCLUDE ADDITIONAL FACTORS SUCH AS COST OF CAPITAL, INFLATION, LOCAL ELECTRICITY RATE INCREASES, AND DISCOUNTS FOR REAL SOLAR CONDITIONS AND PRODUCTION LOSS OVER TIME.

The PV "energy payback time," the amount of time a system must operate to recover the amount of energy and emissions it took to make and transport the system, is currently two to five years and anticipated to be cut in half by pending advancements.[6]

Geographical and Size Considerations

Location is the most important factor in the effectiveness of on-site solar, from several perspectives:

1. Solar Resources – The first location consideration is the level and consistency of solar radiation, typically measured by number of peak sun hours available in the geographic area. Both environmental and financial effectiveness are impacted.

2. State Regulation & Incentives – Financial effectiveness is largely dependent upon state rules and incentives.

   Rules to be aware of are interconnection and net metering. Because storage batteries scaled for a retail building are not yet viable, access to the grid and a net metering arrangement are required to use electricity produced on site at another time, such as in the dark evening hours. Interconnection rules impact difficulty and expense involved in connecting the system to the grid and the ability to send excess energy to the grid during times more is produced than used on site. Net metering allows the same amount of "banked" grid electricity to be consumed at a later time during the same billing period, and in some cases allows net excess to be sold. However, extremely conservative kilowatt caps on net metering are common.

   Incentives are highly variable by state, and may include:[7]

   - Direct Cash (rebates, buy downs, grants, performance-based; typically cover 20% to 50% of project costs)
   - Loan Programs (sources include appropriations, public benefits funds, renewables portfolio standard alternative compliance payments, sale of bonds); Can now both finance under government loan program and receive federal tax credit subject to overall federal tax credit eligibility of corporate structure
   - Property Tax Incentives (Typically exclude the added value of solar energy equipment in the valuation of the property; Some states specify that the systems must produce energy for on-site use)
   - Sales Tax Incentives (for direct purchase and installation of systems and components)
   - Investment Tax Credits (direct reduction in a taxpayer's tax liability for a portion of the cost of purchasing and installing a solar energy system; REIT tax exempt status may preclude a direct credit); the 30% federal Solar Energy Property Credit has been extended through 2016

3. Physical Efficiency – Also impactful are the physical attributes of the site, including total square footage available, the availability of contiguous space, angle for highest solar radiation potential, shade, and to a lesser degree, altitude.

   Often initially overlooked, the amount of contiguous space "seen" by the sun is very important because the connections required for transference impact the system design efficiency, ultimately impacting the electricity production cost per square foot.

   Due to series connections prevalent in PV solar arrays, 10% shading can lead to a 50% decline in efficiency. A shading analysis study is essential to avoid or understand the impact of structural shading, for example, rooftop HVAC units.

Location is expected to continue to be the most significant factor to financial productivity well into the future. Because photovoltaic technologies under exploration; such as magnifying mirror or lens concentrators, moving solar trackers, nanomaterials and photoactive dyes add cost; productive locations are required to generate the desired returns. In addition, there can be additional physical requirements. For example, concentrating equipment requires direct sunlight versus diffused sunlight, thus is productive only in certain geographical areas such as the southwest and Florida in the U.S., and Spain.

Risks to Consider

The most common concerns retail real estate owners have when considering on-site solar are transfer flexibility and technology opportunity cost. These risks exist regardless of the business model, but can be mitigated via a third party ownership agreement of shorter term than the solar asset's useful life, as well as assignment, buy-out and relocation provisions.

Most other risks can be avoided under the third party ownership model, as the system owner assumes them.

Transfer Flexibility

A very common concern is how the 20-year term commonly required by third party solar generation asset owners impacts the building owner's business flexibility. Flexibility concerns include the ability to carry out multi-year roof replacement programs or emergency repairs, potential constraints on redevelopment or tenant-driven changes, and the impact to property dispositions.

PPA providers mitigate these concerns with buy-out, relocation and assignment rights, as well as physical options such as non-penetrating roof or parking deck canopy systems.

Technology Opportunity Cost

There are two schools of thought about the right time to adopt on-site solar technology.

Property owners who favor adopting now point out that as long as a PPA or third party lease guarantees lower power costs than market rates, high REC rates, or pays attractive roof rent now, there is no reason to wait to enjoy an immediate financial benefit. This is akin to the concept of leasing a space to receive rent now, versus holding it for a higher value lease later.

Waiting is advocated by others who are counting on most of the solar efficiency improvements occurring on a 5-year time horizon, suggesting potentially higher returns during a shorter term on a deferred deal than on a longer term deal starting immediately. Another opportunity cost argument is the first capital and time is better invested in equipment and practices that lower energy consumption.

Some of the factors that support earlier adoption include: learning curve benefits, greenhouse gas emissions regulatory readiness, expiring governmental solar incentives, wide availability of capital-free options, and in some markets, synergies with peak demand response revenue opportunities or price hedge against rising or volatile grid electricity prices.

Risk Factors Chart:

	DIRECT OWNERSHIP OF POWER		THIRD-PARTY OWNERSHIP OF POWER	
RISKS	USE OF POWER	NO USE OF POWER	USE OF POWER	NO USE OF POWER
Transfer Flexibility	YES	YES	YES, for duration of the site agreement	YES, for duration of the site agreement
Technology Opportunity Cost	YES	YES	YES, for the duration of the power purchase agreement (PPA)	YES, for the duration of the hosting arrangement
Competent Expertise	YES, (extensive) including procurement, design, operations, regulatory, incentives, grid interconnection, legal, insurance, accounting and tax implications	YES (extensive) including procurement, design, operations, regulatory, incentives, grid interconnection, legal, insurance, accounting and tax implications	YES, legal, insurance, accounting and tax implications	YES, legal, insurance, accounting and tax implications
Power Generation Reliability ("Dispatch")	YES, both investor and power purchase risk is assumed	YES, investor risk is assumed	YES, power purchase risk is assumed	NO
Operational	YES	YES	NO, not unless retain ownership of solar generation asset	NO
Building Impacts	DEPENDS, should review structural, roof warrantee and insurance impacts	DEPENDS, should review structural, roof warrantee and insurance impacts	DEPENDS, should review structural, roof warrantee and insurance impacts	DEPENDS, should review structural, roof warrantee and insurance impacts
Credit	YES, may be weakened by debt-financed renewable energy project	YES, may be weakened by debt-financed renewable energy project	NO, financial ratios may improve due to energy cost savings	NO, financial ratios may improve as unused asset brought into productive use

Chart adapted from World Resources Institute's Harnessing Nature's Power: Deploying and Financing On-site Renewable Energy), "Risks Summary: On-Site Solar Energy by Business Model"

Other Issues to Consider

REC Ownership and Greenhouse Gas Legislation

A renewable energy certificate (REC) represents the property rights to the environmental, social and other nonpower qualities of renewable electricity generation. Specifically, a REC is the "unique and exclusive proof that one megawatt-hour of electricity has been generated form a qualified renewable resource connected to the grid."[9] If the physical electricity and the associated RECs are sold to separate buyers, the electricity is no longer considered "renewable" or "green" and should not be claimed as such by the user.

RECs are often purchased by electric utilities as an alternative to building renewable energy generators to satisfy mandatory state renewable portfolio standards.[10] They are also sold in voluntary green power markets. Whether purchasers of RECs should make greenhouse gas emission reduction claims and how they might impact greenhouse gas accounting and reporting under cap & trade or carbon tax legislation is a source of debate, but eligibility is likely in cases where the chain of custody can be verified.

Third party solar owner agreements can be structured with or without RECs ownership.

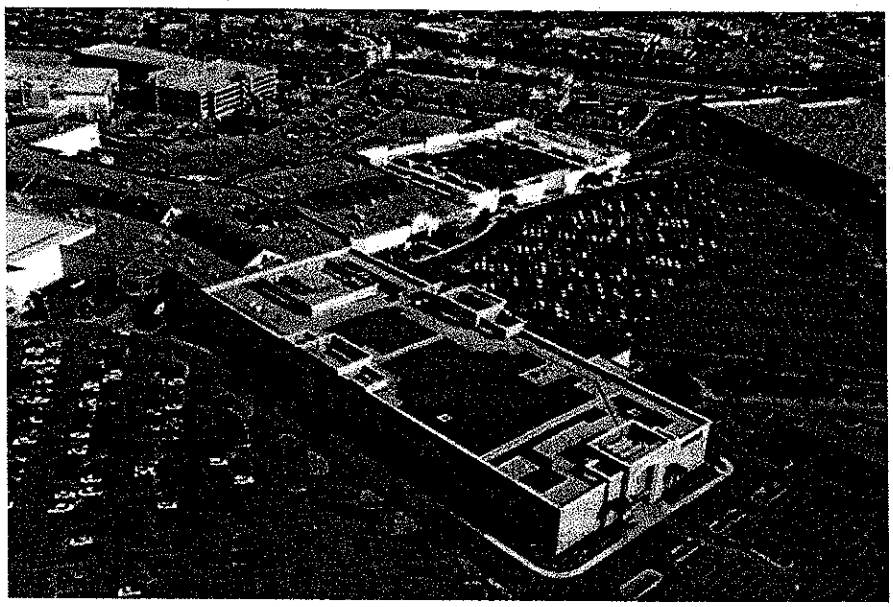
Environmental, Health & Safety

Just as with any "green" strategy, the lifecycle impacts incurred from each step in the supply chain from extraction, production, transportation and disposal, should be considered. There are some modest production and disposal impacts, including:

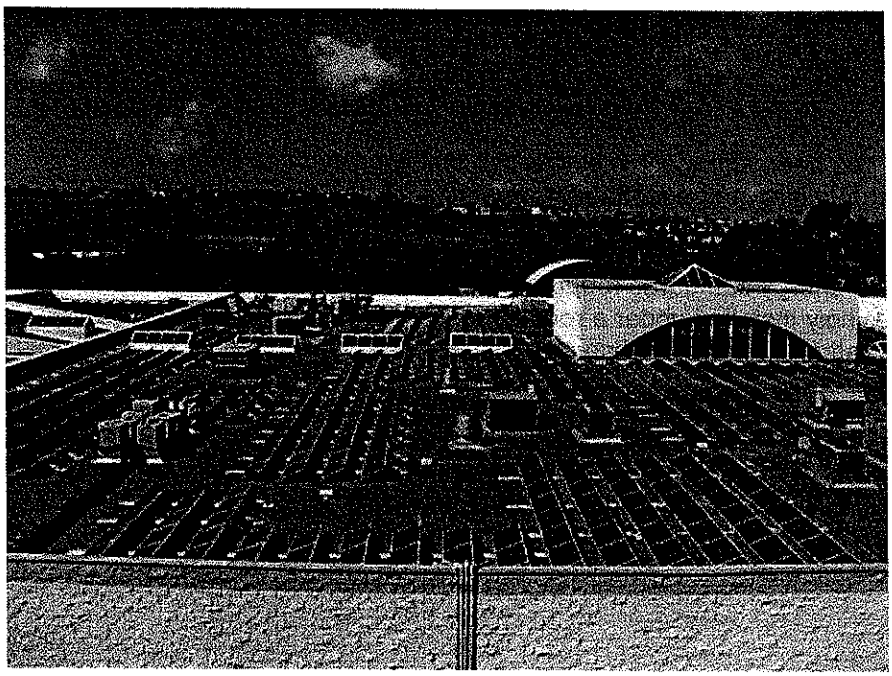
- Production & installation health hazards (solvents, toxic or explosive gases, inhaling dust, electrical fires)
- Electronic waste burden (in case of PV; small amounts of semiconductor material per cell and dispersed use makes recycling challenging)

Since solar energy produces no pollutants during operation and solar PV cells have useful lives of 20-30 years, the environmental benefits exceed the modest manufacturing, implementation and waste impacts.

Shopping Center & Retail Applications



Macy's two stores at Promenade Temecula in Temecula, California have large roof mounted photovoltaic solar arrays. Note the difference in amount and location of infrastructure on the stores' roof versus the mall roof, an issue impacting the viability of a large and efficient PV system. ***Photo Credit: Macy's***



The Shops at Mission Viejo in Mission Viejo, California, a Simon mall, hosts a fixed-tilt roof mounted photovoltaic array. Note the placement around skylights, rooftop HVAC units and parapet walls. **Photo Credit: Simon Property Group**

Solar PV

Adoption of solar PV, particularly crystalline technology, has been increasing amongst large format prototype retailers, typically implementing 10 to 30 solar locations in phases. Major shopping mall owners have also shown growing interest, most adding solar locations one by one due to customized property designs different in every market.

The predominant application in retail real estate is non-penetrating roof mounted panel systems. Roof application options include thin film integrated with roofing membrane or separate crystalline panels, penetrating or non-penetrating rack systems, and flat or fixed tilt orientation.

Other applications are available, such as building integrated (incorporated into windows or awnings), parking lot or deck canopies, and ground mounted sun-tracking systems. Adoption of these alternative applications has been low within the retail real estate industry due to the priority of building site lines and parking availability.

The overlapping impacts of energy efficiency strategies dependent upon roof space are important considerations. Reflective roofs, "daylighting" with skylights, high-efficiency HVAC units, and installation of rooftop solar arrays - while each positive - may inadvertently reduce overall effectiveness when deployed together.

Solar Thermal

Adoption of solar thermal has been very limited within retail real estate. Returns to date have been longer than other available energy responsibility strategies in test locations. The National Renewable Energy Lab is actively working on improving the efficiency of thermal energy technologies, including space heating, water heating and space cooling.

Adoption

Solar PV adoption has been strongest in single-use buildings such as department stores, large format retailers, and warehouses, in states offering financial incentives and allowing net metering.

As states' renewable energy standards requirements have increased, photovoltaic systems are increasingly installed under a roof lease, with the energy often consumed off site by someone other than the building owner.

Globally, Germany leads in solar PV electricity capacity (all sites including utility), with more than 5,300 MW, followed by Spain (nearly 3,000 MW), Japan (almost 2,200 MW) and the U.S. (more than 1,500 MW). U.S. States with the most grid-tied PV capacity in 2008 were: California, New Jersey, Colorado, Nevada, Hawaii, New York, Arizona, Connecticut, Oregon and North Carolina, with California holding over 65%.[8]

Shopping Center Owner & Vendor Sources

Shopping Center Owner	Contact	Technology	Financial Model	Vendor(s)	Location(s) & Size (DC unless otherwise stated)
Developers Diversified Realty	Marc Feldman Vice President New Business Development (216) 775-6551 mfeldman@ddr.com	Roof mounted PV	Roof lease option and PPA agreement (Includes consent to meter tenants contracting with SunEdison to system and/or expand system over tenant's roof)	SunEdison Developers Diversified Realty Strategic Business Partner Program (consultant)	Approximately 200 centers; multi-phase deployment in solar-viable states starting in California, Colorado, New Jersey and Puerto Rico (first phase ranging from 35 kW to 150kW per site; portfolio potential 259 MW assuming 150kW per SF)
Simon Property Group	George Carighuar, LEED AP Vice President, Energy Services (317) 263-7123 georgec@simon.com	Roof mounted PV panels	PPA	Element Markets	The Shops at Mission Viejo, Mission Viejo, CA (173 kW; 20,000 SF system)
Westfield	Jim Darrish Senior Director of Technical Operations (310) 575-5934 jdarrish@westfield.com	Building-interated PV thin film integrated into Sarnafil PVC roof membrane Roof mounted mono-crystalline silicon PV modules FS-275 First Solar Panels with SatCon inverter; a CdS/CdTe thin film glass encapsulated system	Direct Ownership (with SGIP rebate) PPA PPA	Solar Integrated Technologies Sustainable Energy Partners (design and bid) Resource Energy Systems (PPA) SPG Solar (installer) Solar City	Mainplace, Santa Ana, CA (78 kW) University Town Center (UTC), San Diego, CA (100 kW AC) Pending project at Fox Hills Mall, Culver City, CA (160 kW)

Retailer & Vendor Sources

Retailer	Contact	Technology	Financial Model	Vendor(s)	Location(s) & Size (DC unless otherwise stated)
BJ's Wholesale Club	Kevin Moran Manager of Energy (508) 651-5518 kmoran@bjs.com	Roof mounted PV panels	PPA	(Not available)	Currently 12 locations (480 kW) 4 additional locations under development (bringing total to 1.7 MW)
CostCo Wholesale	(Not available)	Roof mounted silicon PV panels	Direct Ownership	(Not available)	25 warehouses in CA, HI and NJ [12.7MW(ac)]
JCPenney	Robert Keller, P.E. Energy Management – Engineering Services Director (972) 431-1788 rkeller@jcpenney.com	Roof mounted PV panels (angled or flat)	PPA	SunPower (system / PPA provider) Integrys (system owner / operator)	9 stores in CA & NJ (3.7 MW)
Macy's	Bill Lyon VP Energy Management (678) 474-3404 bill.lyon@macys.com	Roof mounted silicon crystalline PV panels	PPA with option to relocate (most locations) Direct ownership (11 locations)	SunPower SunEdison PPL Renewable Energy	34 stores in CA, HI & NJ (totaling 9.5 MW) 11 additional locations under development in NJ, MD & AZ
Staples	Mark Buckley VP – Environmental Affairs (508) 253-0510 mark.buckley@staples.com	Roof mounted PV 2 ground mount applications in development	PPA	SunEdison	25 stores in CA, CT & NJ (4 MW installed) 150 projects in development including AZ, CO & MA
Safeway Inc.	George Waidelich Vice President Energy Operations (925) 467-2983 george.waidelich@safeway.com	Roof mounted crystalline PV panels	PPA preferred	Solar Power Partners, Inc.	18 stores in CA plus 10 under development in three states (totaling over 5 MW)
Target	Eames Gilmore Design Manager (612) 761-1585 eames.gilmore@target.com	Roof mounted flat or tilted silicon PV panels	Most installations direct ownership (positive NPV); single PPA in San Diego, CA	SunPower DRI Energy Nextek (PPA system owner)	18 stores in CA; 3 in HI

Retailer	Contact	Technology	Financial Model	Vendor(s)	Location(s) & Size (DC unless otherwise stated)
Walgreen Co.	Menno Enters National Energy Manager (847) 315-6329 menno.enters@walgreens.com	Roof mounted silicon PV panels	PPA	SunEdison	81 sites in CA, CT, HI, OR, NJ (5.65 MW capacity)
Wal-Mart	David Ozment Director of Regulated Utilities (479) 204-0771 James.ozment@wal-mart.com	Roof mounted PV crystalline panels (stores) Ground mounted PV tracking system (distribution center)	PPA	SunPower SunEdison BP Solar	18 sites in CA; 2 in HI (11 MW aggregate producing 16 million kWh per year) Additional 10-20 planned
Whole Foods Market, Inc.	Kathy Loftus Global Leader, Sustainable Engineering, Maintenance & Energy Management (617) 492-5500 kathy.loftus@wholefoods.com	n/a (various)	Predominantly PPA Some direct ownership	SunEdison	More than 12 stores in 5 states (approximately 1 MW) Additional 18 in various stages of implementation and 40 planned for future rollout

Additional Resources

CBEA - Commercial Building Energy Alliances, part of the U.S. Department of Energy (DOE) Energy Efficiency and Renewable Energy (EERE) Building Technologies Program, http://www1.eere.energy.gov/buildings/commercial_initiative/alliances.html

DSIRE - Database of State Incentives for Renewables & Efficiency, http://www.dsireusa.org/

DOE -

U.S. Department of Energy (DOE) Green Power Partnership, "Top 20 On-Site" as of July 7, 2009 - http://www.epa.gov/greenpower/toplists/top20onsite.htm

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EERE Solar FAQs – Photovoltaics – Financial Considerations - http://apps1.eere.energy.gov/solar/cfm/faqs/third_level.cfm/name=Photovoltaics/cat=Financial%20Considerations

NREL - National Renewable Energy Laboratory (NREL) , http://www.nrel.gov/learning/re_solar.html

SEIA - Solar Energy Industries Association - http://www.seia.org/

WRI - World Resources Institute, "Harnessing Nature's Power: Deploying and Financing On-Site Renewable Energy," March 2009 - http://www.wri.org/publication/harnessing-natures-power

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A special thanks is extended to each of the contacts listed in the "Sources" tables for contributing content regarding their installations.

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