Letting the Sun Shine on the Retail Sector

More Retailers Explore Solar Power

Jerry Yudelson*

Abstract: *More retailers are getting aboard the solar-power train. With the advent of third-party financing partnerships, putting solar power on a building roof allows companies to buy renewable electricity without incurring the upfront capital costs. This article explores what some retailers are doing today and presents the current economics of solar power.*

The Solar-Power Movement

A powerful change in energy usage among retailers is shinning through with each new company announcement. Collectively, solar-power implementation is getting significant traction throughout the retail sector, although the number of stores today with those systems is relatively small as the industry experiments with the technology.

In late 2007, Wal-Mart announced a solar power "pilot" project in California (18 units) and Hawaii (four units) to outfit a total of 22 stores with solar energy systems, with a projected output of 20 million kilowatt-hours (kwh) per year.[1] The company signed 10-year agreements with three companies: SunEdison, BP Solar and PowerLight, a subsidiary of SunPower Corporation. Wal-Mart will maintain ownership of the Renewable Energy Credits (RECs) that the solar systems produce. According to Vice President, Prototype and New Format Development, once it has evaluated the results of the pilot projects, the company may move forward with additional solar-power systems for other stores.[2]

Safeway Stores has announced that they will "solarize" 23 stores, mainly in California, with systems averaging about 300 kilowatts (kw) each. Collectively, these stores' systems are expected to produce 7.5 million kwh per year.[3] According to Joe Pettus, Senior Vice President of Safeway, "Safeway, one of California's largest renewable energy purchasers, has embarked upon a major solar initiative with Solar Power Partners to augment our comprehensive Greenhouse Gas Reduction Initiative...There are many items that must come together to make solar economics work, with no two projects being exactly the same."[4]

In April 2007, Kohl's department stores announced that 64 stores (of 80 total) in California will get solar power by the end of 2008, each with 2,340 solar panels, which will nearly cover the roof of a typical 88,000-square-foot Kohl's store. The Kohl's program is expected to generate 35 million kwh annually.[5] Ken Bonning, Executive Vice President for Kohl's, said "Kohl's is committed to being environmentally responsible. We are actively seeking ways to make a difference as an organization. Our continued commitment to green power is an important way Kohl's can make an immediate and long-term impact."[6]

Other retailers with solar power announcements include:

- Macy's is installing solar power systems in 26 stores. For 15 of the stores, Macy's will purchase solar-generated electricity from a third-party financier. At the end of 10 years, Macy's can renew the agreement, transfer the equipment to a new site, or buy the system. Macy's plans to purchase outright solar power systems for the other 11 stores.[7]
- Target expects to install solar panels on the roofs of 18 of its California stores in 2007.[8]
- BJ's Wholesale Club and Costco plan to install six systems total in 2007.
- In January 2007, Tesco, announced that it planned to install a $13 million solar roof ("the world's largest") on its five-building, 820,400-square-foot

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[1] Wal-Mart [online], http://www.walmartfacts.com/FactSheets/Solar_Power_Pilot_Project.pdf, accessed December 1, 2007.
[2] Charles Zimmerman, personal communication, December 18, 2007.
[3] *Environmental Leader* [online], http://www.environmentalleader.com/2007/09/14/safeway-to-install-solar-power-panels-on-23-stores/, accessed December 13, 2007.
[4] Solar Power Partners, press release, http://www.energyrecommerce.com/index.php?fuseaction=public.news_article&id=13, accessed December 18, 2007.
[5] "Kohl's to go solar in California," *Milwaukee Journal Sentinel* [online], http://www.jsonline.com/story/index.aspx?id=596541, accessed December 15, 2007.
[6] Kohl's Corporation, press release, http://www.kohlscorporation.com/2007PressReleases/News0426Release.htm, accessed December 18, 2007.
[7] *Environmental Leader* [online], http://www.environmentalleader.com/2007/06/06/macys-installs-solar-power-in-26-stores/, accessed December 10, 2007.
[8] "Target Starts Solar Power Rollout," *American Business Daily* [online], http://www.mlive.com/business/ambizdaily/bizjournals/index.ssf?/base/abd-3/1177915233122600.xml, accessed December 18, 2007.
[9] *Environmental Leader* [online], http://www.environmentalleader.com/2007/01/19/tesco-usa-to-install-13-million-solar-roof/, accessed December 5, 2007.

distribution center under construction in Riverside, California, to supply 2.6 million kwh annually.[9]

Most of these projects are financed by third parties, with various "end of lease" arrangements. (See Appendix 11-1 for a more complete description of how these third-party equipment leasing partnerships work.) Typically, the retailer is obligated to take all energy generated by the system (which is typically no more than 30% of its daytime needs) and to pay at or slightly below prevailing retail electrical energy rates. Ownership of the Renewable Energy Credits is negotiable between the retailer and the solar system provider.

According to one source,[10] SunEdison, the largest commercial solar power provider in the U.S., sells commercial solar power at or below the going rate for electricity by leveraging capital from Goldman Sachs and other investors to cover the initial capital cost of installing photovoltaic (PV) panels on customers' roofs. By mid-2007, SunEdison had already built 127 of its distributed generation systems nationwide for many customers, including retailers Staples and Whole Foods.

With the U.S. Green Building Council, the American Institute of Architects and the American Society for Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) calling for reducing energy use in buildings by 50% over current codes by 2010, and in the context of significantly higher oil prices and growing concern over global warming, retailers are wise to take a good look at using solar power systems, or photovoltaics, in their projects, as a complement to many other energy conservation measures.

Solar Technology

PVs come in two basic forms: stand-alone PVs, which are typically installed on rooftops (but which could be used as shading devices for parking lots); and building-integrated photovoltaics (BIPVs), which are usually placed on top of south-facing sunshades or spandrel panels, or integrated with roofing tiles. For most retailers, the roof-mounted stand-alone solar arrays are probably the system of choice.

Given today's technology, it is probably better to use single-crystal or polycrystalline solar modules, since they produce about twice as much power per unit area as the "amorphous" silicon panels; hence, they require only half the roof area. This in turn means that a given area of roof can generate twice as much power.

Some estimates project that the cost of solar power will decrease to about the level of that of conventional power by 2014, as solar cell production costs continue to fall and retail electricity prices continue to grow. One research firm, Clean Edge, estimates that venture capital firms pumped $264 million into solar companies in 2006, an indicator that expected cost reductions are likely to be achieved.[11]

The Current Market

The current market for photovoltaics for retailers is dominated either by investment partnerships or by large vendors with the financing to complete the transaction and take all the tax and utility benefits. In this context, the market is vastly changed from the PV market I worked in during the 1980s, when energy was a lot cheaper and PV systems were much more expensive. Consider these points about solar energy:

- Costs have come down, from about $10 per watt (peak) a few years ago to about $6 per watt (peak) in 2006, for commercial systems.
- For systems *placed in service* before the end of 2008, the federal tax credit for PVs is 10% to 30%, with no limit on cost for commercial systems.[12]
- Accelerated depreciation (MACRS) adds about 25% (net) to the tax benefits of PV systems.
- Many state, city and utility programs are offering additional incentives in the form of tax credits, subsidies based on system size or payments for power generated.[13]
- Most experts expect the price of electricity to rise considerably in the future, probably faster than the rate of inflation, making the output of PV systems more valuable over time.
- Globally, the solar power industry is projected to grow fourfold by 2010, from $20 billion in 2006 to $90 billion in 2010, according to reliable projections.[14]

Economics of Photovoltaic Solar Power

Without access to third-party financing, of course, a company must make its own investment in solar PV systems. Without tax incentives, the economics of solar power are not very favorable. Take a look at the basic

[10] *Fast Company* [online], http://www.fastcompany.com/magazine/113/open_14-sunedison.html, accessed December 18, 2007.
[11] "Forecast for Solar Power: Sunny," *USA Today* [online], August 26, 2007, accessed December 18, 2007, http://www.usatoday.com/tech/science/environment/2007-08-26-solar_N.htm.
[12] As we went to press, on December 18, 2007, Congress passed the new "Energy bill" in a form that President Bush has indicated he will sign. This bill does NOT extend the current solar energy tax credits past the end of 2008. Some members of Congress have indicated they will introduce a separate bill to do so. One experienced solar lobbyist indicated to us that he has some hope early in 2008 for an "extender" bill to deal with a number of expiring tax credits.
[13] For a directory of state incentives for renewable energy and energy efficiency, visit www.dsireusa.org.
[14] *Financial Times* [online], April 4, 2007, http://www.ft.com/cms/s/0/edfdbbf0-e248-11db-af9e-000b5df10621.html?nclick_check=1, accessed December 18, 2007.

Table 11-1
Basic Economics of Photovoltaic Systems

- System cost (50 kw – peak output) $300,000 (assuming $6/watt-peak installed)
- Annual energy output: 75,000 kwh (assuming 1,500 kwh/kw-peak/year)
- Value of output $7,500 (at 10 cents/kwh)
- Annual return on investment: 2.5%, assuming no maintenance costs
- Payback: 40 years (at 0% discount rate); never (at 5% discount)

economics of PVs as an add-on power source for buildings (this is a rough order-of-magnitude approach, but not far off), in Table 11-1.

An easy way to estimate the cost of PV-generated power is to first collect the following information:

1. **Cost of installation**, excluding the value of all incentives, expressed as dollars per kilowatt (typically given at peak power output; but, as always, "your mileage may vary.")
2. **Annual energy generated** (the typical U.S. range is 1,200-1,800 kilowatt-hours per year, per kilowatt-peak power rating)
3. **Value of power generated**: typically your retail rate, eight cents to 12 cents per kilowatt-hour (although some places may have slightly higher average rates)
4. **System lifetime**: assume 20 years (this is fairly accurate for most solar technology)
5. **Net Present Value (NPV) Factor**: Determine the best way to discount the value of future electricity—typically, figure a 5% discount rate (like a 20-year government bond). Over 20 years, the value of getting $1 each year at 5% is worth $12.46 today. Remember that this is pretty risk-free, and typically generates a fairly reliable return.

Then apply this easy formula:

Value of PV electricity = (Annual kilowatt-hours produced) x (Your electric rate) x NPV Factor.

(In the example, the value = 1500 kwh x $0.10 x 12.46 = $1,869.)

This sample result says that you could pay $1,869 (per kilowatt-peak) for the system and still generate a 5%, 20-year return at 10 cents per kilowatt-hour. If your retail rate is 15 cents, then you could pay up to $2,803 for the same return. If you think power costs will increase faster than the rate of inflation, you could increase the price you're willing to pay, after taking all incentives into account. The fundamental economic problem is: If the system costs $6,000 per kw, *you will never make a return on investment.*

Table 11-2
Financial Benefits to Photovoltaic System Owners

- Federal and state accelerated depreciation (for stand-alone systems), might be worth 25% net
- Federal tax credits (30% for commercial PV systems put in place by the end of 2008)
- State tax credits (e.g., Oregon tax credit is valued at about 25% of initial cost)
- State and local subsidies ($2,000 to $3,000 per kilowatt in some places like California)
- Utility credits and payments for power produced (15 cents per kilowatt-hour or more)
- Peak period power savings, in areas where power demand is monitored "real time"
- Greenhouse gas emission reduction credits (Renewable Energy Credits)

From Table 11-1 and the sample calculation, it is easy to see that *without tax incentives there is little direct economic justification for photovoltaic*s as an add-on energy supply system for private projects (in areas with no utility credits or low peak period power rates).

Financial Benefits of PV Solar Power

But now take a look at the potential financial benefits to PV system owners. These can change the economic outlook dramatically for most users.

Despite the unfavorable "raw" economics of implementing PV systems, Table 11-2 indicates that, in some cases, at least, it may pay to look at a full range of economic and financial benefits, particularly those that will reduce initial costs or secure a rapid payback. For example, some states, such as Oregon, allow projects to "pass through" state tax credits to other private entities, making this benefit realizable to private investment partnerships. In this situation, a PV project may command a return on investment (or internal rate of return) of up to 10%-12%. That is not bad, considering that future energy-generation benefits, in terms of avoided utility costs, may well be much higher.

The financial benefits of solar power have been significant enough to generate tens of millions of dollars for investment partnerships dedicated to investing in solar power on buildings, including retail stores. Many of the larger retailers have one very under-utilized asset: the large expanse of roof area that serves now mainly to keep the rain out. Typically retailers don't have to worry about shading of rooftop solar panels, either, since they are surrounded by parking lots. The rooftops are also vandal-proof (if anything really is), since they are generally out of sight and/or hard to reach, with 24/7 security the norm in large retail environments.

Table 11-3
"Non-economic" or "Intangible" Photovoltaic (PV) System Benefits to Users and Owners

Features	Benefits
▪ PV systems are visible on buildings.	▪ It is immediately recognizable to the public that you have a green building that uses solar energy.
▪ PV output can be measured and displayed easily (see www.greentouchscreen.com).	▪ PV can be incorporated into public education about green buildings.
▪ PVs are a visible commitment to renewable energy	▪ They may generate support for retail projects and result in faster entitlements for development projects.
▪ Larger PV systems are still newsworthy in most locations.	▪ Because they are visible and don't pollute, PV systems may be perceived as attractive and thus gain media attention to publicize the project.
▪ Rooftop PV systems can be physically separated from the underlying building and owned by different entities and taxed as physical vs. real property.	▪ PVs can be part of a "micro-utility" that can be owned and operated by a private company, even for public projects, qualifying them for full tax benefits. As physical property, PV systems may qualify for accelerated depreciation.
▪ To the public, PV systems represent a commitment to using renewable energy.	▪ PVs can be part of the branding of retail company.
▪ PVs can help get additional LEED (Leadership in Energy & Environmental Design) project credits for energy efficiency and renewable energy, especially under the LEED rating system, beginning at 2.5% of total energy use in the building.	▪ The value of moving from a basic LEED-certified project to a LEED Silver level may be significant where there are tax credits, or where there is an owner or public policy requirement for attaining LEED Silver certification.

Non-Economic Benefits of Solar Power

Consider, too, the "non-economic" benefits (some tangible, others intangible) that may come with installing PV systems, as shown in Table 11-3, which describes how PV systems may translate into user or owner benefits. The major point of this article is that PV has a prime benefit for retailers, because it is a *visible* commitment to renewable energy, or, as I like to say, "The six o'clock news will have something to film."

Based on this list of benefits in Table 11-3, it is clear that the decision whether to go with PVs should not be made just by the electrical or energy engineer, but should involve the senior-most corporate leaders of the company. It is important for retailers to recognize this, rather than simply dismissing PVs out of hand at the beginning of a project as *too expensive*.

Proponents of photovoltaics have to be creative in presenting the economics and financing of solar energy systems, as well as the "non-quantifiable" benefits, to upper management. Architects, engineers and contractors who are PV proponents should also incorporate these benefits in presentations to owners and to design review committees.

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[15] For one example, see http://www.qualityattributes.com/greentouchscreen

Appendix 11-1
The Solar-Services Model

Installation of photovoltaic systems accelerated in 2006 and 2007 because investors, store owners and developers figured out how to separate ownership of the PV system from that of the underlying building. This "micro-utility" model was first used in the 1980s to install solar water-heating systems in apartment buildings in California; at the time, there was a 55% state solar tax credit, a 25% federal solar tax credit, and generous depreciation schedules. When those credits disappeared in 1986, so did these programs.[16]

In the more recent "solar-services model," a company agrees to buy all the solar electricity generated by a rooftop PV system for a period of at least 10 years, at then-prevailing commercial electrical rates. (In essence, the company is running its meter backwards.) According to a recent report in *The New York Times*, General Motors, Alcoa, Staples and Whole Foods are installing such units on the roofs of their warehouses and big-box retail stores. These facilities typically have more than 80,000 square feet (sq ft) of rooftop area to work with, as well as unimpeded access to sunlight and plenty of electrical demand. [17]

In the *solar-services model*, investors build, own and operate the PV systems, while leasing the rooftop for a nominal amount. Typically, the units are larger than 100-kw ($600,000 installed cost), which helps pay for the cost of installation and all the sales and marketing expenses. In a $1,000,000 system, for example, the current federal tax credit would be $300,000, and accelerated depreciation could add another $250,000 in net benefits. In the state of Oregon, a solar tax credit would net another $250,000 in state tax benefits, as well as electricity payments of $0.15 per kilowatt-hour. Table A presents some of the considerations to explore when your company is approached by these investment groups or by vendors representing them.

Tax benefits and utility payments can meet 80%-100% of total system cost. Thus, investors would not have to rely on the rather small 2%-3% of capital cost generated each year by the electricity from the PV system. *For example, at $0.10 per kwh payment and 1500 kwh/kw per year net power output, a 1 kw system costing $6,000 would generate perhaps $150 a year in income—a 40-year payback*, without tax and utility incentives.

My advice to retailers thinking about investing directly in solar power: Be sure to consult a tax advisor knowledgeable in federal, state, and local laws and regulations to make sure you can use all the tax credits and other benefits in a reasonable period of time.

Table A. Considerations in Purchasing Solar Power from Investment Partnerships

1. Length of contract? Anything over 15 years may tie you up for too long.
2. Options to renew or purchase the system after 10 years.
3. Provisions for default or lack of production, including system removal.
4. Level of experience of vendor and reliability of its financing source.
5. Can they get access to product, so that the installation will finish before December 31, 2008?
6. Will the installation have any effect on the roof warranty?
7. What if the investment firm goes out of business? Will you have the right to take over the system?
8. What is the price for electricity in the contract? Is it pegged to prevailing utility rates (e.g., 10% off the going rate) or is it level for the term of the contract?
9. Who will own the Renewable Energy Credits? You may want to own these for offsetting other corporate "carbon generation."

[16] Personal experience of the author, at one time director of solar commercialization programs for the State of California.

[17] "Sunny Side Up," by Claudia H. Deutsch, *New York Times* [online], October 21, 2006, http://www.nytimes.com/2006/10/21/business/21solar.html, accessed December 18, 2007.

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