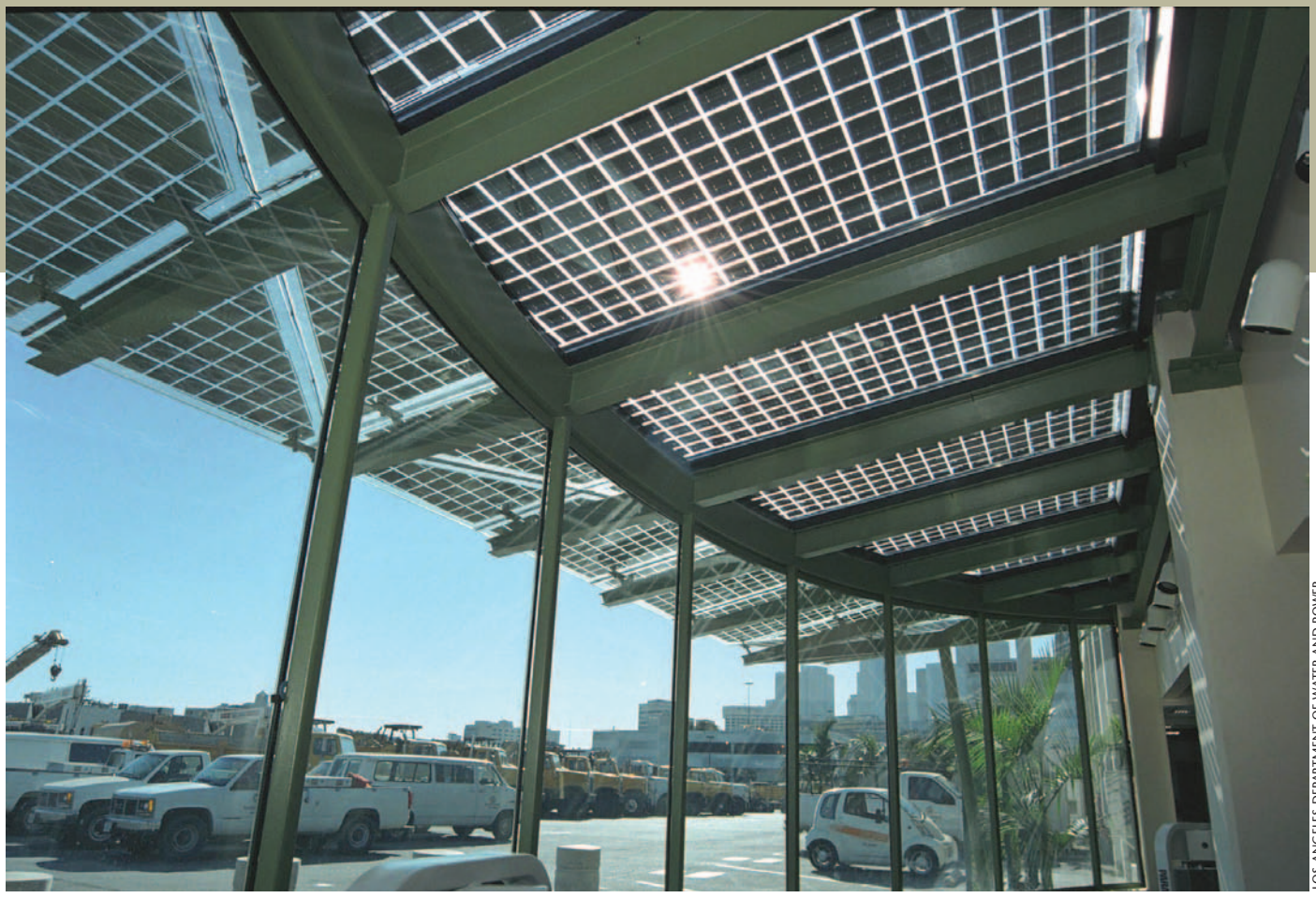
Utility Prospects Under the Sun

By Chris Robertson



LOS ANGELES DEPARTMENT OF WATER AND POWER

How electric utilities can turn the presumed disadvantages of solar power into profitable business opportunities.

Austin Energy surprised renewable energy advocates last December when it announced that it would develop 100 megawatts (MW) of solar photovoltaic (PV) capacity by 2020. This step will make the Austin, Texas, municipal utility one of the leading buyers of solar energy in the United States.

Austin's 100-MW PV program provides a glimpse of the new role electric utilities might play as solar industry customers. If other utilities join AE, PV sales volumes will greatly increase, the solar industry will be able to expand production capacity, the average cost of energy from PV systems will drop and solar energy will take a more prominent role in mitigating climate change.

The International Energy Agency estimates that the worldwide electric utility industry will invest $4.2 trillion in new generating plants during the next 30 years. According to *The New York Times*, "Most of these would be using outdated, highly polluting technologies. [The *status quo*] locks in more outmoded investment, adds to carbon emissions already in the atmosphere, and increases the ultimate cost of protecting the environment."

This article presents a vision for how part of this electric utility investment in new generating capacity can be channeled into PV. Acting in their own economic interest, electric utilities could evolve into a substantial new market for the solar industry, causing a "virtuous cycle" of mutual benefits:

- Utilities will begin to identify buildings and neighborhoods where solar makes sense economically and invest in PV systems to serve peak electric demand.
- Utilities may own and operate these PV systems, or contract for

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—Small is Profitable, *Rocky Mountain Institute*

energy production from third-party suppliers.
• Solar costs will continue to decline due to large, increasing, sustained orders by utilities.
• PV system reliability will improve as utilities are rewarded for performance quality and they, or their third-party energy providers, manage site selection, design and maintenance.
• Assuming favorable regulatory treatment, utilities' savings from investments in solar capacity should create economic value for their customers and shareholders.

A change in utilities' perspective and strategy is needed to realize this vision. For electric utilities, solar energy seems to be a classic "disruptive technology." It appears too expensive, risky, small and unreliable to become a major part of utility bulk power supply. Despite these apparently negative attributes from the utilities' perspective, the solar industry continues to grow at about 30 percent per year, supported by a raft of state and local policies and incentives to support purchases of retail solar equipment.

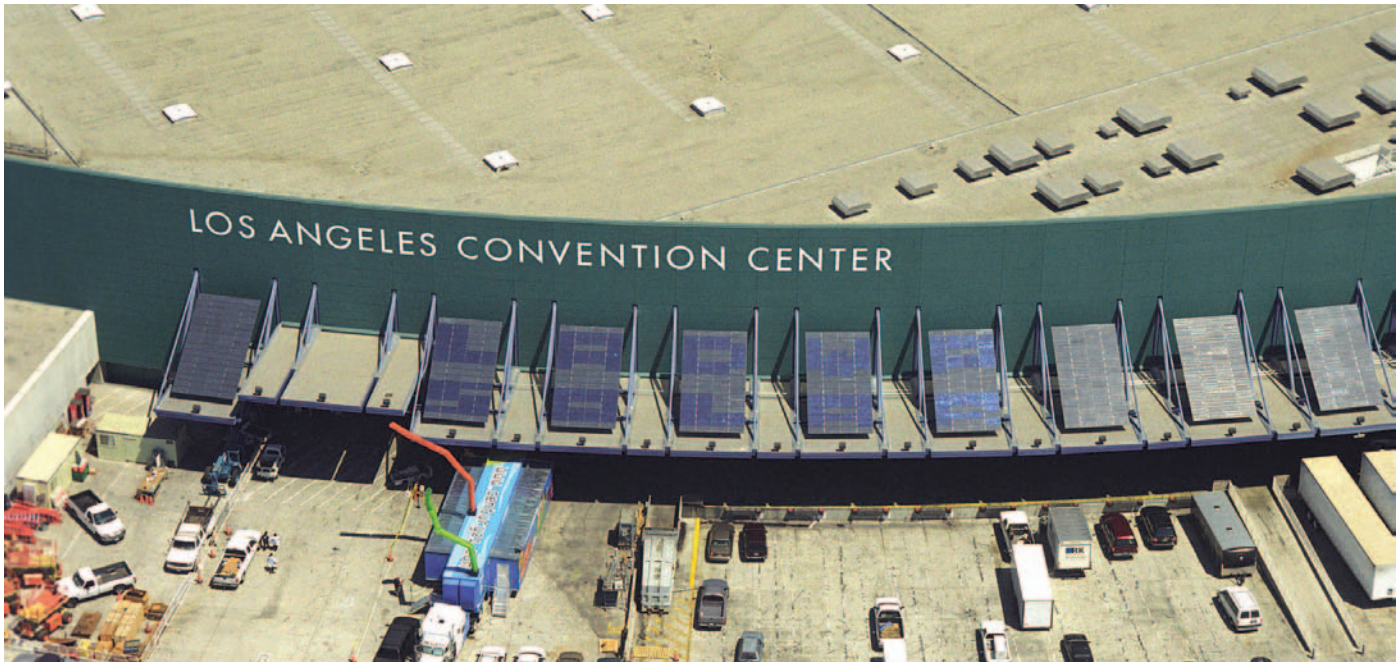
Most utilities tend to resist the policy initiatives designed to advance the solar industry. These solar policy strategies—net metering, simple standards for interconnection, large public-financed subsidies and renewable portfolio standards—seem to advance solar technology at the expense of the utilities' economic interests. But electric utilities can profit from solar and benefit their customers and shareholders. How? By managing solar as an energy resource that can sustain and improve, rather than disrupt, their businesses.

Utilities can turn PV's presumed disadvantages into profitable business opportunities and risk-management solutions. To fully realize the potential benefits of solar generation, utilities must do several things:
• Invest in PV as part of their energy resource portfolio, and install PV where its attributes produce economic value.
• Design their solar energy purchases to be predictable, grow over time and take advantage of declining solar costs as production ramps up.
• Manage the solar value chain to resolve bottlenecks, reduce risks, improve quality and drive down costs.
• Share the value fairly among utility customers, shareholders and solar companies.

Finding Solar's Full Value for Utilities

Utilities' *costs* vary wildly depending on location served, time of day and season. On mild nights, the cost to serve a customer may be as much as five times less than the retail electric rate. On sunny summer days, when a PV system is most productive, the cost of serving some customers' energy demand can be more than 10 times greater than the retail electric rate. A 1997 study by the Solar Energy Industries Association found that 20 percent of electric utility customers live in regions where their utility's daytime peak electric costs exceed today's solar energy cost.

Solar is most valuable to utilities during summer peak demand when it is sited as close to the electric load as possible—at the sub-



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Opposite, the Los Angeles Department of Water and Power's Temple-Duco fitness center features a photovoltaic skylight canopy. Above, LADWP has constructed a 400-kW solar photovoltaic system at the Los Angeles Convention Center.

ARDEN REALTY

This DTE SolarCurrents System in Fountain Valley, California (owned by DTE Solar Energy of California), is one of three rooftop arrays totaling 340 kW.

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The roof of the Cherry Street parking garage at the Los Angeles Convention Center features a 250-kW car shade.

station and on or near buildings. Such installations help the utility avoid costs throughout its generation, transmission and distribution systems, and reduce many forms of business and technical risk.

Rocky Mountain Institute (RMI) has concluded that "properly considering the economic benefits of 'distributed' (decentralized) electrical resources typically raises their value by a large factor, often approximately tenfold, by improving system planning, utility construction and operation [especially of the grid], and service quality, and by avoiding societal costs." (*Small is Profitable: The Hidden Economic Value of Making Electrical Resources the Right Size*, published by RMI, 2002.)

Some "distributed benefits," such as reduced fuel cost volatility and reduced carbon and financial risks, are produced at all customer locations. Other benefits, such as avoided construction of a new substation, apply to only a few locations at any time.

The full range of distributed benefits is not easy to quantify, especially site by site. No utility can now fully document the value of distributed energy resources. Yet analysts have done a lot of research to evaluate PV's benefits to utilities' energy resource portfolios. The Center for Resource Solutions is working with utilities in California to evaluate the benefits of solar in their distribution systems. Austin Energy plans a "comprehensive study" on how to ramp up its solar purchases most cost-effectively.

In 1992 Pacific Gas and Electric installed a 500-kilowatt (kW) PV array at its Kerman substation near Fresno, California. The cost was $9,900 per kilowatt. PG&E concluded that if the Kerman PV had cost $7,500 per kilowatt (about what PV costs *today*) and included benefits for improved reliability and environmental credits, it would have been a cost-effective resource. According to RMI's analysis in *Small is Profitable*, the value of the Kerman PV would *more than double* if four additional benefits—reduced investment risk, portability and cost volatility of fuel and purchased power—had been counted.

Last November the National Association of Regulatory Utility Commissioners (NARUC) adopted a resolution encouraging utilities and their regulators to acquire diverse energy resources in order to minimize risk and improve reliability. According to NARUC's resolution, "Portfolio management … offers a structured approach for assembling a diverse mix of short- and long-term energy resources … via traditional power supplies as well as energy efficiency, distributed generation, demand response, and renewable energy resources. …"

Solar also can help utilities manage the emerging danger of carbon business risk. The risk is that future greenhouse gas regulations will erode a utility's share price and perhaps expose its executives to personal liability for damages caused by their company's carbon emissions.

Swiss Re, the world's second-largest re-insurer, announced in 2002 that it would consider withdrawing director and officer liability coverage from firms that are large carbon emitters with inadequate greenhouse gas mitigation strategies. Why? Insurance is sold to cover random risk, not systematic risk. Potential carbon liability is a systematic risk—something for management to manage, not insure against.

In 2003 a group of 35 institutional investors representing $4.5 trillion in assets summarized their research about the carbon

SMUD/CHARR CRAIL

Sacramento Municipal Utility District in California built the 500-kW "Hedge PV" solar installation during the '90s as a "hedge" against energy price inflation.

5 Ways
to Promote Solar at Utilities

Your voice is louder than you may think. Here are five suggestions for encouraging your utility to invest in solar generation.

- Ask your utility to study the full value of distributed solar generation.
- Urge your state utility regulators to account for the full value of distributed solar generation, and to provide incentives for utility investment in distributed solar generation that produces net benefits. To access a U.S. state regulatory commission, visit www.naruc.org/displaycommon.cfm?an=15.
- If your utility is considering issuing a request for proposals for renewable energy resources, encourage it to design an RFP that will account for the full benefits of distributed solar generation.
- Support businesses that purchase renewable energy.
- Sign up for green energy programs at your utility.

risk-management policies of the world's 500 largest companies. In "Carbon Finance and the Global Equity Markets" they report, "Companies with strong [carbon] risk management policies … will gain competitive advantage [and] create top line revenue growth from products and services predicated on a low carbon future." *(Download the report, prepared by Innovest Strategic Value Advisors, at www.cdproject.net.)*

Matching Purchase Structure to Goals

To realize the greatest benefits, utilities should install solar capacity at the locations where it can produce the greatest economic value on their systems—substations, circuits, neighborhoods and buildings. These solar capacity purchases should increase over time and take advantage of declining solar costs as production ramps up. Utilities should integrate their solar investments with energy-efficiency opportunities to save money and provide an efficient electric load for the solar resource to serve.

In addition, purchasing mechanisms should match the interests of the utility and solar industry. The solar industry is still small and undercapitalized. It needs orders that start at a manageable scale and increase over time. That will enable investments in large production facilities, and result in declining PV unit costs that can be planned into forward prices.

As an example, in the January/February 2004 issue of *SOLAR TODAY*, John Schumacher, Ph.D., presented a "PV Substrate Technology Roadmap." Based on this roadmap, the manufacturing cost of a PV module (including material, labor and overhead) produced by a PV plant producing 300 MW per year would drop to about $1.00 per peak watt in year 10.

The structure of the purchasing mechanism will affect the distribution of costs, risk and performance responsibility. If a utility issues a power purchase agreement to a third-party, it will elicit different players and business models than if the utility contracted to buy and install solar capacity for its own account. Either model can work; it just depends on the utility's context and preference.

These principles apply whether a utility is under traditional regulation, in a competitive market, or consumer- or investor-owned. They can work in states with renewable portfolio standards or solar rebate programs.

In the case of traditional regulation, regulators should grant incentives to investor-owned utilities that document the net savings from their investments in solar energy and capacity. These utilities should be allowed to retain some savings for shareholders, with customers receiving the balance. Utilities would then work to reduce solar costs, assure performance and identify locations to install solar that will maximize economic value.

Driving Benefits Through Solar Growth

Value sharing is also crucial to the solar industry's expansion. Utilities will need to commit to paying enough so that their solar industry suppliers can be profitable.

Utilities should buy from a portfolio of PV suppliers that can scale up manufacturing and drive down costs. This arrangement will help manage vendor risks and capture the rewards of innovation that one or more companies may produce. Solar companies must continue to focus on improving reliability and quality and driving cost out of their manufacturing, sales and installation operations.

Value chain management will reveal bottlenecks, barriers, quality management issues and opportunities for profitable investment. For example, silicon supply shortages and high prices can retard the industry's growth, yet the solar industry is not sufficiently capitalized to build its own silicon production capacity. Investments to expand the supply of low-cost, ultra-pure silicon would translate directly into reduced costs for finished solar capacity.

PV value chain investments will be crucial to support the solar industry's growth. Utilities and other stakeholders may profit from making such investments.

A New Value Proposition Ahead?

Imagine that your electric utility has identified your neighborhood as a place where solar can produce economic value. A solar company contracted by the utility makes you and your neighbors the following offer: Your utility will lease your roof to install a PV system at no direct charge to you. The deal includes an insurance policy that repairs your roof in the event of damage. The utility owns and maintains the system and pays the property taxes. You get a discount on your electric bill, and the utility's cost savings further reduce its electric rates.

Would you take that offer? ●

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