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September 2002

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## Berkeley Lab and the Clean Energy Group

# CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY

## PV (and Small Wind) Pricing Programs that Link Supply with Demand

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### CASE SUMMARY

#### *Case Description*

The proliferation of both regulated and competitive green power markets potentially creates new revenue opportunities for photovoltaics (and, potentially, small wind). One such opportunity involves green power marketers purchasing “green tags” that represent the attributes of customer-sited grid-connected PV (and/or small wind) systems. Marketers then lay claim to the photovoltaic (PV) or small wind tags and re-sell them as part of a green power product.

In the United States, two such “PV pricing” programs are just getting underway in Pennsylvania and the Pacific Northwest, while a related model known as the “solar power exchange” has been deployed in Switzerland since 1997. This case study describes each of these three innovative models.

#### *Innovative Features*

- PV pricing programs seem to create a true win-win situation: the PV (or small wind) system owner benefits from an additional revenue stream, while the utility or power marketer

benefits by procuring relatively cheap solar (or small wind) power and reaping positive public relations from supporting local green power projects.

- These programs can have a synergistic relationship with buy-down programs, and clean energy funds can use their buy-down programs as a vessel through which to work with green power marketers to create additional customer value.
- While clean energy funds in the U.S. and abroad have not yet *directly* supported these types of innovative programs, opportunities to do so may exist.

#### *Results*

- The two U.S. programs are just getting underway, with few results to show yet. Both programs have just announced their first PV pricing investments.
- Switzerland’s “solar power exchange” model has been quite successful, and is partially responsible for helping Switzerland to claim the highest installed PV capacity per capita of any country in the world.

## CASE STUDY DETAILS

The largest barrier to widespread adoption of photovoltaics (PV) is undeniably its high energy costs: even with aggressive capital cost buy-downs and favorable net metering policies, system payback periods can still exceed 20 years especially for small residential systems. The proliferation of both regulated and competitive green power markets where customers voluntarily pay more to support renewable forms of generation potentially creates new revenue opportunities for PV. One such opportunity involves green power marketers purchasing “green tags” that represent the generation from customer-sited grid-connected PV (or small wind) systems. (Of course, tags may also be purchased from non-customer sited and non-grid connected systems). Marketers then lay claim to the PV or small wind tags and re-sell them as part of a green power product. The PV (or small wind) system owner benefits from an additional revenue stream, while the marketer benefits by procuring relatively cheap solar or wind power and reaping positive public relations from supporting local, distributed, green power projects.

Limited experimentation with this innovative approach by green power marketers in the U.S. has taken place for several years. More recently, two more formal and comprehensive programs have begun in the United States, while a related but somewhat different model known as the “solar power exchange” has been deployed in Switzerland since 1997. This case study describes each of these three models.

### *The Energy Cooperative Association of Pennsylvania (ECAP)*

ECAP is a member-owned heating oil supplier and electricity marketer in the Philadelphia area that offers a Green-e certified product containing 80% biomass, 19% small hydro, and 1% wind (consistent with Green-e standards, 10% of the product is from new renewable resources). ECAP would like to add solar power to their mix, and has launched a “PV pricing” program to enable it to do so.

The following example (adapted from ECAP’s web site) illustrates how this innovative program works:

- An ECAP member installs a PV system through the Sustainable Development Fund’s buy-down program (described in a separate case study on buy-down programs), or a non-member installs the system and joins ECAP. The member agrees to pay 7¢/kWh to serve his *gross* electricity consumption with ECAP’s green power product (the customer will already have two meters to enable monitoring of the PV system for the buy-down program).
- Assume that the member’s gross electricity consumption averages 750 kWh per month, and the PV system will generate an average of 150 kWh per month (in reality, the system will generate more in the summer and less in the winter). Thus, in an average month the member will consume 600 kWh from the grid, with the remaining 150 kWh being generated on site by the PV system.
- Each month, the member pays PECO (the local wires company) roughly 7¢/kWh for distribution and transition charges on a net usage of 600 kWh. Note that the member avoids these charges on the 150 kWh that was self-generated.
- Each month (during a 2-year contract period), the member pays ECAP 7¢/kWh on 750 kWh of *gross* usage for the green power product.
- Each month (during a 2-year contract period), ECAP pays the member 20¢/kWh for 150 kWh of PV power.

The net result of this somewhat complex transaction is that ECAP pays the member a net price of 13¢/kWh for PV “tags” – the 20¢/kWh that ECAP pays the member less the 7¢/kWh that the member pays ECAP for the green power product. This is cheap PV power that ECAP can blend into its green power product mix. In addition, the member also

avoids distribution and transition charges totaling 7¢/kWh on the self-generated portion, bringing total revenue to 20¢/kWh. This total is 6¢/kWh higher than the 14¢/kWh that the member would have received through net metering alone. With both ECAP and its members benefiting, this program seems to create a true “win-win” situation.

Though it has been “live” for only a few months and is somewhat dependent on the pace of installations under the Sustainable Development Fund’s buy-down program (which has gotten off to a slow start), ECAP’s program has reportedly been well received. ECAP has recently signed its first deal (for 2,800 kWh/year) and is close to inking another one involving a 2 kW system. In addition, several solar prospects have told ECAP that this program is what will “make the difference” and enable them to go solar. ECAP hopes that this market-based program will eventually become self-sustaining.

While ECAP’s program is not sponsored by the Sustainable Development Fund (SDF) or even directly related to its buy-down program, synergies do exist. By requiring participating systems to meet SDF’s rather stringent system specifications and quality assurance mechanisms, ECAP ensures that it is purchasing tags from a quality system. Furthermore, ECAP intends to “piggyback” off of SDF monitoring requirements and meter reads to verify system output. At the same time, SDF’s buy-down program looks all the more attractive because of ECAP’s PV pricing program.

Had ECAP received direct funding from the SDF, funds targeted at organizational development reportedly would have been most useful. ECAP’s biggest resource drain has apparently not been the 20¢/kWh it spends for each kWh, but the time it has spent thinking through the logistics (e.g., how does this work? who reads the meter and how often?), developing a purchase agreement, and promoting the program.

### ***Bonneville Environmental Foundation (BEF)***

Building on previous efforts in this area, in April 2002 the BEF announced a new partnership with the Northwest Renewable Energy Cooperative (NWREC), whereby NWREC will sign 5-year agreements with owners of new PV systems to pay the system owners 10¢/kWh for the green tags produced by the PV systems. BEF will in turn purchase the green tags from NWREC and re-sell them to its wholesale customers and on its web site. As many as 30 small PV installations on homes and businesses are included in the first phase of the project.

A similar program is under development for small wind power. Bergey Windpower, the NW Cooperative Development Center, Northwest SEED, and others are in negotiation with NREL for funding to implement a wind power “co-op” model in the Northwest. Under this model, the organizations hope to install 10 small wind systems in distributed applications. Though customer-sited, the systems are to be metered to allow for the sale of the tags. BEF has agreed to provide critical funding for the project by paying upfront for 10 years worth of green tags for 100 kW of small wind.

These programs are quite similar to that described above for ECAP, in that it will enable BEF to include more PV (and small wind) in its product content at the low cost of 10¢/kWh for PV, while providing PV system owners with an extra 10¢/kWh above what they can earn through net metering. These two programs are slightly different than ECAP’s, however, in that BEF buys and sells green tags only (whereas ECAP buys tags and sells delivered electricity), which simplifies the transaction. Furthermore, BEF is working with NWREC to market its PV program, while ECAP is going it alone.

### ***Solar Power Exchanges in Switzerland***

Switzerland enjoys the distinction of having the largest amount of installed PV capacity per capita in the world. This success is due, in part, to an innovative program launched by the Swiss utility Elektrizitätswerk der Stadt Zürich

(EWZ) in 1997 and now emulated by many other Swiss utilities. Known as the Solarstrom Börse (solar power exchange), this program – like the ECAP and BEF programs described above – channels green power demand in support of new PV systems. Also like the BEF and ECAP efforts, the Solar Power Exchange presents an innovative approach to building PV capacity to serve the green power market. Unlike BEF and ECAP, however, the solar power exchange involves systems installed on the utility's side of the meter, and the utility merely acts as a facilitator, passing its cost of power through to the buyer, reportedly without markup. In this way, the utility is really an intermediary, offering an innovative green power product consisting of solar power to its customers.

The solar power exchange works as follows. The utility (EWZ) issues an RFP for new PV plants, and extends 20-year power purchase agreements (PPAs) to those bidders with the lowest cost of energy (*and* feasible projects, with sites identified, etc.). Developers use the PPAs to finance their projects. The utility actively markets the solar power to its customers at the weighted average cost of the winning bids (i.e., with no markup). Customers sign up to meet a portion of their electricity needs with PV power for a one-year term, and the contract automatically renews each year unless canceled in advance by the customer. When customer demand for PV power exceeds supply, the utility solicits another round of PV bids, and folds the cost of the winning systems into its aggregate weighted average costs charged to all participating customers.

In EWZ's program, system costs have declined in each successive round of bidding, meaning that the weighted average cost charged to all customers has decreased over time. Between the first and third competitive bidding rounds in 1997 and 2000, the weighted average cost charged to all customers has declined by 20%. Falling costs make it easier to attract new and retain existing customers.

At the end of 2000, just four years after the start of the program, 43 PV plants totaling 1.65 MW were participating in EWZ's solar power exchange, and more than 10,000 EWZ customers, representing 3% of the utility's customer base, were buying the power. (As of 2002, 2.5 MW of PV are now supported). The model has also been widely emulated throughout Switzerland: as of September 2000, 100 Swiss utilities were offering solar power from 1,200 PV systems to their customers, many – but not all – adopting EWZ's solar power exchange model. As a result, more than half of the Swiss population now has access to a solar power exchange (Haas 2002).

The success of this model, which at its core is simply an innovative design for a green pricing program, is notable given the failure of previous subsidy programs to result in significant PV installations within Zurich. In an urban environment dominated by rented apartments, tenants previously had no way to support PV. EWZ's model addressed this problem by installing the PV on the utility side of the meter, and then allowing tenants to buy it at cost.

Operating on the utility side of the meter also avoids potential criticisms that could be levied at the ECAP and BEF programs, which support systems on the customer side of the meter. Specifically, once a PV system owner has sold green tags to ECAP or BEF, can the PV system still be considered green? If not, should the PV system continue to qualify for net metering (if net metering is restricted to renewable technologies)? The solar power exchange avoids this potential complication by siting PV systems on the utility side of the meter.

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NW SEED Wind Co-op Information:  
[www.nwseed.org/nswtc.asp](http://www.nwseed.org/nswtc.asp)

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### ABOUT THIS CASE STUDY SERIES

A number of U.S. states have recently established clean energy funds to support renewable and clean forms of electricity production. This represents a new trend towards aggressive state support for clean energy, but few efforts have been made to report and share the early experiences of these funds.

This paper is part of a series of clean energy fund case studies prepared by Lawrence Berkeley National Laboratory and the Clean Energy Group, under the auspices of the Clean Energy Funds Network. The primary purpose of this case study series is to report on the innovative programs and administrative practices of state (and some international) clean energy funds, to highlight additional sources of information, and to identify contacts. Our hope is that these brief case studies will be useful for clean energy funds and other stakeholders that are interested in learning about the pioneering renewable energy efforts of newly established clean energy funds.

Twenty-one total case studies have now been completed. Additional case studies will be distributed in the future. For copies of all of the case studies, see:

<http://eetd.lbl.gov/ea/ems/cases/> or <http://www.cleanenergyfunds.org/>

### ABOUT THE CLEAN ENERGY FUNDS NETWORK

The Clean Energy Funds Network (CEFN) is a foundation-funded, non-profit initiative to support the state clean energy funds. CEFN collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds. The main purpose of CEFN is to help states increase the quality and quantity of clean energy investments and to expand the clean energy market. The Clean Energy Group manages CEFN, while Berkeley Lab provides CEFN analytic support.

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### FUNDING ACKNOWLEDGEMENTS

Berkeley Lab's contributions to this case study series are funded by the Assistant Secretary of Energy Efficiency and Renewable Energy of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098. The Clean Energy Group's contributions are funded by the Energy Foundation, the Surdna Foundation, the Rockefeller Brothers Fund, and the Turner Foundation. An earlier version of this case study was prepared for the Energy Trust of Oregon, and we appreciate the vision of the Energy Trust – and Peter West in particular – for initiating this work. We also thank Larry Mansueti and Jack Cadogan of the U.S. Department of Energy for their ongoing support.

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