States Emerge as Clean Energy Investors: A Review of State Support for Renewable Energy

State clean energy funds supported by system benefits charges appear to be one of the more positive developments to emerge from electricity restructuring. These funds, working in combination with renewables portfolio standards and voluntary green power marketing programs, may transform renewable energy from niche to mainstream energy source.

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As states have introduced competition in the supply and delivery of electricity, most have elected to continue "public benefits" programs—programs that have traditionally been administered or funded by regulated electric utilities in the areas of energy efficiency, renewable energy, and low-income assistance. The system benefits charge (SBC)—a nonbypassable charge to electricity customers, usually applied on a cents/kWh basis—has been a popular policy mechanism used to support these public purpose programs.

During the restructuring policy debates, a number of articles in *The Electricity Journal* have focused on various design aspects of the SBC mechanism, including projected economic impacts, interaction with other policies, and potential at the national level, and have reviewed SBC support for energy efficiency.[1]

Now, with many SBC funds in place, this article moves the discussion to implementation and focuses specifically on the status and early performance of the renewable energy portion of state SBC funds.

In the last few years, 14 states have established SBC-funded renewable or "clean" energy funds that are expected to collect roughly $3.4 billion in aggregate through 2011 for renewable energy. These funds have the potential to provide significant support for clean energy technologies over at least the next decade, and at this time some early successes can be reported. As with any new and innovative undertaking of such unprecedented scale, however, program delays, frustrations, and missteps are inevitable. Our purpose in this article is therefore to relay early experience with these funds and provide preliminary lessons learned.[2] We hope this analysis will facilitate learning across states and help state fund managers develop more effective and more coordinated programs.

Table 1: Renewable Energy Funding Levels and Program Duration

State	Approximate Annual Funding ($ million)	$ Per-Capita Annual Funding	$ Per-MWh Funding	Funding Duration
CA	135	4.0	0.58	1998–2011
CT	15→30	4.4	0.50	2000–indefinite
DE	1 (maximum)	1.3	0.09	10/1999–indefinite
IL	5	0.4	0.04	1998–2007
MA	30→20	4.7	0.59	1998–indefinite
MT	2	2.2	0.20	1999–2005
NJ	30	3.6	0.43	2001–2008
NM	4	2.2	0.22	2007–indefinite
NY	6→14	0.7	0.11	7/1998–6/2006
OH	15→5 (portion of)	1.3	0.09	2001–2010
OR	8.6	2.5	0.17	3/2002–2/2011
PA	10.8 (portion of)	0.9	0.08	1999–indefinite
RI	2	1.9	0.28	1997–2006
WI	1→4.8	0.9	0.07	4/1999–indefinite

Note: Annual per-capita and per-MWh funding figures are based on funds expected during 2001 (with the exception of: New Mexico, which does not start until 2007; Oregon, for which we used an expected annual figure; New York, for which we used the $14 million per year figure; and Wisconsin, for which we used $4.8 million). Some states, such as Connecticut, ramp up funding levels over time, making 2001 a conservative estimate, while others, such as Ohio and Massachusetts, ramp down funding levels over time, making 2001 an aggressive choice. Note that funding scope differs by state, so that strict inter-state comparisons may be misleading. For example, New York's fuel cell budget is outside of the Energy $mart renewable R&D program and is not included in this table, while fuel cell funding is included in the funding levels reported for other states. Finally, it should be noted that even those funds with "indefinite" funding horizons are not immune to periodic funding reviews and redirections.

I. Background on Clean Energy Funds

A. Funding Level and Duration

Table 1 shows the funding levels and duration of the 14 state renewable energy programs that currently exist and are covered in this article. **Figure 1**, meanwhile, shows aggregate annual and cumulative fund collection over the 1998–2011 timeframe. While funding levels vary considerably by state, aggregate annual fund collection for renewable energy ranges from $175 million to over $250 million during this period, totaling a projected $3.4 billion by 2011. This level of funding is considerable by almost any standard. By a wide margin, the largest state fund is California's, with sizable funds also in existence in Connecticut, Massachusetts, New Jersey, and New York.

B. Technology Eligibility

Wind and photovoltaic (PV) generation are eligible for support from virtually every fund. Geothermal electricity is also eligible under many of the funds, but is generally a strong target for support only where economic resource potential exists, i.e., in the West. Landfill gas has proven to be moderately popular, especially in states that do not simultaneously have a renewable portfolio standard (RPS) to support such near-market technologies. Fuel cells (using either renewable or nonrenewable fuels) have also been targeted by many funds, especially in states with limited wind and solar resources and difficult project siting constraints, as in the Northeast. Biomass power production, with various restrictions, is eligible in most states, though only a few funds have actually supported such projects thus far; hydropower has been treated similarly. Finally, non-

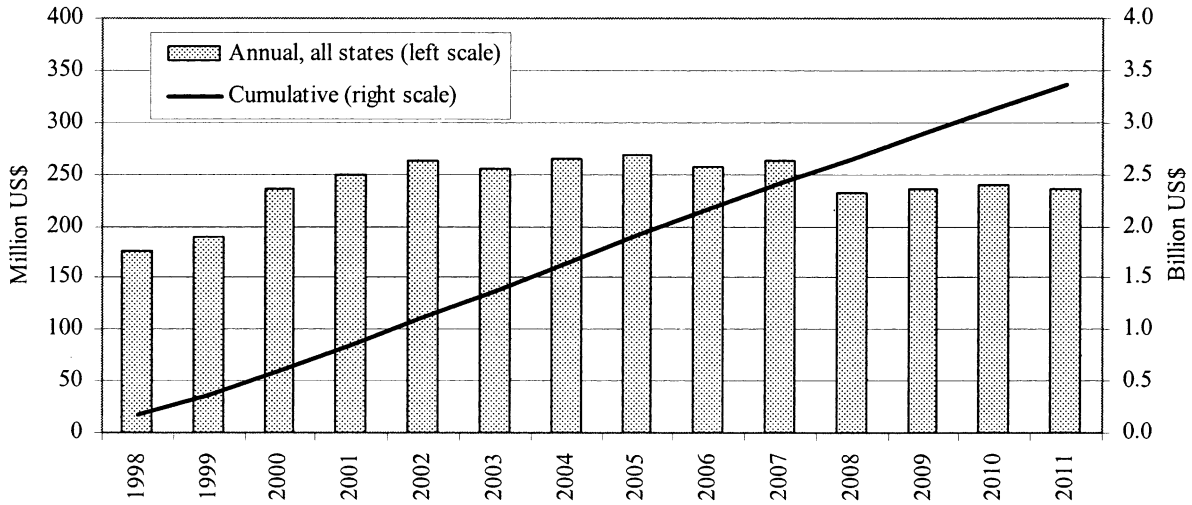

Figure 1: Aggregate Annual and Cumulative State Funding of Renewable Energy Programs

electrical renewable energy applications, such as geothermal heat pumps and daylighting, have been targeted by some funds.

C. Fund Administration

Administrative structures and responsibilities for the 14 SBC funds studied vary considerably across states. Many of the funds are administered by state energy, commerce, or environmental agencies. Other funds, such as those in Massachusetts and Connecticut, are administered by quasi-public business development organizations. Still other funds, such as those in Pennsylvania, Oregon, and Wisconsin, are or will be managed by independent third-party organizations under the oversight of state public utilities commissions (PUC). Montana's SBC fund is administered by the existing utilities, and both Montana and Oregon allow large customers to "self-direct" their SBC funds, if desired. Rhode Island uses a multi-party collaborative structure to administer its fund, under PUC oversight.

II. Program Design

A. Program Focus

For the most part, states are still in the very early stages of obligating program funds. So far 10 states (indicated in **Table 2**) have spent funds on renewable energy projects and programs, but even among these states only a few years of experience is available. Given the dearth of past experience at the state level in spending public funds directly to support renewable energy, it is perhaps not surprising that states are adopting very different views about how best to target their SBC funds toward renewable energy projects and programs. While each state differs, and many states incorporate elements of each model to some degree, the 14 SBC-funded clean energy funds can be roughly categorized into three different models: investment, project development, and industry and infrastructure development.

The investment model uses low-interest loans, and near-equity and equity investments to support renewable energy companies and projects. The funds in Connecticut, Massachusetts, and Pennsylvania employ some programs characteristic of the investment model category, though each of these funds also has standard grant-based programs.

The project development model uses financial incentives such as production incentives and capital grants to directly subsidize and stimulate renewable energy project installation. California is perhaps the best example of this approach, though numerous other states, including New Jersey, New York, Montana, Rhode Island, Delaware, and Illinois also follow this model.

The industry and infrastructure development model uses business development grants, marketing support programs, R&D grants, resource assessments, technical assistance, education, and demonstration projects to build renewable energy industry infrastruc-

Table 2: Current and Past Renewable Energy Programmatic Activities[a]

Model/Program Type	CA	CT	IL	MA	MT	NJ	NY	PA	RI	WI
Project development										
Financial incentives for large-scale projects[b]	•		•		•		•	•	•	•
Predevelopment grants for specific projects				•					•	
Support for existing projects	•									
Distributed generation buy-downs	•		•			•	•	•	•	
Distributed generation competitive solicitations		•		•	•		•		•	•
Consumer financing programs							•	•		•
Investment										
Project or company financing		•						•		
Industry and infrastructure development										
Detailed resource assessment							•		•	
Business development grants							•	•		•
Broad-based customer education	•							•		•
Support for green power marketing	•	•		•			•	•	•	

[a] This table is not intended to be entirely comprehensive. For example, many states have funded research studies that do not fall neatly into any of the categories identified here.

[b] Wisconsin's DSARE program will support large digester gas systems, but to date no projects have been funded. Rhode Island has issued an RFP for large renewable energy projects, but results of that RFP are not yet known.

ture. Wisconsin's program is perhaps best indicative of this approach, while many other states have some programs in these areas as well.

B. Program Elements

Restricting our attention to the 10 states that have begun to distribute funds, Table 2 summarizes the types of programs implemented thus far. (Programs that are planned but still under development are not included here.)

Within the project development model, the most common type of program involves financial incentives for the development of new utility-scale renewable energy projects; the grants or production incentives provided under these programs are typically contingent on project success. Other states have provided earlier-stage funding as pre-development grants to specific projects, not contingent on project success. Also popular are buy-downs and competitive solicitations for distributed generation projects (often PV), and three states have developed consumer-financing products to augment these programs. California is the only state that provides support to existing resources, though Illinois has funded the refurbishment of existing small hydro facilities.

Project or company financing—the hallmark of the investment model—has been used by only two states thus far.

Within the industry and infrastructure development model, a variety of activities, including resource assessments and business development grants, have been common. While other states have provided limited customer education (e.g., solar for schools curriculum), only California and Wisconsin have devoted significant resources to broad-based customer education activities thus far (though Pennsylvania and Rhode Island have recently solicited proposals for significant educational programs). Meanwhile, six states have directly supported the green power market in a variety of ways.

Other states, not included in the table because they have not begun to obligate funds, have also developed some guidelines for the types of programs they will offer. Delaware is developing a rebate program for PV and solar hot water/space heating that is expected to be up and running in 2002. Though the inception of New Mexico's fund has been delayed until 2007, the state tentatively plans to provide grants to public schools, local governments, and Native American communities to support the installation of renewable energy systems. Ohio's new SBC fund expects to provide low-interest loans in partnership with local banks to residential and commercial renewable energy projects beginning in late 2001. In Oregon, a new nonprofit administrator is currently working on a strategic plan in preparation for the inception of funding, delayed five months until March 2002.

III. Funding Results

Further restricting our attention to some of the more popular program types—financial incentives for large-scale projects, distributed generation programs, and support for green power marketing—below we summarize early experience with the distribution of state SBC funds and highlight some of the lessons learned.

A. Financial Incentives for Large-Scale Projects

Perhaps the most visible funding successes to date have come from the development of large-scale renewable energy projects. **Table 3** summarizes the program design used by and results from each of the five states that have supported large-scale projects to date (here we do not include predevelopment grants).

As shown, a total of $265 million, the majority of which comes from California, has been obligated under these programs to new renewable energy projects. While many of these projects have not yet come on line, and some (perhaps many) may never be developed, a total of 1,464 MW could be installed if all projects that have been obligated funds were to come on line. Wind power has by far been the most-favored technology with nearly 1,130 MW of possible installation, followed by geothermal in California with 157 MW, and landfill gas with 101 MW. Biomass and hydropower have made lesser contributions.

Programs have used a mix of financial incentive structures, from standard grants to production incentives. All incentives, with the exception of those in Illinois, have been distributed after competitive solicitation processes. Because incentive structures differ by state, to allow comparison we normalized all incentives to their five-year production incentive equivalent assuming a 10 percent discount rate. We find that incentive levels vary dramatically by state and technology supported, from a low of 0.11 cents/kWh to a high of 6.75 cents/kWh.

In addition to grants and production incentives, other state funds have used equity or debt investments to support large-scale projects (not included in Table 3). For example, Connecticut has invested $500,000 as a convertible note in a consortium that proposes to build a 72 MW next-generation hybrid power plant combining biomass gasification and fuel cell technologies in the state, and Pennsylvania's funds have provided $3.6 million of subordinated debt to a 9 MW wind power project. Still other states, such as Rhode Island and Massachusetts, have used pre-development grants for early-stage project work.

Lessons learned. Though experience is too limited to draw definitive conclusions on the ideal form of support for such large-scale

Table 3: State SBC Funding of Large-Scale Renewable Projects

State	Form of Fund Distribution	Level of Funding ($ million)	Results[a]	Discounted Cents/kWh Incentive over Five Years[b]
CA	Five-year production incentive	162	543 MW (assorted)	1.20
		40	471 MW (assorted)	0.59
		40	300 MW (assorted)	0.75
IL[c]	Grant	0.55	3 MW landfill gas	0.57
		1	3 MW hydro	1.86
		0.352	1.2 MW hydro	1.63
		0.55	15 MW landfill gas	0.11
MT	Three-year production incentive	1.5	3 MW wind	3.63
NY	Grants with performance guarantees	9	51.5 MW wind	1.95
		4	6.6 MW wind	6.75
PA	Grant/production incentive	6	67 MW wind	1.00

[a] These results are projected and are based on announced results of solicitations. Only a fraction of the projects obligated funds are yet on line. Some (perhaps many) projects may ultimately be cancelled due to unforeseen circumstances, thereby lowering the total capacity supported. Furthermore, it is difficult to know how many and what size projects would have been built in the absence of state funding, and therefore to assess the true incremental effect of state policy investments. In the interest of simplicity, we have simply assumed that none of the projects would have been undertaken in the absence of state funds.

[b] Because incentive structures differ by state, to allow comparison we normalized all incentives to their five-year production incentive equivalent assuming a 10 percent discount rate. To do this, we calculated the net present value of the projected cash outlay for each state using a 10 percent discount rate, and then amortized that net present value over five years using the same 10 percent discount rate. For California, we used projected five-year electricity generation output from funded projects. For other states, we assumed a 35 percent capacity factor for wind power in Montana, a 25 percent capacity factor for wind in New York and Pennsylvania, a 90 percent capacity factor for landfill gas in Illinois, and a 50 percent capacity factor for small hydro in Illinois.

[c] Two comments related to the Illinois investments bear mention. First, the two hydropower projects represent refurbishments of existing small hydro plants. Second, for both landfill gas projects, funding was used to buy down the cost of a single 1 MW turbine as part of larger 3 MW and 15 MW projects. Here we attribute the funding to the full project sizes.

projects, four specific issues that have arisen from early state experience—and resultant lessons—deserve mention:

• ***Speculative bidding can erode a fund's impact.*** Though pitting eligible projects against one another can lower the public investment needed in renewable energy projects, effective design of the competitive process is necessary to ensure that funds are put to good use. Speculative bidding has been of particular concern. The one–off nature of California's initial $162 million New Renewables auction, for example, along with relatively weak penalties for opting out of a successful bid, led to what many believe was a certain degree of speculative bidding, as those who had contemplated developing new facilities saw the auction as their only chance in the next four years of receiving a portion of the state subsidy. The effect of such speculative bidding is that a number of winning bidders may not develop their projects, either because market conditions are not as favorable as necessary to make the project viable or because the project is unable to obtain the necessary permits. In the meantime, such projects hold up scarce funds that might have been better used for other purposes.

Based on this experience, at least three (nonexclusive) approaches have been used or considered by state funds to discourage speculative bidding. First, a series of smaller, regularly scheduled auctions or solicitations should reduce incentives for speculative bidding, as projects are given time to arrange site selection, permitting, and perhaps even power sales agreements before bidding for funds.[3] Second, state fund administrators can strongly penalize winning bidders that are unable to make reasonable progress toward project completion by, for example, withholding bid bonds or other forms of security. Finally, providing fund administrators the discretion to select and fund projects that have the highest probability of completion may also reduce the risk of speculative bidding.[4]

At least three approaches have been used or considered by state funds to discourage speculative bidding.

• ***Funding new supply in the absence of quality demand can result in project failure.*** Ironically, the supply shortage that has caused problems in California over the past 18 months has had a chilling effect on the development of new in-state renewable capacity. In this environment characterized by utility bankruptcy and extreme market uncertainty, many existing renewable generators have gone for months without being paid and green power marketers have been forced to exit the state. As a result, developers of new projects have largely been unable to secure the long-term contracts they need in order to obtain suitable financing and develop their projects. Combined with the effects of speculative bidding described above, this lack of demand is behind the sluggish pace of development under California's New Renewables program. For example, based on the results of the first two auctions, 944 MW of new renewable capacity was slated to come on line by the end of 2001. Yet as of October 2001, only 200 MW was operational, and prospects for significant capacity additions in the final quarter of the year appeared dim. This experience shows that state funds must remain mindful of the need for projects to access secure power sales contracts.[5]

• ***Maximizing the impact of an SBC fund can involve out-of-state project funding.*** Experience, especially in the Northeast, also shows that limiting funding eligibility to in-state projects can constrain project options, especially for those states facing a limited renewable resource base and/or difficult siting conditions. Adopting a broader, regional approach allows such states to maximize the impact of their funds by supporting more economical developments in nearby states, while potentially providing the same environmental benefits to the state as would a local project.[6] Several states have taken this view and expressed a willingness to fund out-of-state (or outside the service territory) projects that can be shown to benefit in-state ratepayers: Connecticut,

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Massachusetts, Pennsylvania, and more recently, Rhode Island, all fall into this category.

• ***State funding should be designed to retain federal tax credits.*** Federal tax incentives, such as the production tax credit for wind and closed-loop biomass and the investment tax credit for geothermal and solar, can be reduced or offset by certain forms of state funding. Given this consideration, California consulted the Internal Revenue Service when designing its SBC-funded renewable energy program to ensure that its design would not reduce the value of federal tax credits. Other funds would be wise to follow suit, as the value of state support can be significantly eroded if its effect is to reduce the value of federal tax incentives.

Table 4: Current State SBC Funding for Distributed Generation

State	Form of Fund Distribution
CA	$4.50/W to 50% of total cost
CT	Equity investments in distributed generation companies and grants for fuel cell installations
IL	$6/W to 60% of total cost (PV); 50% of total cost (up to $300,000) for wind >10 kW
MA	Predevelopment grants for analysis of premium power applications; 25% cost buy-down for DG used in premium power applications
MT	Solicitations for PV and wind installations
NJ	$5/W (<10 kW), $4/W (10–100 kW), and $3/W (>100 kW), all to 60% of total cost
NY (NYSERDA)	Competitive solicitations for commercial PV installations, for PV manufacturers to develop distribution channels that enable them to better reach residential customers, and for "high-value" DG installations; low interest consumer loan program
NY (LIPA)	$3/W to 30% of total cost (PV only), marketed with loan rate buy-down and state tax credit
PA (PECO)	*1st Installment:* $3/W up to $6,000 (to PV owner); *2nd Installment (after 1 year):* $1/kWh generated in first year up to $2,000 (to PV owner), and $0.10/kWh generated in first year up to $250 per system (to PV installer); no-hassle consumer and commercial loans
RI	$3/W (PV) and $1.5/W (small wind) to 50% of total cost
WI	Low-interest loans, interest rate buy-downs, production rewards

Note: PV, photovoltaic.

B. Distributed Generation Programs

Customer-sited distributed generation (DG) programs, including buy-downs, competitive solicitations, and consumer financing programs, have also been popular among state funds. **Table 4** lists the funding approaches taken to date. Most of these efforts target customer-sited PV, with lesser emphasis on small wind, fuel cells, and other technologies. In aggregate, approximately 30 MW of distributed generation capacity has been developed thus far or is likely to be installed shortly under these programs.

Prior to the recent electricity crisis, customer-sited DG programs were generally considered to be performing below expectations. For example, even after the first two-and-a-half years of what was designed as a four-year program, California had not attracted enough interest in its emerging renewables buy-down program to exhaust the funds in the first and most lucrative of five funding blocks for smaller (<10 kW) project sizes (i.e., less than 20 percent of funds had been obligated). Rhode Island, offering a less appealing solar resource and an incentive half as large as California's, had also met with disappointing results, and in early 2001 doubled its buy-down incentive to $3/Watt to boost program participation. In New York, the Long Island Power Authority (LIPA) gave away 30 free PV systems to kick off its Solar Pioneer program, but in the ensuing year was only able to sell a small number of additional systems. These modest early results were perhaps due to a combination of factors including low consumer awareness, interconnection barriers, low buy-down levels in some states, and the high up-front costs of PV and other DG technologies.

The electricity crisis has reversed these circumstances, and has had a profound effect on some of the DG programs, dramatically increasing consumer awareness, prompting increases in buy-down levels, and stimulating increased interest in and installation of DG systems. This is particularly true in California, where the severity of the crisis, the extensive media coverage given to distributed generation solutions, state consumer awareness campaigns, and the increase in

the state buy-down level from $3 to $4.5/Watt have spurred a 13-fold yearly increase in sales of small wind and PV systems in the first three quarters of 2001.

Lessons learned. While experience is limited and the market for DG is rapidly evolving, assuming that a fund's goal is to expand the market for DG technologies, there are a number of lessons to be learned from experience to date:

• ***Buy-downs often need to be generous for grid-connected PV systems.*** In the wake of the initially modest response to buy-down programs in certain states, other states have upped the ante accordingly: New Jersey, Illinois, and Montana all offer more attractive terms than the $3/Watt initially offered in California. Based on this early experience, generous buy-down incentive levels appear to be necessary, though perhaps not sufficient, to stimulate significant demand for grid-connected PV systems. Ongoing evidence about the successes or failures of these buy-down programs will be critical to the design of future PV programs.

• ***Customer education and awareness appear to be vital to success.*** Perhaps as or more important than the specific buy-down level is the level of customer education and awareness of DG options. Nowhere is this better illustrated than in California, where an otherwise attractive $3/Watt incentive did not meet expectations for its initial two-and-a-half years. During these initial years, the educational component of California's renewable energy program focused principally on green power marketing and very little on the buy-down program, in part explaining why only 14 percent of residential and 9 percent of business customers were aware of the buy-down program nearly two years after its launch.[7] Such low levels of program awareness perhaps partially account for the slow initial response to California's buy-down program.[8] In 2001, more focused educational efforts, in combination with the considerable media attention paid to the state's electricity crisis, have combined to significantly boost awareness of and interest in California's buy-down program. For example, in the first three months of 2001—i.e., at the height of California's electricity crisis, yet notably prior to the $1.50/W increase in incentive level—reservations rose 11-fold from the same period the previous year. This trend accelerated in the second quarter, when reservations increased 23-fold over the same period in 2000, and then settled back to a 10-fold annual increase in the third quarter (though the *number* of third-quarter reservations exceeded those in the previous quarter).[9]

Some administrators have begun to explore whether other incentive policies may more cost-effectively support PV development.

• ***Consider approaches other than formal buy-downs.*** Given the high incentive requirement of typical buy-down programs, some state fund administrators have begun to explore whether other incentive policies may more cost-effectively support the development of a self-sustaining PV market. While experience with these programs is too limited to evaluate their successes relative to buy-downs, seven specific policies have been used or considered:

1. *Project-based competitive solicitations:* The New York State Energy Research and Development Authority (NYSERDA) has issued a series of requests for proposals (RFPs) for commercial PV systems, often requesting bids for specific projects. This approach has the advantage of a high project completion rate and cost minimization—receptive sites are identified up front, removing one large barrier to project completion. The RFP process also allows NYSERDA to consider factors other than cost, such as which projects provide the most visibility and demonstration value.

2. *Developing distribution channels:* NYSERDA has targeted the residential PV market in a more indirect way by funding three PV manufacturers to develop distribution channels that are intended to enable them to more effectively market their products.

3. *Low-cost financing:* Easily accessible low-cost financing—the lack of which is often noted as a barrier to PV sales—may offer a

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low-cost complement to other PV incentives and thereby enhance the effectiveness of customer-sited programs. New York, Pennsylvania, and Wisconsin have developed such programs.

4. *Equity investments:* Connecticut has provided seed capital to a manufacturer of a portable PV generator. The goal of this investment is not necessarily to boost PV use in Connecticut, but to develop a Connecticut-based business that can tap into national and international DG markets.

5. *Bulk purchases:* State funds may be able to leverage their impact by aggregating interested participants into a bulk purchase order. The Sacramento Municipal Utility District's PV Pioneer program has achieved considerable success in driving the price of PV systems down through bulk purchases.

6. *Project leasing:* Leasing programs remove perhaps the greatest barrier to PV adoption—high upfront costs—and may also reduce homeowner anxiety over system performance or maintenance, or having to move before the system pays for itself. Furthermore, a leasing company may be able to take advantage of bulk equipment purchases, the federal five-year accelerated depreciation schedule, the federal 10 percent business energy tax credit, and long-term financing to reduce PV costs.

7. *Niche markets:* As an alternative or supplement to supporting the broad grid-connected market for PV, it may make sense to target niche applications for which the technology creates economic and other value and where sustainable markets are readily achievable without substantial ongoing incentives. Such applications may include PV use in new highly energy-efficient buildings, new residential construction, or PV-powered outdoor lighting or traffic control systems.

• ***Consider programs specifically designed for fuel cells and other DG technologies.*** Much of the discussion above emphasizes PV, but PV is by no means the only DG technology eligible for program support; small wind systems and fuel cells are also frequently targeted. While many of the lessons identified above for PV are also applicable to small wind installations, fuel cells often present different challenges. For example, even though Rhode Island's $2.10/Watt support of a 200 kW fuel cell installation at a hospital, when combined with a Department of Energy incentive, covered more than half the installed cost of the system, the hospital still invested nearly $400,000 in the system. For many institutions, this level of capital investment will need to be included in the annual capital budget, which could extend the sales cycle for this technology to a year or more. Moreover, most customers have no established budgets to analyze the merits of these systems, and a technical and economic assessment can alone cost over $100,000.

Several Northeast states are developing significant programs to target fuel cells.

Any DG program targeting fuel cells should also keep in mind that potential fuel cell customers may be very different from PV customers. PV customers are most likely motivated primarily by environmental concerns, whereas fuel cell customers are just as likely to be motivated by power quality and reliability issues. Moreover, these customers, principally large commercial or industrial concerns, may be able and willing to pay significant premiums for the private value derived from these technologies in the form of increased power protection—if they understand the potential costs and benefits of these technologies compared to incumbent technologies like diesel generators.

With these considerations in mind, several states in the Northeast are developing significant programs to target fuel cells. Massachusetts recently developed two incentive programs. The first is a predevelopment grant program to support the analysis needs of commercial and industrial customers in showing whether fuel cells make economic and engineering sense for "premium power" applications, where power interruptions can cause economic loss. The second offers a 25 percent capital buy-down for fuel cell installations serving a premium power load.[10] Connecticut, home to a sizable portion of the U.S. fuel cell industry, recently embarked on a major fuel cell initiative and

released an RFP for commercial and demonstration projects.

C. Support for Green Power Marketing

With the introduction of customer choice and the ability of consumers to buy from retailers that sell green power, several SBC funds have supported the development of the green power market. While providing direct support to help build the customer-driven green power market has proven somewhat controversial, such a focus is typically justified by the goal of developing—over time—a sustainable market for renewable energy that is not tied exclusively to public funding. California, Connecticut, and Pennsylvania have been the three largest direct supporters of this market thus far, while Massachusetts, Rhode Island, and New York have recently released solicitations targeting the retail green power market. A summary of each state's approach follows.

California's SBC program has been the most aggressive in its support of green power marketing thus far. Funded with $75.6 million from 1998–2001 program funds, the customer credit subaccount of the California Energy Commission (CEC) currently offers a 1 cent/kWh credit for residential and small commercial customers purchasing eligible green power through the competitive market. This credit, initially established at 1.5 cents/kWh but declining as green power demand increased, is paid to green power marketers to help offset the cost of green power procurement and marketing, and to thereby lower the cost of green power to end-use customers. Through September 2001, $56.2 million of incentives had been paid to competitive electricity suppliers that were, at the peak of the market in May 2000, selling renewable power to 168,000 residential and 47,000 nonresidential customers.

With default service rates historically pegged to the wholesale price of power in California, the customer credit was just about the only mechanism by which competitive electricity suppliers were able to compete for smaller customers. While the specific design of the customer credit has been criticized by some (as discussed below), as a result of the program nearly all of the residential and small commercial customers that switched to competitive retail electricity providers in the state have been served by eligible green power.

Despite some early success, wildly increasing wholesale prices largely halted retail marketing.

Despite some early successes in growing this customer-driven market, however, during 2000–2001 wildly increasing wholesale electricity prices largely halted retail electricity marketing in the state. Additionally, a large number of green power customers reverted back to utility default service as most electricity suppliers were forced to terminate service. Prior to the PUC suspension of direct access in late September 2001, the CEC had proposed that the customer credit be extended for an additional five years with a funding level of $13.5 million per year.

Other states have taken less aggressive, but still important steps in supporting the green power market. In early 2000, for example, **Connecticut** loaned $500,000 (convertible to equity) to the Connecticut Energy Cooperative, the first competitive green power marketer in the state. In early 2001, Connecticut announced a similar $2 million investment in Green Mountain Energy Company.

In the first quarter of 2001, **Massachusetts** released its first five solicitations, two of which were aimed at supporting the green power market. One provides grants of up to $150,000 to develop consumer aggregation programs for purchasing green power. Another finances predevelopment activities for grid-connected renewable electric generating facilities of 1 MW or more located in New England. The power from such projects must be sold into the Massachusetts retail market as part of a green power product. So far, three projects—a 5–10 MW PV project sited on two brownfields, a 27 MW wind project in Maine, and a 4–6 MW landfill gas project—have been awarded predevelopment grants, and nine organizations have received aggregation grants.

Pennsylvania's Sustainable Development Fund (SDF) in

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PECO's service territory provided $250,000 in subordinated debt to help Energy Unlimited develop a small (130 kW) wind project for sale into the green market. In addition, SDF has provided a number of small business planning grants to help several organizations examine new clean energy ventures. PP&L's Sustainable Energy Fund has also invested in both Energy Unlimited and the marketer Community Energy, providing a $100,000 loan to help Energy Unlimited secure a land lease for a potential wind project site and $150,000 in royalty financing to enable Community Energy to hire two sales representatives to solicit commercial and industrial demand for wind power.

Rhode Island awarded a $150,000 refundable grant to a western Massachusetts wind project in late 2000 on the condition that any marketer selling renewable energy into Rhode Island would have first access to the project's output at a price discounted sufficiently to amortize and "repay" the grant over time. More aggressively, in July 2001 Rhode Island released two solicitations in support of the green market: one seeking proposals to encourage large customer demand for green power, the other providing production incentives to new renewable projects located in New England and selling power into Rhode Island's retail market. Two additional solicitations—one offering customer acquisition (and retention) incentives to retailers selling eligible green power products to residential and small commercial customers, and the other soliciting consumer education programs targeted at the green market—were released at the end of October.

Finally, **New York** recently issued one solicitation providing up to $3.3 million in the first year to attract green power marketers into the state, and another providing up to $550,000 for the development and deployment of a renewable energy credit accounting and trading system.

Lessons learned. Based on the experiences and plans of these and other states, we offer several observations regarding SBC support of the green power market:

• ***There is risk in funding customer incentive programs that are dependent on vibrant retail markets.*** As a subset of the overall competitive retail electricity market, the green power market flourishes or languishes with retail competition. This point has been made painfully clear in California, where the recent electricity crisis has led to the cessation of retail marketing in the state, resulting in large numbers of green power customers reverting back to the default service providers. Even prior to the crisis, California's customer credit program had propped up green power marketers in a market that was otherwise hostile to retail choice, calling into question the ability of the program, no matter how well-crafted, to create sustainable demand for green power over the long run.[11]

In markets where retail competition is limited, there are several ways that state SBC funds can support the green power market without betting on the success of retail competition. First, state funds might consider supporting the purchase of renewable energy "tags" that are separate from retail electricity supply.[12] Such purchases are becoming more frequent in the United States and may ultimately serve as a key method of support for renewable energy by larger customers in particular. Second, state funds can provide more ancillary forms of support. For example, in the absence of a functioning retail market, Massachusetts' strategic plan proposes to support the green power market through a number of alternative avenues, including remaining involved in important regulatory proceedings that could affect the future success of the market. Third, state funds could work with incumbent utilities and others to offer a green option to those customers that opt not to switch to a competitive supplier but are instead served by the default service provider.

• ***A well-designed customer incentive program may help minimize market distortions.*** Though California's customer credit program is recognized as having helped create and

build the green power market in the state (notwithstanding the sustainability questions raised above), two program design features are often criticized. First, because the program rewards sales of any eligible green power, there was little incentive for marketers to include "new" renewable energy in their products.[13] Second, the incentive has, at times, been large enough to make green power cheaper than other electricity supplies, creating what some consider an unsustainable market for green power.

While the precise design of the California customer credit may be inappropriate for some states, a redesigned customer incentive program may be worth considering, especially if applied in a market where the long-term prospects for retail choice are bright. For example, a fund might consider a customer incentive that favors new renewable generation and/or limits the size of the credit so that green power remains a premium-priced product. Rhode Island has taken some of these issues under advisement in designing its small-customer incentive program. Likewise, the CEC's investment plan for 2002 through 2007 reorients customer credit funding more toward new renewable resources, though it is not clear how the suspension of direct acess will affect this plan.

• ***Large-customer purchases of green power can provide ancillary benefits.*** As California's market has shown, increasing green power demand by large customers—especially governmental customers—can lead to increased media coverage of the market, a higher level of customer awareness and education, and a stronger market for green power overall. With an eye toward capturing these benefits, Rhode Island recently released a solicitation providing incentives for large electricity customers to purchase green power and promote their purchases, and Massachusetts' strategic plan indicates a desire to

encourage such purchases among local government agencies.

• ***Customer education may be essential to achieving significant customer response.*** While customer education is critical in virtually every segment of the renewable energy industry, perhaps nowhere is there as much potential for customer confusion as exists in the green power market. California's SBC fund has therefore helped offset the cost of a customer education campaign on green power, and had planned prior to the suspension of direct access to play a larger role from 2002 to 2007 with the CEC proposing $6.75 million per year for consumer education. Rhode Island and Connecticut have provisional plans to help co-fund educational efforts, and Pennsylvania has approved a plan for the $2.5 million earmarked for education resulting from the PECO/Unicom merger. Given that much of the underlying message and content will be similar across states, education may be one area where funds can benefit from partnering with one another or with nonprofit organizations.

V. Moving Forward: Opportunities for Collaboration

Perhaps it goes without saying that the various state funds have many promising avenues for collaboration and joint projects. Renewable energy markets are not, after all, defined by state boundaries. At best, the uncoordinated funding strategies taken by the 14 states can be confusing to a renewable energy developer; at worst, uncoordinated programs can impose unnecessary costs on the renewable energy market, lead to competition for projects among the various funds, and slow the sharing of useful information and program results among the funds. Though each state faces unique constraints and opportunities, all are engaged in a similar undertaking—the support of renewable energy development. The key to mutually beneficial collaboration is to identify projects that address the common needs of multiple funds.

To respond to this need, the nonprofit Clean Energy Group created the Clean Energy Funds Network

(CEFN). The first two years of preliminary planning established the need for common action. In the last few months, staff from funds in the Northeast, including Connecticut, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, and Rhode Island, have worked with CEFN to develop a work plan for several initial areas of joint activity. Though at the time of writing approvals are still be sought, anticipated areas of collaboration between state funds and CEFN in the coming months include:

• ***Public education.*** The state funds will work together to improve the value of educational efforts by sharing in the development work and costs of a clean energy education campaign.

• ***Financing of projects and companies.*** Under this project, CEFN will help the state funds fully understand the financial options that are available and that should be considered when reviewing project and company finance proposals, and to help funds perform quality project assessments. A secondary goal is to increase deal flow and leverage capital by networking with other funders of clean energy projects.

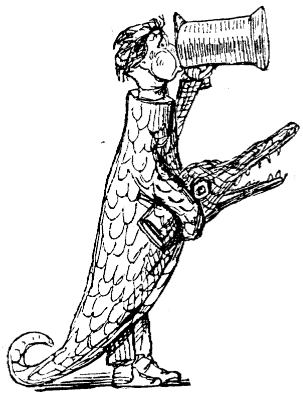
• ***Distributed generation outreach.*** The goal of the DG market development project is to promote the development of a market for fuel cells and other DG technologies by working with funds to develop an outreach program for commercial and industrial customers.

• ***PV standards.*** The PV market development project will help funds develop the market for PV by working with industry, identifying market niches where PV offers a high value proposition, and helping to harmonize PV hardware and installer standards.

CEFN expects this work to expand over time to include business development services, renewable energy tags, and other market development issues.

V. Concluding Remarks

Electricity restructuring has been called to task, rightly or wrongly, for any number of problems,



including underinvestment in new generation and transmission, widespread power shortages, and rising electricity costs. Regardless of one's opinion on these matters, state clean energy funds appear to be one of the more positive developments to come out of electricity restructuring.

These funds, working in combination with renewables portfolio standards and voluntary green power marketing programs, have the potential to transform renewable energy from its current niche status into a more mainstream source of energy. Positive early indicators of such a change are already emerging: large-scale wind farms, for example, now exist or are planned in states such as Maine, Massachusetts, Montana, New York, and Pennsylvania, where wind power largely failed to develop under monopoly regulation. In light of these and other successes, four states have recently announced significant extensions to their funds—California for 10 years, New York and Rhode Island for five years each, and Montana for 2.5 years—all at the same or an increased level of funding.

While this trend should be encouraging for advocates of renewable energy, there is a risk that as restructuring efforts are rolled back or possibly reversed, some planned or existing SBC funds could become unintended casualties. Citing the turmoil in Western electricity markets, for example, New Mexico recently delayed the advent of restructuring—and the state's SBC fund—for five years. Oregon has also grappled with this issue, delaying restructuring and its renewable energy fund by five months.

Public purpose programs do not have to become a political casualty of restructuring rollback, however. As a small per-kWh adder on retail electricity bills, the SBC funding mechanism is largely independent of the structure of retail or wholesale electricity markets. Wisconsin, for example, has implemented both an SBC-funded renewable energy program and a renewables portfolio standard without opening its retail market to competition. As long as SBC fund administration resides with an entity that can oper-

ate equally well irrespective of market structure, there is no compelling reason that public purpose funding should be held hostage by restructuring delays. In fact, given supply shortages, recent high market prices, and ongoing public concern for the environment, funding for public purpose programs in energy efficiency, renewable energy, and low-income assistance is perhaps more warranted than ever before. ■

Endnotes:

1. See Richard Cowart, *Restructuring and the Public Good: Creating a National System Benefits Trust*, ELEC. J., April 1997, at 52–57; Brent M. Haddad and Paul Jefferiss, *Forging Consensus on National Renewables Policy: The Renewables Portfolio Standard and the National Public Benefits Trust Fund*, ELEC. J., March 1999, at 68–80; Ryan Wiser, Kevin Porter, and Steve Clemmer, *Emerging Markets for Renewable Energy: The Role of State Policies during Restructuring*, ELEC. J., Jan./Feb. 2000, at 13–24; Steven Nadel and Marty Kushler, *Public Benefit Funds: A Key Strategy for Advancing Energy Efficiency*, ELEC. J., Oct. 2000, at 74–84; M. Sami Khawaja, Patricia Koss, and Brian Hedman, *System Benefits Charge: Economic Impacts and Implications*, ELEC. J., June 2001, at 25–32.

2. Though treated less systematically, we also discuss and address some of the renewable energy funds created through utility settlements and other lump-sum transfers. The reader can find information about all of the state clean energy funds at the Clean Energy Funds Network Web site, http://www.cleanenergyfunds.org (accessed Oct. 23, 2001). We further note that our discussion excludes Arizona, which will use SBC funds to help fund its renewables portfolio standard. System-benefits charges collected by the publicly owned utilities in California are also excluded from our discussion.

3. With this consideration in mind, Pennsylvania split the $12 million PECO/Unicom wind development fund into two $6 million auctions over time, rather than auctioning the entire amount at once. Similarly, the California Energy Commission investment plan for managing the first five years of the 10-year extension of California's fund recommends holding an auction of roughly $122 million every two years.

4. In Pennsylvania, for example, winning projects were able to demonstrate both a low incentive level requirement and a high probability of project completion by the end of 2001.

5. Two specific issues that merit consideration by state funds deserve mention. First, independent system operator (ISO) rules that penalize intermittent generation for scheduling inaccuracies can limit the availability of secure, long-term contracts for renewable project power output. State funds may want to remain active in these ISO rule-making processes, funding forecasting tools and other methods to reduce the risk and cost of scheduling penalties. Second, funds might consider a "full-cost" auction as opposed to a productive incentive auction. Under a full-cost auction, renewable projects would bid and receive the full cents/kWh cost of their project. Winning bidders would then remit to the fund any power sales revenue that is generated. Unlike a production incentive auction, a full-cost auction eliminates the risk of not finding a long-term power contract with a creditworthy buyer, reducing demand risk and speculative bidding.

6. As New England's experience with acid rain from SO_2 emissions and smog from NO_x emissions has proven, air sheds know no political boundaries, and tend to move from west to east. In this sense, a wind farm in western Massachusetts, for example, could potentially provide equivalent air quality benefits to populated coastal areas in Rhode Island as could an in-state project.

7. See *Renewable Energy Program Preliminary Evaluation: Overall Program Summary Report*, prepared for the California Energy Commission by Regional Economic Research, Oct. 30, 2000.

8. During the first 2.5 years of California's buy-down program, roughly 30 systems/month were "reserved" on average. While this level of activity greatly exceeds the average installation rate of 1 system/month prior to the inception of the program, 30 systems/month was nevertheless clearly below the CEC's initial expectations for the program, and pales in comparison to the 300 systems/month average reservation rate in the first three quarters of 2001.

9. Other states are also pursuing educational efforts. Wisconsin has used program funds for broad-based customer education, and New Jersey has similarly budgeted for public awareness and outreach, target marketing, and market facilitation activities to occur in tandem with its own buy-down program. Meanwhile, several funds (e.g., Montana Power Company) are targeting PV demonstration projects on schools and other high-visibility locations, and will assist with the development of a solar curriculum to leverage the demonstration value of these projects. In such cases, higher incentive levels may be warranted given the supplemental educational value of the resultant projects.

10. The first grants under this program have gone to Harvard Medical School and Merck & Co. Inc. to study a fuel cell system for medical research, and to the United States Coast Guard to install a fuel cell at an emergency facility. See *http://www.mtpc.org* (accessed Oct. 23, 2001) for copies of the fuel cell solicitations and the announcements of awards.

11. In fact, the CEC's own evaluation of the program shows that significant numbers of customers (especially nonresidential customers) purchasing green power and receiving the incentive are not even aware that they are purchasing green power. See *supra* note 7.

12. Renewable energy tags represent the environmental and public benefits provided by renewable energy production, and are a separate commodity from the electricity generation itself. Other names frequently used for this type of product include renewable energy credits or certificates.

13. Critics argue that existing projects would likely have continued to run without additional incentives, and that the customer incentive program is therefore doing little to further increase the level of renewable generation in the state.