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Utility-Scale Renewable Energy Projects: A Survey of Clean Energy Fund Support

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DISCLAIMER

Perhaps because utility-scale renewable energy projects are both highly visible and often quite cost-effective, support for large (> 1 MW) renewable energy projects has proven to be popular among state clean energy funds. While other incentive structures have been used, most states have thus far employed one or more of the following incentive types:

- **Grants** are lump sums usually awarded at the inception of a project to offset a portion of capital costs. Grants are most often not contingent upon project performance/success.
- **Forgivable loans** must be repaid to the fund only if the project comes on line; otherwise, the debt is forgiven. In this respect, forgivable loans are a cross between a grant and a loan.
- **Production incentives** award funding on a $/kWh basis, thereby providing a strong incentive for efficient project performance.
- **Equity investments** infuse working capital either directly into companies, providing support particularly in the early stages of development, or projects. The fund may earn a return on its investment, though the level of risk is often quite high.
- **Royalty financing** is similar to equity financing, except that the fund's return on investment is based on a project's or company's *output* rather than *earnings*. Because a project or company may generate substantial output (providing a royalty return) but still ultimately fail (leaving equity-holders with nothing), royalty financing is considered less risky than equity financing.
- **Subordinated debt financing**, which is cheaper than equity financing, may allow a project to optimize its capital structure, resulting in a more competitive cost of electricity. The fund will likely earn a return on its investment, as stipulated in the financing agreement.

Take Away Points

- Clean energy funds have had varying success using grants, forgivable loans, and production incentives to support large-scale projects. Using these three types of incentives, state funds have to date allocated more than $265 million in support of a potential 1,500 MW of new renewable capacity.
- Long-term power purchase agreements **(**PPAs) are critical to project development. At most, incentive programs can shave costs enough to enable a PPA to close at a price that allows the project to proceed.
- Stable demand from renewables portfolio standards, and to a lesser degree green power markets, encourages long-term PPAs.
- Speculative bidding should be discouraged.
- The use of discretion in selecting the most promising projects can enhance results.
- Considering projects that are located outside of the fund's service territory or state may open up promising opportunities and result in more effective use of state funds.
- Incentives for wind power and closed-loop biomass should be structured such that they do not reduce the value of the federal production tax credit (PTC) to the project owner.

Opportunities for CEFN Coordination

This report suggests that there are at least three broad areas where state clean energy funds interested in supporting large-scale projects could benefit from joint work – project coordination, joint research, and information sharing. For more details, please see page 19.

This report will focus on only the first three incentive structures – grants, forgivable loans, and production incentives.[1] So far eight states – California, Illinois, Massachusetts, Minnesota, Montana, New York, Pennsylvania, and Rhode Island – have deployed such incentive structures to collectively allocate more than $265 million in support of a potential 1,500 MW of new renewable capacity. The purpose of this report is to describe this experience, as well as to provide relevant lessons learned.

Section 1 provides an overview of project funding to date, along with a brief discussion of factors that potentially account for disparities in funding levels. Section 2 describes experience with grants and forgivable loans, which are typically not tied to project performance. Text Box 1 in this section highlights the potential interaction of state funding with the federal production tax credit (PTC) for wind and closed-loop biomass. Section 3 discusses production incentives – the most common performance-based incentive employed to date – by contrasting California's experience with that of Pennsylvania. Text Box 2 in this section highlights the importance of demand to project success. Section 4 concludes, with Text Box 3 offering opportunities for coordination among clean energy funds.

I. Overview of Project Funding

Table 1 provides a summary of state clean energy fund support for large-scale (>1 MW) projects funded to date. States that have or are developing programs that will fund such projects, but have not yet done so, are not included.

As shown in the final column of Table 1, the level of incentive provided (as depicted by the normalized 5-year production incentive) varies dramatically from fund to fund, and even within funds. For example, hydro incentives vary from 1.77¢/kWh in Illinois to 8.56¢/kWh in Minnesota, while in New York, wind projects funded by the New York State Energy Research and Development Authority (NYSERDA) received 1.77¢/kWh, while Niagara Mohawk's sole wind project received 7.3¢/kWh.

Keeping in mind that one goal should be to minimize the amount of dollars spent per kWh generated (at least for a given resource type), a few factors may contribute to these differences:

- **Resource Type.** Different resources may require different levels of support. Landfill gas, for instance, may require relatively little support compared to PV.

- **Technology Type.** Within resource types, required levels of support may vary by the type of technology employed. For example, both Illinois hydro projects involved refurbishments of existing plants/dams, while the Minnesota project involves the construction of a new run-of-river plant. Though both are hydro projects, the technologies involved in each case may have substantially different costs.

- **Resource Strength.** The strength of a resource will also affect the required level of support. For example, wind in California (see Table 2) is more economical than wind in the mid-Atlantic. Similarly, our assumptions about capacity factors may be flawed.

[1] The remaining three forms of support – equity investments, royalty financing, and subordinated debt financing – will be explored in separate CEFN financing case studies.

Table 1. State Clean Energy Fund Support of Large-Scale (> 1 MW) Renewable Projects

State	Incentive Type	Competitive Process?	Tied to Performance?*	Requires In-State Power Sales?	Level of Funding ($ million)	Capacity Supported** (MW (resource))	Normalized ¢/kWh over 5 Yrs***
CA	5-yr production incentive	Yes	Yes	No	$162 $40 $40	530 (assorted)† 471 (assorted)† 300 (assorted)†	1.13 0.58 0.72
IL††	Up-front grant	No	No	No	$0.55 $1 $0.352 $0.55	3 (landfill gas) 3 (hydro) 1.2 (hydro) 15 (landfill gas)	0.61 2.01 1.77 0.12
MA	Forgivable loan Forgivable loan Up-front grant	Yes	No	Yes	$0.076 $0.150 $0.128	27 (wind) 4-6 (landfill gas) 5-10 (PV)	unclear†††
MN	Up-front grant	Yes	No	No	$1.3 $5.1 $1.65	1.7 (biogas) 3.2 (hydro) 6.3 (wind)	2.56 8.56 2.26
MT	3-yr production incentive	Yes	Yes	Yes	$1.5	3 (wind)	3.56
NY	Up-front grant	Yes Yes	Yes No	No No	$7 $4	41.55 (wind) 6.6 (wind)	1.77 7.30
PA	Front-loaded production incentive	Yes	Yes	No	$6	67 (wind)	0.90
RI	Forgivable loan	No	No	Yes	$0.15	12.5 (wind)	unclear†††

* "Performance" refers to the generation output of a project.

** These results are projected and are based on announced results of solicitations. Only a fraction of the projects obligated funds are yet on line (particularly in California), and some projects (perhaps many in California) may ultimately be cancelled, 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.

*** Because incentive structures differ by state, to allow comparison we normalized all incentives to their 5-year production incentive equivalent assuming a 10% discount rate. To do this, we calculated the net present value of the projected cash outlay for each state, and then amortized that net present value over 5 years, both at a 10% discount rate. For California and Pennsylvania, we used projected 5-year electricity generation output from funded projects. For other states, we assumed a 35% capacity factor for wind power in Minnesota and Montana, a 25% capacity factor for wind in New York, a 90% capacity factor for landfill gas in Illinois and Minnesota, and a 50% and 56% capacity factor for small hydro in Illinois and Minnesota, respectively.

† See Table 2 for a resource-specific breakdown of California's three auctions.

†† 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.

††† The forgivable nature of loans and grants in both Massachusetts and Rhode Island, as well as the very early stage at which funding is provided, make it difficult to assess the per kWh level of support provided.

- **Project Size.** Significant economies of scale can be achieved by larger projects, perhaps reducing their need for support.

- **Market Opportunities.** A project that can sell its output into green power markets or a renewables portfolio standard (RPS) may require less of an incentive. Comparing wind projects in Pennsylvania and New York helps to illustrate this point: while the New Jersey RPS offers long-term opportunities to wind projects located in both Pennsylvania and New York, the existence of green power markets in Pennsylvania and New Jersey (but not New York) provides near-term market opportunities only to Pennsylvania projects. Perhaps as a result, none of the three wind projects funded by NYSERDA have secured long-term power purchase agreements, while all three Pennsylvania projects have done so (see Text Box 2).

  Given that wind resources in New York and Pennsylvania are of similar caliber, the lack of near-term market opportunity in New York may be one reason that NYSERDA's normalized wind incentive is 1.77¢/kWh, while Pennsylvania's is 0.90¢/kWh – until the New Jersey RPS begins to ramp up or a green power market begins to develop, it will simply take more funding to make a project viable in New York.

- **Learning Curve.** Finally, some of the differences in incentive level may simply reflect the passage of time, which allows for both technology cost reductions and a growing knowledge of how best to structure incentives to encourage project development. California and New York are perhaps good examples of this phenomenon: California's second and third auction came in considerably lower than the first, and NYSERDA's wind program was carefully crafted in the wake of Niagara Mohawk's perhaps overly-generous one-time funding.

The next two sections provide specific details on the approaches used to fund some of the projects listed in Table 1.

II. Up-Front Grants and Forgivable Loans

As shown in Table 1, five states – Illinois, Massachusetts, Minnesota, New York, and Rhode Island – have used up-front grants or "forgivable" loans to support large-scale renewable energy projects.

Up-Front Grants

Illinois has funded a number of projects through its Renewable Energy Resources Program, which pays half of the cost of projects up to $300,000 for wind (> 10 kW), up to $550,000 for organic waste biomass (including landfill gas), and up to $1 million for hydropower refurbishments. While the program has funded 2 landfill gas projects and 2 hydro refurbishments to date, the $300,000 maximum grant for wind power has so far been unsuccessful in luring a commercial wind project to the state.[2] Possible reasons include the relatively small size of the grant and the likelihood that its up-front guaranteed structure, targeting capital costs, will reduce the 10-year 1.7¢/kWh (escalating with inflation) federal production tax credit (PTC) by an equivalent

[2] However, a handful of small wind projects have been funded, and several large wind projects are proposed for Illinois.

amount, thereby effectively rendering the grant worthless (see Text Box 1). In addition, a second Illinois fund – the Illinois Clean Energy Community Foundation – is currently reviewing project applications, though it is unclear if the Foundation will be able to fund commercial wind projects, given its non-profit status.

NYSERDA has awarded $7 million total in grants to support the 11.55 MW Madison project[3] and the 30 MW Fenner project.[4] After consulting with selected project developers, NYSERDA restructured the original terms of its award, changing it from a guaranteed grant (with 25% of funds withheld until the project operates as planned for one year) to a small up-front grant combined with a series of availability-based payments.[5] This structure provided NYSERDA with a higher degree of comfort and control over its funds, and the developer with reasonable assurance that the incentive would not offset the value of the federal production tax credit.[6]

In exchange for being allowed to store spent nuclear fuel at its Prairie Island nuclear site, **Xcel Energy** has been setting aside funds since 1999 to award grants to renewable energy projects in Minnesota. The first eight funded projects were announced in November 2001, and include: 3 biogas projects totaling 2.38 MW; one 3.2 MW hydro project in downtown Minneapolis; 2 PV projects, one an installation and the other a rebate program; and two wind projects, one involving the installation of 5.4 MW of prototype Enron turbines partially financed through an innovative community ownership program, and the other involving a single 900 kW turbine located at a school. These eight projects will receive a total of almost $9.8 million.

While grants are perhaps the simplest type of incentive to administer, they are somewhat ill-suited to support large commercial projects that require significant funding. First, grants generally provide weak performance incentives, a characteristic that may cause growing discomfort among fund administrators as the funding amount per project increases. Second, as described in Text Box 1 and elsewhere, grants may reduce the value of the PTC for wind and closed-loop biomass projects. Because of the importance of the PTC to the success of commercial projects, wind developers typically prefer to avoid grants, and in some cases have proactively worked with funds to restructure a grant to include performance-based components (e.g., NYSERDA).

[3] Jointly developed by Atlantic Renewable Energy Corporation and PG&E National Energy Group, and solely owned and operated by PG&E National Energy Group. See CEFN case study on the development of the Madison Windpower Project at: http://cleanenergyfunds.org/CaseStudies/Madison%20Wind%20final.pdf

[4] Jointly developed by Atlantic Renewable Energy Corporation and CHI Energy, and solely owned and operated by CHI Energy.

[5] 25% of the award is paid up front, with the remaining 75% distributed quarterly over the next 3 years based on quarterly project availability. The project earns the full incentive at 92% availability (or higher), and the incentive declines on a linear scale down to 42% availability (or less), where no incentive is paid (e.g., at 67%, half of the quarterly incentive is paid). After the Madison project missed the availability target during the first two quarters (while working out the bugs), NYSERDA agreed to allow the project to average availability over multiple quarters as a way to potentially re-earn missed payments.

[6] In 2002, NYSERDA released a second solicitation ($10 million) for new wind development. At least 75% of each award will be paid as a 5-year *production* incentive (i.e., rather than *availability* incentive), with any remainder paid as an up-front grant.

Text Box 1: Interaction of Clean Energy Fund Incentives and the Production Tax Credit (PTC)

Section 45(b)(3) of the Internal Revenue Code states that the federal production tax credit (PTC) for wind, closed-loop biomass, and poultry waste shall be reduced by:

> "(i) grants provided by the United States, a State, or a political subdivision of a State for use in connection with the project, (ii) proceeds of an issue of State or local government obligations used to provide financing for the project the interest on which is exempt from tax under §103, (iii) the aggregate amount of subsidized energy financing provided (directly or indirectly) under a Federal, State, or local program provided in connection with the project, and (iv) the amount of any other credit allowable with respect to any property which is part of the project…"

Given the vagueness of this language, at least two entities have requested specific Internal Revenue Service (IRS) rulings on whether incentives provided by state clean energy funds would reduce the value of the PTC. In 1997, the California Energy Commission (CEC) sought such a ruling with regards to the proposed structure of its SBC-funded Renewable Energy Program, and in 2001, Waymart Wind Farm LLC requested a ruling on production incentives awarded to it by the Sustainable Development Fund (SDF) in PECO's service territory.

California

In response to the CEC's query, the IRS harkened back to the Crude Oil Windfall Profits Tax of 1980, which also enacted a PTC (for non-conventional fuels) containing credit offset rules ("§29" rules) similar to those under §45(b)(3). In particular, the IRS cites a 1985 ruling that Federal fuel price-support payments – which are based on the sale price of the fuel – are not grants that reduce the §29 credit, on the basis that "grants" as referred to in §29 are *grants for capital costs* of the project. The IRS goes on to cite testimony and proposals leading up to the Energy Policy Act of 1992 and the enactment of the §45 credit for wind that reference the §29 rules, suggesting that Congress intended to apply the §29 safeguards and limitations to the §45 credit. Given this history, the IRS concludes that "…there is a strong inference that the offset rules under §45 should apply only to grants, credits, tax-exempt financing, subsidized energy financing, and other credits *that relate to the construction or acquisition of the facility or its equipment* and that the §45 offset rules should not apply to loan guarantees." (emphasis added) In the absence of specific taxpayer facts, however, the IRS notes that it is able to provide only general – and not definitive – guidance on the CEC's concerns. Based on this ruling, the CEC concluded that its planned program of production incentives – which do not directly offset the capital costs of a project – would not reduce the value of the PTC.

Waymart Wind Farm LLC (Pennsylvania)

While the California ruling focuses on what types of costs the incentive offsets (e.g., capital versus operating), the Waymart Wind Farm ruling in Pennsylvania seems to adopt the capital cost criteria and then focuses more heavily on the source of the incentive (e.g., government versus private). Specifically, the IRS notes that §45(b)(3) requires a reduction in the PTC "…in proportion to a facility's *capital cost* which is financed by *government* grants, proceeds of *government* issued tax-exempt obligations, subsidized energy financing under a *government* program, and any other credits." (emphasis added) "In the present case, we conclude that the Sustainable Development Fund's wind energy incentive payment is not pursuant to a governmental program and thus not subject to offset under §45(b)(3). Specifically, the Sustainable Development Fund is a non-governmental body that derives its funding from a private, investor owned utility company, PECO Energy Company. We believe the Pennsylvania Public Utilities Commission's approval of the settlement agreements based on funding from PECO Energy Company does not transform the Sustainable Development Fund's wind energy development program into a state governmental function or program."

Notably, the incentive in question resulted from the PECO/Unicom merger settlement, which injected $20 million directly into the SDF's coffers, $12 million of which was earmarked specifically for wind development. While the source of these funds is clearly "a private, investor owned utility company" (as ruled), it is unfortunately less clear if the IRS would have ruled similarly had the funds been raised through the traditional SBC mechanism as opposed to a merger settlement. Furthermore, the Waymart ruling seems to imply that choice of fund administrator might have important consequences – by their nature, governmental administrators may reduce the value of the PTC (though this did not factor into the California ruling, where the CEC is a state agency).

Thus, while Waymart received a definitive ruling for its specific situation, few generalizations can be drawn from that ruling. The California ruling, meanwhile, provides only general guidance. Taken together, the two rulings suggest that non-governmental incentives that offset non-capital-related project costs should not diminish the value of the PTC, though given the considerable number of unsettled questions and the importance of the PTC to a wind project, project developers/owners would perhaps be best served by seeking definitive rulings of their specific cases. *(Note: NYSERDA has recently released an authoritative analysis of PTC offsets: see www.nyserda.org/energyresources/wind.html.)*

Forgivable Loans

In the summer of 2001, **Massachusetts** announced three awards from its Green Power Predevelopment Financing solicitation: a $150,000 loan to the developer of a 4-6 MW landfill gas facility in Chicopee, a $128,415 grant to the City of Brockton to conduct feasibility studies for siting 5-10 MW of photovoltaics on two brownfields, and a $75,358 loan to a 27 MW wind project in Maine. The awards are intended to offset the cost of predevelopment activities only, and not construction costs. Predevelopment activities include site identification and negotiation, resource and environmental assessments, permitting, design and engineering studies, technical and financial feasibility studies, interconnection planning, and community relations.

Loans are provided at favorable interest rates on a non-recourse and unsecured basis, and will be forgiven if the project does not proceed. Should the projects come to fruition, all power must be sold into Massachusetts as part of a green power project, and the loan can be repaid in cash or through discounted power prices.

After searching in vain for a viable in-state wind project to support, **Rhode Island** pioneered the use of forgivable loans in late 2000 when it opportunistically provided a wind developer with the $150,000 needed to retain building permits for between 8 and 28 wind turbines on Brodie Mountain in western Massachusetts. These permits – the culmination of two years' effort – were in imminent danger of expiring unless the developer proceeded with construction-related site work, which Rhode Island's loan enabled. The terms of the loan are similar to those described above – the loan will be forgiven if the project is abandoned, but is otherwise repayable to Rhode Island in cash and/or discount green power sales into the state. This project is still in development, seeking long-term power purchase agreements.

Forgivable loans as applied in Massachusetts and Rhode Island have four interesting, if not innovative, aspects:

1. Both funds have targeted pre- and early-stage development activities, which can be critical to a project's ultimate success, especially in New England with its undeveloped renewable energy market and substantial siting hurdles.

2. Both funds allow out-of-state development, thereby gaining access to potentially superior – or, in the case of Rhode Island, viable – projects.

3. By requiring funded projects to sell power into the state, both funds are attempting to jump-start their retail green power markets, which have nominally been in existence since 1998.

4. Finally, the forgivable loan structure – a hybrid of a grant and a loan – holds appeal to both the developer and the fund: as with a grant, the developer is not on the hook should the project fail, while unlike a grant, the fund gets repaid in full if the project comes to fruition.

On the negative side, forgivable loans are, by their nature, not tied to effective project performance. Furthermore, forgivable loans, which have been targeted primarily at pre-development activities, may not be sufficient to bring projects to fruition; many projects will likely require additional construction-related support.[7] Funds

[7] Given this likely need, it is possible that developers would rather see pre-development funds re-directed

offering such early-stage support should both recognize this potential future need and be willing to satisfy it through later-stage funding, or else risk stranding uncompleted projects. Finally, it is not entirely clear how the use of forgivable loans impacts the PTC.[8]

III. Production Incentives

To more closely align funding with efficient project performance and to reduce the chance of negatively impacting the PTC, several clean energy funds have structured project awards in the form of production incentives. As shown in Table 1, three states – **California**, **Montana**, and **Pennsylvania** – have awarded funds to utility-scale renewable energy projects (mostly wind) on a production incentive basis. Not shown in Table 1 because no funds have yet been awarded, **Rhode Island** has a solicitation currently on the street that intends to provide production incentives to utility-scale renewable energy projects located in New England and selling power into the state (though the solicitation is somewhat open-ended and developers are allowed to request other forms of support). **New Jersey** has also recently solicited in-state renewable projects to receive a 5-year production incentive.

This section will detail experience in **California**, and then describe how **Pennsylvania** has applied what it learned from that experience in designing its own program. **Montana**'s use of a 3-year production incentive to support 3 MW of the 22 MW Blackfeet wind project will not be discussed beyond what is listed in Table 1.

California

Using funds from its New Renewable Resources Account,[9] California has held three auctions of 5-year production incentives, which could eventually support as much as 1,300 MW of new renewable capacity. Wind will supply the bulk of the new generation capacity (986 MW), followed by geothermal (157 MW) and landfill gas (81 MW). Table 2 provides capacity and weighted average incentive levels by resource for each of the three auctions, as well as totals for all auctions.

towards helping them sell their output at a price the market will pay (e.g., through a production incentive). Gauging developer preferences for different types of incentives is one example of a research task that would benefit all funds.

[8] Structuring the incentive as a loan and prohibiting its use for construction purposes (as Massachusetts has done) may avoid any PTC offsets, though neither Massachusetts nor Rhode Island (nor the wind projects they have funded) have sought a definitive ruling from the IRS (perhaps due to the small size of the incentive relative to total project costs).

[9] Funded by the state's system benefits charge and administered by the California Energy Commission (CEC).

Table 2. California New Renewable Account Auction Results

	Capacity and Capacity-Weighted Average 5-Year Production Incentive (MW (¢/kWh))			
	Auction 1 June 1998 $162 million	Auction 2 November 2000 $40 million	Auction 3 August 2001 $40 million	All Auctions Combined $242 million
Wind	297.8 (1.04)	439.1 (0.54)	249.2 (0.72)	986.1 (0.74)
Geothermal	156.9 (1.28)			156.9 (1.28)
Landfill Gas	68.5 (1.11)	12.5 (1.33)		81.1 (1.15)
Small Hydro	1.0 (1.35)	12.2 (1.04)	21.0 (0.80)	34.2 (0.90)
Waste Tire			30.0 (0.65)	30.0 (0.65)
Biomass	3.8 (1.35)	7.5 (1.13)		11.3 (1.20)
Digester Gas	2.1 (1.39)			2.1 (1.39)
Total	**530.1 (1.13)**	**471.3 (0.58)**	**300.2 (0.72)**	**1301.6 (0.84)**

Incentives are capped at 1.5¢/kWh, a level that has only been approached in the first of the three auctions. Successful bidders are responsible for finding their own power purchase agreements, and are required to meet a series of milestones, which in the initial auction was to culminate in commercial operation within 36 months. The two subsequent smaller auctions were both a response, in part, to the state's electricity crisis. As such, they targeted plants with the ability to come on line much more quickly by awarding 10% bonuses or assessing 10% penalties to projects that come on line before or after reference dates roughly corresponding to the beginning and end of the coming summer, respectively.

Given these timetables and projected online dates at the time of each auction, a total of 931 MW were expected to be operating by the end of 2001. As 2001 drew to a close, however, only about 200 MW had come on line. Reasons for the delay are numerous, and include both speculative bidding and the widespread effects of California's electricity crisis on both the green and conventional power markets. These factors are discussed in more detail below, as well as in Text Box 2.

Speculative Bidding

Though pitting eligible projects against one another can lower the public investment required to support renewable energy projects, effective design of the competitive process is necessary to ensure that funds are put to good use. The one-off nature of California's initial New Renewables auction,[10] 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. Furthermore, with the auction conducted after only a few months of experience in the new competitive market, bidders lacked important information concerning the strength of the market and the extent of the "green" premium they might expect to receive from green power marketers. The effect of such speculative

[10] Only one auction was originally planned for the four-year SBC program; the two smaller subsequent auctions were in response to the state's electricity crisis and were enabled by rededicating idle renewable energy program funds away from existing renewable projects.

bidding is that a number of winning bidders may not develop their projects, either because market conditions are not favorable enough to make the project viable (e.g., direct access is suspended, the PTC has expired) 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.

California's experience suggests at least three (non-exclusive) remedies aimed at discouraging speculative bidding, two of which the California Energy Commission (CEC) appears to have at least partially adopted:

1. 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. Perhaps with this consideration in mind, the CEC investment plan for managing the first 5 years of the 10-year extension of California's fund recommends holding an auction of roughly $122 million every two years.

2. Fund administrators can strongly penalize winning bidders that are unable to make reasonable progress towards project completion by, for example, withholding bid bonds or other forms of security, or by reducing (or eliminating) the incentive if certain milestones are not met. California's bid bond requirement has been criticized not for its size (10% of the full 5-year value of the bid), but for its lenient refund policy. The CEC refunds half of the bond once a project passes the first milestone, which amounts to little more than formalizing the intent to develop in writing, and the other half after the project passes the second milestone, which involves filing permit applications. In other words, a developer can receive a full refund of the bid bond before the project is even permitted. California has supplemented its rather weak bid bond requirements by also instituting (in the second and third auctions) a calendar-based system of bonuses and penalties to encourage early project completion, effectively tying the size of the production incentive not only to the level of production during operations, but also to the speed of development.[11]

3. 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.

California's Electricity Crisis

Ironically, the supply shortage that caused problems in California during 2000/2001 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 (see Text Box 2 for a discussion of the importance of long-term contracts).

[11] Note that calendar-based increments or decrements to the production incentive level do little to weed out speculative bidders, as a developer's worst-case scenario is merely to lose a positive cash flow (rather than suffer a negative cash flow). Such incentives, however, do promote early development of legitimate projects.

Revenue uncertainty has been exacerbated not only by the electricity crisis, but also by ISO imbalance penalties facing intermittent wind generators unable to predict their output with certainty.[12]

These examples, along with the discussion above and in Text Box 2, demonstrate that even with generous production incentives, revenue uncertainty – stemming from many sources – can still plague a project, implying that in addition to providing effective incentives, state funds must remain mindful of the need for projects to access secure power sales contracts (see Text Box 2).

Pennsylvania

As part of the PECO/Unicom merger settlement, the Sustainable Development Fund (SDF) in PECO's service territory received $12 million to support the development of new wind power in Pennsylvania. The SDF was eager to leverage these funds by allowing recipients sufficient time to develop their projects prior to the scheduled expiration of the federal production tax credit at the end of 2001, but did not want to spend the full $12 million all at once. Therefore, in late 2000 the SDF issued its "Phase I" competitive solicitation for new wind power, modeled very closely after California's program. To balance these objectives, Phase I first promised $6 million in the form of 5-year production incentives capped at 1.5 cents/kWh.

But, after consulting with the winning bidders, the SDF determined that it could increase its leverage – and the number of MW installed – by instead effectively providing a lump sum payment (contingent on production) payable upon the commercial operation of each project.

Through this novel arrangement, the SDF provides the developer with the full incentive amount, and in return the developer provides the SDF with a letter of credit for that amount. As the wind project "earns" its incentive over time by producing energy, the amount of funds secured by the letter of credit is reduced accordingly until either the project earns the full incentive amount or the 5-year incentive period expires (in which case the project forfeits any remaining un-earned incentives).[13]

Pennsylvania wind projects believe that accepting what is effectively an up-front grant structured as a secured performance incentive enables them to claim the full value of the PTC, and at least one project has received a definitive ruling to this effect from the IRS (see Text Box 1).[14]

Two projects, totaling 67 MW, were announced as winners of the solicitation in early 2001. The 15 MW Mill Run project[15] in western Pennsylvania came on line in October 2001, while the 52 MW Waymart project[16] on Moosic Mountain near Scranton

[12] In the fall of 2001, the ISO and the wind industry reached an agreement whereby the ISO will exempt wind generators from imbalance penalties, provided the wind industry helps to fund a more accurate forecasting model that the ISO will run and by which wind projects will schedule their output.

[13] Rhode Island's solicitation for new supply (currently on the street) also indicates a willingness to pursue this type of "letter of credit" arrangement, should the winning developers request it.

[14] Note that this project-specific ruling is different from California, where the CEC consulted the IRS for a blanket approval of its 5-year production incentive auctions.

[15] Developed and owned by Mill Run Windpower LLC, a jointly owned subsidiary of Atlantic Renewable Energy Corporation and Zilkha Renewable Energy.

[16] Developed and owned by Waymart Wind Farm LLC, a wholly owned subsidiary of American National Wind Power and Orion Energy LLC of Oakland, California.

was delayed until 2002 by planning opposition from a local family. Both projects have already secured 20-year power purchase agreements from Exelon Power Team, a wholesaler who in turn has reached an agreement with Community Energy, Inc. to market the wind power to both commercial and residential retail customers. As of December 2001, Community Energy had already reportedly sold roughly 90% of the output of the 15 MW Mill Run project (along with that of the 9 MW Somerset project, also funded by Pennsylvania's SBC program[17]) to institutional and commercial buyers in the state.[18] In addition, PECO Energy filed a tariff amendment in late November 2001, under which it would offer wind power to all of its customers. The cost premium is $2.50 per 100 kWh block, or 2.5¢/kWh for customers who wish to purchase 100% of their consumption from wind generation. PECO's tariff is currently in limbo, awaiting decision on an injunction filed by Green Mountain Energy to stop default suppliers such as PECO from offering green power.

[17] The 9 MW Somerset project received a total of $3.6 million in subordinated debt financing from the four Pennsylvania sustainable energy funds. This project, which differs from the Mill Run and Waymart projects discussed here by the type of support received (i.e., financing instead of production incentives), will be discussed in a separate CEFN case study on subordinated debt financing.

[18] The green power purchasers include the University of Pennsylvania, Penn State University, Carnegie Mellon University, Philadelphia Suburban Water Corporation, Giant Eagle, Inc. (a regional supermarket chain), the United States Environmental Protection Agency, and the State of Pennsylvania.

Text Box 2: Demand is Critical To Project Completion and Success

Regardless of which incentive structure a fund adopts, it is important to keep in mind that incentives alone will not be sufficient to guarantee a project's success. Grants merely reduce future revenue requirements, while production incentives provide only a portion of a project's required revenue stream. Unless a project is able to secure the remaining portion through a power purchase agreement (PPA) or some other means, the project will likely fail, or never be developed in the first place.

Perhaps nowhere is this important point better illustrated than in California, where relatively few of the new renewables projects funded by the California Energy Commission (CEC) have come on line. For example, although roughly 300 MW of wind capacity was awarded a 5-year production incentive in the CEC's first auction back in June 1998 (and an additional 688 MW of wind has been funded in the two auctions since – see Table 2), only 3 wind projects totaling 85 MW had come on line by the end of 2001 (i.e., 3.5 years after the first auction). This despite the fact that wind projects can typically be built in a year or less, and that the end of 2001 marked a major deadline for wind projects for another reason – the expiration of the federal production tax credit.

While a few of these projects may have been speculatively bid without strong intentions to develop, the main culprit behind this poor showing is a perverse lack of demand. California's electricity crisis destroyed the green power market and concentrated all power purchasing in the hands of the Department of Water Resources (DWR), which signed only 3 contracts for wind power (out of more than 50 contracts total). Notably, of the three CEC-funded wind projects that have been built, two were built back in 1999 to serve the green power market, and the other is one of the "lucky 3" to have secured a PPA with the DWR. In other words, demand matters.

With demand from the green power market and the DWR now effectively choked off, all hope has turned to the new California Power Authority, which has so far entered into letters of intent to purchase power (which it would re-sell to the DWR at cost) from more than 1800 MW of wind power, some of which was also successfully bid in the CEC auctions. However, with the DWR's creditworthiness threatened by the state's delay in issuing $12 billion in bonds to pay for above-market power purchases, the Power Authority's plans are on hold. In fact, the DWR's uncertain credit status is also impacting the other two (of the "lucky 3") wind projects with which it has signed long-term PPAs: these two projects have been unable to attract financiers willing to take on the considerable risk that the DWR will remain solvent, and so have not yet been built.

This grim story stands in stark contrast to Pennsylvania, where all three wind projects (totaling 76 MW) funded by Pennsylvania's sustainable energy funds have secured 20-year PPAs with the Exelon Power Team. Two of the three projects, with PPAs in hand, came on line less than a year after being awarded incentives (the third has been delayed by local planning opposition). Nearly all of the output of the two projects currently on line has been sold through the green power market.

In New York, two of the three initial wind projects targeted by NYSERDA have come on line, but have not secured power purchase agreements and so are selling their output on the spot market (a third 10 MW project has recently been cancelled, and NYSERDA has issued a new solicitation for wind supply). In addition, the 11.55 MW Madison project is attempting to supplement its revenue by selling green tags at 4¢/kWh. NYSERDA's initial success in funding wind projects that come on line despite a notable lack of demand is perhaps partly due to the novelty of wind power in New York (as in Pennsylvania). In the continued absence of demand, however, further merchant development is unsustainable and unlikely. Recognizing this problem, NYSERDA has recently embarked on a major effort to develop New York's green power market.

(continued on next page)

Text Box 2 (continued): Demand is Critical To Project Completion and Success

Because high initial success rates in Pennsylvania and New York may not be indicative of what most states can expect, there are several proactive steps that clean energy funds might consider to ensure adequate revenue for worthy projects:

1) Funds might consider "full cost" or "target price" auctions, where renewable projects bid and receive the full ¢/kWh cost of their project. Winning bidders 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 PPA with a credit-worthy buyer, reducing both demand risk and speculative bidding. This structure is similar to the Non-Fossil Fuel Obligation (NFFO), which until recently was the primary method of support for renewables in the United Kingdom. While the NFFO has been abandoned in favor of a renewables purchase obligation, this does not mean it is unworthy of consideration by state clean energy funds (which do not have the legal authority to impose purchase obligations).

2) Several funds have considered offering green power price insurance, where the fund guarantees that a project will receive a green premium, even if it is not able to obtain one through the market. This is somewhat different than a production incentive (which could be considered a green premium) in that price insurance is contingent upon a project not being able to find a sufficient revenue stream, while production incentives are typically paid irrespective of market environment or specific project needs. Thus while price insurance could involve significant payments (i.e., larger than typical production incentives) from a fund in bad times, good times would result in only minimal cash outlays (i.e., lower than typical production incentives). In this way, price insurance smoothes what otherwise might be a volatile revenue stream.

3) Rather than directly providing revenue certainty, clean energy funds may instead wish to stimulate long-term market demand by encouraging the development of a robust green power market. Several funds, including New York and Rhode Island, have taken this route to date. Furthermore, decisions about whether to allow funded projects to be eligible to satisfy in- or out-of-state RPS requirements can also impact the revenue available to a project. Pennsylvania and New Jersey have specifically allowed (at least temporarily) SBC-funded projects to qualify for RPS eligibility, while Massachusetts has required funded projects to sell their output into the green power market.

Three main factors have contributed to Pennsylvania's relative success at promoting wind power:

1. The state's restructured electricity market has remained relatively stable compared to that of California and a few other states, allowing developers and market participants to proceed in an environment of relative certainty. Furthermore, Pennsylvania's green power market remains functional, which may have contributed – along with the possibility of selling into New Jersey's RPS – to Exelon Power Team's willingness to offer these projects 20-year power purchase agreements. Unlike California, which has no RPS and now no green power market, Pennsylvania offers multiple markets in which to sell wind power, making wholesalers like Exelon comfortable enough to enter into long-term power purchase agreements, which are critical to the development of wind power.

2. The relatively small size of the Phase I program (i.e., $6 million) and the novelty of wind development in Pennsylvania encouraged the SDF to consult the wind industry as to the most effective way to structure its incentive program, resulting in the implementation of front-loaded production incentives. If

one assumes that the wind developer's cost of capital exceeds the SDF's opportunity cost of capital by 10%, this up-front lump sum approach boosts the incentive's leverage by 32% (16 MW) compared to a production incentive distributed over 5-years. If the cost of capital differential is 5%, a 15% (9 MW) leverage boost could be expected.

3. In the absence of a predefined structure, the SDF employed considerable discretion in (a) holding back $6 million for a later Phase II program and (b) selecting projects that were both able to demonstrate low required incentive levels *and* a high probability for project completion by the end of 2001. To evaluate projects based on the latter metric, the SDF asked bidders to provide information demonstrating: financial health, ability to finance a large wind energy project, technical ability to construct and manage a large wind energy project, site control, feasibility of interconnecting the proposed project with the electric grid, wind resource adequacy, ability to secure all required permits within four months of award, and, perhaps most importantly, progress towards securing a power purchase agreement. These criteria are more comprehensive than those employed in California, and may have contributed to Pennsylvania's success in bringing new wind projects on line in a short time period. They have also served to demonstrate that the 52 MW Waymart wind project is still the most promising project in the pipeline, prompting the SDF to stick with it despite the unforeseen permitting delay.

   Pennsylvania's bid bond system also differs from California's in one critical respect. Though the level of security provided – at $2,500 per MW of project – is only about 20% as large as California's requirement, the refunding milestones are more stringent: one third of the bid fee is refunded once the project has secured all permits, a second third is refunded once the project has secured financing, and the final third is only returned once the project has commenced commercial operation. This is in contrast to California, where the entire bid bond is refunded when the project *applies* for permits.

Two other considerations that confronted the SDF, and which are also applicable to other funds, are worth mentioning:

- *Fate of renewable generation should be considered.* Another issue faced by Pennsylvania and other states is whether fund managers should impose requirements on where winning projects are able to sell their electrical output (or renewable energy credits – RECs). Perhaps of most significance is whether projects should be able to sell into an in-state or out-of-state renewables portfolio standard (RPS). To increase the likelihood that it was supporting "incremental" wind plants that would not have otherwise been built, Pennsylvania initially considered forbidding funded projects from selling their output (or RECs) into New Jersey's RPS,[19] but ultimately decided not to restrict power sales because it felt such limitations would reduce the effectiveness of production incentives and drive up the needed incentive amount. Additional issues that have arisen in some states include whether projects should be required to sell their

[19] Prohibiting sales into New Jersey's RPS might also serve to boost Pennsylvania's green power market from the supply side.

output (or RECs) in-state and whether projects should be allowed to receive an additional renewable energy premium from retail or wholesale marketers.

- *Pending incentives can bring project development to a halt.* In order to maintain a steady pace of renewable energy development, experience with some state funds suggests that it may be important for fund administrators to quickly articulate a clear funding plan and to minimize potential funding uncertainties. Failure to do so may lead to a "wait and see" attitude among market participants, thereby slowing renewable energy project development, perhaps with serious consequences for certain timely funding opportunities, such as wind development prior to the expiration of the PTC. In Pennsylvania, for example, the PECO/Unicom merger, with its $12 million settlement fund earmarked specifically for wind development, may have caused wind developers to hold off on new projects until it was clear how the funds would be distributed. The SDF effectively cleared this logjam by rapidly allocating half of the $12 million through the award of production incentives as described above, while reserving the remaining $6 million to be allocated at a later date after a thorough review of funding options.[20]

[20] Following the successful use of subordinated debt in the 9 MW Somerset project (to be described in a separate CEFN case study on subordinated debt financing), the SDF is currently soliciting wind industry input on how to structure the $6 million Phase II of its wind program. Phase II will likely feature innovative ideas such as subordinated debt financing or green power price insurance, rather than production incentives.

IV. Concluding Remarks

Effective support for utility-scale renewable energy projects requires consideration of many factors and tradeoffs. Among the most relevant considerations are:

- How to encourage project performance while at the same time meeting a developer's needs;
- How to structure an incentive so that it does not reduce the value of other state and federal tax incentives;
- How to cope with nascent markets or market rules that might not value the project's output; and
- Whether to employ grants, production incentives, or some other form of financing such as subordinated debt.

This survey of fund experience with grants, forgivable loans, and production incentives finds that clean energy funds have achieved various degrees of success under different support regimes: New York has successfully supported wind power with a (form of) grant while Illinois has not (yet), and Pennsylvania has helped bring wind projects on line with production incentives in less than a year while California is struggling to develop projects awarded production incentives back in 1998.

Given this mixed experience, it remains too early to draw definitive conclusions as to which incentive structures are most effective, particularly since successes or failures may ultimately be due to factors that are independent of the form or style of support chosen. For example, demand for renewable energy fomented by RPS policies or green power markets appears to be critical to projects securing viable long-term power purchase agreements, regardless of the form of incentive chosen.

That said, it does look as if direct grants, which lack performance guarantees and may offset the value of the PTC for wind and closed-loop biomass projects, are by their nature less effective than other incentives at stimulating the successful development of large commercial projects.

Given the potential for state clean energy funds to cost-effectively support large amounts of renewable energy by funding highly visible utility-scale renewable energy projects, support for such projects is likely to persist into the future, and even increase as a number of new programs (e.g., Rhode Island, New Jersey) begin to bear fruit. It is therefore more important than ever for state clean energy funds to continue to learn from successes and failures of the past – their own as well as those of other funds. Along these lines, Text Box 3 offers a number of opportunities for cooperation and coordination among the funds, aimed at enhancing the learning process, and ultimately the success of future funding support for large projects.

Text Box 3: Opportunities for CEFN Coordination

This report suggests that there are at least three broad areas where state clean energy funds interested in supporting large-scale projects could benefit from joint work – project coordination, joint research, and information sharing.

Project Coordination: At a minimum, state funds (particularly in the Northeast, where out-of-state project funding is more common) should be aware of what projects are being funded by neighboring states, so that "double-dipping" can be prevented. At best, states could jointly fund mutually beneficial projects to reduce the required level of commitment from any individual fund, or to draw upon different funds' areas of expertise. For example, the four Pennsylvania funds – led by the Sustainable Development Fund in PECO's service territory – have jointly provided $3.6 million in subordinated debt financing to the 9 MW Somerset wind project.

Research Questions: What steps can funds take to shore up project revenue certainty? At what stage of development can clean energy funds have the most impact? What types of funding (e.g., pre-development grants, grants, production incentives, etc.) are least/most valuable to developers? What types of funding reduce the value of the PTC? How are other states/countries supporting large-scale projects? Working through these questions with key private finance and industry partners – in a regional collaborative setting – could be an effective way to approach these issues.

Information Sharing: Perhaps the most useful information will come from other state funds involved in similar undertakings. Specific examples include sharing any IRS rulings pertaining to potential PTC offsets (such as those described in Text Box 1), as well as details on the funding of specific projects. A rigorous, systematic, and sustained structure for detailed information sharing is essential and should be incorporated into future CEFN work.