

# **APPENDIX E – Renewable Energy Programs in other States and Countries**

November 2004



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# 1 Executive Summary

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The following exhibits summarize the results of interview and literature on renewable energy programs for the states of California, New York, Massachusetts, Texas, New Mexico, Oregon, Wisconsin, Illinois, Pennsylvania, Connecticut, Delaware, Vermont, and Washington.

The purpose of these exhibits is to overview key areas for the New Jersey Board of Public Utilities to compare itself to other projects in other states by criteria.

## NUMBER OF INDIVIDUALS INTERVIEWED

Total number of interviews: 20

- ◆ California – (4) Emerging Renewable Program (REP), Self-Gen (SGIP), LADWP, SMUD
- ◆ New York – (2) NYSERDA, LIPA
- ◆ Massachusetts – (1) MTC
- ◆ Texas – (1) City of Austin
- ◆ New Mexico – (0) N/A
- ◆ Oregon – (1) Energy Trust of Oregon
- ◆ Wisconsin – (2) Wisconsin Focus on Energy, Wisconsin Public Power Association
- ◆ Illinois – (3) Illinois Clean Energy Community Foundation, ComEd Solar Partnership, Illinois Department of Commerce and Economic Opportunity - Bureau of Energy and Recycling
- ◆ Pennsylvania – (3) The Energy Cooperative, Community Foundation of the Alleghenies, Sustainable Energy Fund of Central Eastern PA
- ◆ Connecticut – (1) Connecticut Office of Planning and Management
- ◆ Delaware – (1) Green Plains Energy
- ◆ Vermont – (1) VEIC/ERC
- ◆ Washington – (0) N/A

**Exhibit 2.0-1 State Summaries**

State	Net Metering	Renewable Energy Portfolio Standard	Tax Incentives	Public Benefit Funds
California	Date Started: 1995 System Size: up to 1,000 kW Technologies: Solar and Wind Customer Type: All customer classes Utilities: All utilities	20% by 2017 (Accelerated RPS 20% by 2010)	State-wide Property Tax Exemptions Personal and Corporate Tax Exemptions	✓
New York	Date Started: 1997 System Size: Solar residential – up to 10 kW Wind residential – up to 25 kW Farm biogas – less than 400 kW Farm wind – up to 125 kW Technologies: Solar, wind, biogas Customer Type: Residential and Farm Utilities: All utilities	25% by 2013	State-wide Property Tax Exemption Personal and Corporate Tax Exemptions	✓
Massachusetts	Date Started: 1997 System Size: up to 60 kW Technologies: All technologies Customer Type: All customer classes Utilities: All utilities	3% by 2007	Local option for Property Tax Exemption Personal and Corporate Tax Exemptions Sales Tax Exemption	✓
Texas	Date Started: 1986 System Size: Up to 50 kW Technologies: Renewable Customer Type: All customer classes Utilities: IOUs and RECs	5% by 2010	State-wide Property Tax Exemption Corporate Tax Exemptions	N/A

State	Net Metering	Renewable Energy Portfolio Standard	Tax Incentives	Public Benefit Funds
New Mexico	Date Started: 1999 System Size: Up to 10 kW Technologies: Renewable and cogeneration Customer Type: All customer classes Utilities: All utilities	5% by 2006 10% by 2011	N/A	N/A
Oregon	Date Started: 1999 System Size: Up to 25 kW Technologies: Solar, wind, fuel cell and hydro Customer Type: All customer classes Utilities: All utilities	Not developed	State-wide Property Tax Exemption Personal and Corporate Tax Exemptions	✓
Wisconsin	Date Started: 1993 System Size: Up to 20 kW Technologies: All technologies Customer Type: Retail Customers Utilities: IOUs	2.2 percent by 2011	N/A	✓
Illinois	Date Started: 2000 System Size: up to 40 kW Technologies: Solar and wind Customer Type: All customer classes Utilities: ComEd only	15% by 2010	Tax Incentives for Ethanol	✓
Pennsylvania (Example: Sustainable Energy Funds of Central Eastern Pennsylvania) <sup>1</sup>	Date Started: 1998 System Size: Up to 10 kW Technologies: Renewable and fuel cell Customer Type: Residential Utilities: All utilities	Varies by utility <sup>1*</sup>	N/A	✓
Connecticut	Date Started: 1990 System Size: Up to 100 kW Technologies: Renewable and fuel cell	13% by 2013	Local Property Tax Exemption	✓

<sup>1</sup> \* Current Pennsylvania Public Benefit Funds and Renewable Portfolio Standards were negotiated with each utility during the state's 1996 restructuring efforts. Pennsylvania is currently in the legislative process of mandating a statewide Renewable Portfolio Standard.

	Customer Type: Residential Utilities: IOUs			
Delaware	Date Started: 1999 System Size: Up to 25 kW Technologies: Renewable Customer Type: All customer classes Utilities: All utilities	Not Developed	N/A	✓
Vermont	Date Started: 1998 System Size: PV, wind, and fuel cells - up to 15 kW Farm biogas and agricultural community energy projects – up to 150 kW Technologies: PV, wind, fuel cells, biogas Customer Type: Residential, commercial and agricultural Utilities: All utilities	Not Developed	Sales Tax Exemption	N/A
Washington	Date Started: 1998 System Size: Up to 25 kW Technologies: Solar, wind, hydro and biomass Customer Type: All customer classes Utilities: All utilities	Initial initiative for 15% by 2013	Sales Tax Exemption	N/A



**Exhibit 2.0-2 State Program Summary: Start Date, Budget, Staffing, Activity, Processing Time, and Oversubscription Issues**

State	Program Name / Agency	Incentive Type	Start Date	Budget (millions)	Staffing / Number of Applications	Activity	Processing Time	Oversubscription Issues
CA	PIER (CEC)	Grants	1996	\$62.5 per year		Mostly research and demonstration projects.	Funds are approved on a case-by-case basis and are leveraged with other institutions.	N/A
CA	ERP (CEC)	Rebate (\$0.90 to \$3.40/watt)	1998 2003	~\$240	5 management level and 23 part time admin staff	14,330 since 1998 2,283 in 2004	Varies depending on completeness of application. Average 6 weeks.	Rebates are readjusted every six months. Reservation applications are received only by mail (post mark used for six month eligibility reservation period), 60-day period for application corrections.
CA	Self-Gen (CPUC)	Rebate (\$2.50 to \$4.50/watt)	2001	\$125 per year		553 as of June 2004	Conditional notice letter is sent within a few weeks of application receipt. Applicant must respond to this letter within 90 days and has up to one year to implement project.	Funds are allocated in four separate categories (Level 1, Level 2, Level 3 and Others). Program Managers reallocate funds for each level/category based on funding needs. Decreased/declining incentive structure is likely to be implemented.
CA	LADPW	Rebate (\$3.50 to \$5.00/watt)	1998	\$7.1 for 2004-2005	2 FTE and part time staff	Estimated 86 new applications and an		In 2003 depletion of annual funds resulted in program closure. In 2004 incentive levels were reduced

State	Program Name / Agency	Incentive Type	Start Date	Budget (millions)	Staffing / Number of Applications	Activity	Processing Time	Oversubscription Issues
					(students), with help from other non-program staff.	estimated 523 in waiting list.		and 3 categories of applications were introduced to help deal with oversubscription. Applicants on waiting list need to confirm their interest in order to receive incentive benefits. Reservation period is changed to 6 month for projects under 30 kW and 12 months for projects equal of larger than 30 kW. Possible extension of 3 months
CA	PV Pioneer/ SMUD	Rebate (\$8.75 to \$2.50/watt)	1993 1999	\$2.5 (2004)	3 FTE. Anticipates 70 residential installations with 2 FTE. Less than 1 FTE for Commercial installations.			Fund shifts and lower incentive levels.
NY	NYSERDA	Incentives \$4.00/Watt to \$4.50/Watt	2000	\$7 for RE	5 program managers supported by tech and admin	NY Energy \$Mart PV Solar ~120 applications per year processed	2 to 3 weeks if application is complete	To date oversubscription has not been a problem.

State	Program Name / Agency	Incentive Type	Start Date	Budget (millions)	Staffing / Number of Applications	Activity	Processing Time	Oversubscription Issues
					staff.	by 2 FTE		
NY	LIPA	Rebates \$4.50/Watt	2000	Clean energy Expenses \$36.1 (2004 budget) R&D for Clean Energy \$4.5 (2004 budget)	4 FTE across all programs	~150 applications per year	Average 4 months, permits are an issue	
MA	Green Buildings and Infrastructure (MTC)	Grants	1998	Through 2004 \$22 for Solar PV initiatives. \$4.2 for Solar-to-Market	20 FTE across 4 program areas	Solar to Market – 117 applications.	Open Solicitation process 3 step review	
TX	Solar Rebate Program	Rebate \$5/Watt, \$6.25/Watt if equipment is made in TX.	June 2004	\$0.9	2 FTE. Not all staff in place, additional hiring expected.	Applicants must submit a site qualification before any application. This step increases processing time	Expected to be 7 month from application to final inspection.	Recent program. Staff aware of funding and rebate levels. After initial launch and depending on response incentives will be adjusted down.

State	Program Name / Agency	Incentive Type	Start Date	Budget (millions)	Staffing / Number of Applications	Activity	Processing Time	Oversubscription Issues
						but ensures siting is adequate for technology.		
OR	Solar Electric and Solar Water Heater (Energy Trust of Oregon)	Rebate \$3.5/DC Watt (Res) \$2.5/DC Watt (Comm) Bonus of \$0.75	2003	\$1.2 (1Q-2004)	Program Manager, Program Coordinator, PT Admin staff. 2 FTE to process applications	Solar Electric 120 (Since May 03) Solar Water Heater – 50 (Since Dec 03)	1 week Average	Reservation period limited to one year. Incentives may be lowered in the future.
WI	Focus on Energy (Dept. of Admin.)	Grants Loans Rebates	2002	\$1.0	2 FTE and 8 part time. Contractors.	1 FTE reviews all applications	30 days average for rebates. Siting study can be an issue. Grants and loans take longer.	
IL	Illinois Dept of Commerce – Renewable Energy	Grants Rebates (50% to 60% of project Cost)	1997		1 FTE for renewable	Since 1998 – 150 projects	1 month average	

State	Program Name / Agency	Incentive Type	Start Date	Budget (millions)	Staffing / Number of Applications	Activity	Processing Time	Oversubscription Issues
IL	Illinois Clean Energy Community Foundation	Grants	2001	\$225	1.5 FTE	23 PV, 3 wind, 3 thermal solar	2 to 4 months depending on system size. All require board approval.	
IL	ComEd Solar Partnership	Rebate \$1/watt	1999		3 FTE, part time as needed.	55 projects, 958 kW total	Target is 6 weeks.	
PA	The Energy Cooperative	Production Incentives (\$0.20/kWh)	2002		Less than 1 FTE	21 participants	1 week	Oversubscription is not an issue, at the moment the program is willing to pay the incentive to at least double their current number of subscribers.
PA	PENELEC Sustainable Energy Fund	Grants Loans Equity Investment	2000		2 FTE but would like to add more.	100s of inquiries	70 to 90 days	
PA	Sustainable Energy Fund of Central Eastern Pennsylvania	Grants Loans Equity Investment	2000		3.5 FTE	25 grant applications 10 loan applications	60 to 180 days	
CT	New Energy	Grants	11 years	Escrow fund	Less than 1 FTE	6 to 8 per year, about 40 to	Approximately 180 days	Awardees have one year to complete the process.

State	Program Name / Agency	Incentive Type	Start Date	Budget (millions)	Staffing / Number of Applications	Activity	Processing Time	Oversubscription Issues
	Technology Program					date.		
DE	Green Energy Program	Grant	2000		1.5 FTE	40 applications since 2000	30 days average up to	Information not available.
VT	Solar and Wind Incentive Program	Rebate	2003	Approximately \$.9in incentives	5 Part time	67 Installed Systems	Several weeks to approve incentives. 3 to 6 months to complete projects	Program managers expect some reservations to be abandoned. Additional funding will go to applicants in the waiting list.

**Exhibit 2.0-3 State Program Summary: Tracking System, Marketing, Certification, Program Design, and Evaluation**

State	Program Name / Agency	Tracking Systems	Marketing	Certification	Program Design	Evaluation
CA	PIER (CEC)					
CA	ERP (CEC)	MS Access database	Marketing activities are coordinated with the CEC Consumer Education Program.	Contractor license number is requested in the application. No certification required at this time	Changes in 2001, 2002 and 2003. Program has changes incentive levels based on participation and funding. Performance based rebates are being reviewed.	Online application to decrease processing time, limiting reservation periods.
CA	Self-Gen (CPUC)		Trade allies are important since they improve customer outreach. Workshops, conferences, media advertising, direct mail and e-mail, press releases.		Process and impact evaluations completed for this program.	Decreased incentive structure recommended and likely to be implemented. (2003)
CA	LADPW	Currently MS Excel based, looking into a more robust database application.	Not much activity due that program is already over subscribed.		Changes in 2003 included incentive reduction, adding 3 distinct categories based on project size, allocation of funding based on	Not available.

State	Program Name / Agency	Tracking Systems	Marketing	Certification	Program Design	Evaluation
					categories.	
CA	PV Pioneer/ SMUD				1999 – significant changes (PV Pioneer II). Redesign expected for 2005.	Redesign will tackle the oversubscription issue by using a more conventional buydown approach.
NY	NYSERDA	Access based tracking system. Looking into specialized Microsoft based proprietary package	Trade allies	Not required. NABCEP preferable.	2 modifications to date. Looked at other state programs. Currently provides advice to other states' program managers	Quarterly reports, for program results. . Program evaluation recently completed.
NY	LIPA	MS Access front end with Server based backend	Trade allies, Newspaper Ad, Homeowner Seminars	Not required. NABCEP preferable.	Forms are reviewed and adjusted periodically. Incentives are adjusted downward after reaching "block" goal.	Evaluations performed every 2 years.
MA	Green Buildings and	Integrated project management	Website, demonstration projects, education and public awareness	Not required. Contractor license is	Combination of in-house staff and subject area	Expected in January 2005



State	Program Name / Agency	Tracking Systems	Marketing	Certification	Program Design	Evaluation
	Infrastructure (MTC)	system, all program areas can update (linked) integrated to track activity and budget.	initiatives.	enough. Investigating whether the University of Massachusetts could develop certification program.	experts.	
TX	Solar Rebate Program	Information not collected.	Austin media covered program launch extensively. 2/3 committed 2 months after launch. Website, newsletters, bill inserts.	By 2006 installer must be NABCEP certified	Collaborative process among stakeholders. Fine-tuning is expected after a few months of operations.	No evaluation yet.
OR	Solar Electric and Solar Water Heater (Energy Trust of Oregon)	Started with Excel database, migrated to a SQL based database, looking into on-line applications.	Proactive marketing, seminars, presentations, press releases, bill inserts, direct marketing	Not required. Considering adopting training (NABCEP). Uses BrightWay Standards	Formal review (after 6 months) – consolidate forms to reduce amount of paper work	Progress reports. Changes based on results (i.e. incentives adjusted down). Formal evaluation in progress.
WI	Focus on Energy (Dept. of Admin.)	Access for projects, Excel for budgets.	Radio, TV, trade allies.	Not required. However, Class 4-A professional licensing is required.	Redesigned to adjust incentive levels, clarify forms and streamline procedures.	Evaluation in 2003.
IL	Illinois Dept of	Excel based tracking. PM	Solar associations, fairs, seminars,	Not required	Radical changes in	No evaluations.

State	Program Name / Agency	Tracking Systems	Marketing	Certification	Program Design	Evaluation
	Commerce – Renewable Energy	does project reporting.	newspapers, press releases.		2003: Before 03 – applications any time. After 03 – applications once a year (open period)	
IL	Illinois Clean Energy Community Foundation	GIFTS - MicroEdge	Direct mailing, RE projects, installers	Not required	Major changes expected in 2005	No evaluations.
IL	ComEd Solar Partnership	System performance tracked by RWE Schott Metering Stations and Software	Cooperatively marketed with ICECF and Spire Solar	Not required	Annual review of application process to simplify based on lessons learned.	Quarterly reports to commerce commission. Annual report. No evaluations.
PA	The Energy Cooperative		None	Not required	Energy cooperative staff	No evaluations
PA	PENELEC Sustainable Energy Fund	Simple tracking	Initially some marketing to spur interest.	Not required	Stakeholders and in-house staff	No evaluations
PA	Sustainable Energy Fund of	Tracking starts with initial inquiry. Track	Through website and economic development organizations	Not required.	Annual reviews.	No evaluations

State	Program Name / Agency	Tracking Systems	Marketing	Certification	Program Design	Evaluation
	Central Eastern Pennsylvania	pipeline of possible projects.				
CT	New Energy Technology Program	Simple tracking	No Active Marketing	Not required	Doubled grant value after first few years	No evaluations
DE	Green Energy Program	Proprietary Green Plains Energy Online Database	Bill inserts, trade shows, word of mouth	N/A	State agencies, public advocacy groups, economic development concerns	No evaluations
VT	Solar and Wind Incentive Program	Access database	75% of promotion done by installers, word of mouth, press releases	Considering adopting training (NABCEP)	Mostly in-house staff, installers	No evaluations

## 2 Introduction

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The objective of this report is to provide an overview renewable energy programs in selected states. Our data collection methodology for assembling the information presented in this report included telephone interviews, conference attendance, literature review, web searches, and legislative review with program staff.

This report focuses on programs that provide incentives for solar, wind, fuel cell and biomass renewable energy sources that can be used to produce electricity and thermal energy. Information on other programs supporting renewable energy, such as geothermal and small hydroelectric have been included where particularly relevant.

The authors researched renewable energy programs in California, New York, Massachusetts, Texas, New Mexico, Oregon, Wisconsin, Illinois, Pennsylvania, Connecticut, Delaware, Vermont and Washington. This research included an assessment of available renewable energy resources in each state, regulations pertaining net metering and interconnection, renewable energy portfolio standards, renewable energy certificate trading, programs already in place and other important activities that could state renewable energy development.

A key component to any effort to evaluate programs is to ensure program design and operational characteristics are consistent with program goals, are designed to succeed in the regulatory and economic environment in which they operate, and take into account factors such as:

- ◆ Funding,
- ◆ Staffing,
- ◆ Incentives,
- ◆ Timeliness of processing,
- ◆ Marketing and program promotion, and
- ◆ Evaluation.

### **Funding**

Funding is one of the most critical factors in program design; in fact, few program managers will ever say that they have sufficient funding. Unfortunately, funding is rarely responsive to the market and is the product of state government appropriations, settlements with utilities and other energy industry entities, or system benefit charges (SBC). Funding is essentially finite and may be constricted further by state government policy decisions and fixed percentages that can be used for marketing, staffing, and other program administration.

### **Staffing**

Staffing is a product of program funding and program activity. In many instances, program funding over rides program activity. In some cases, during program peaks, temporary staff may be hired to ensure that the level of customer service provided is adequate.

### **Incentives**

Incentive levels are one of the most significant factors that contribute to program success or failure. A generous incentive will likely draw a large number of program participants but may quickly deplete program funds, possibly resulting in less installations at a higher overall cost to the program, and leave many potential participants not served. Also, large amounts of quickly depleted incentives may have a negative affect on renewable energy dealer and installer networks by attracting many “fly by night” and rapid growth companies but does not establish sufficient market strength to maintain the network. On the other hand, a program with low incentives may not attract enough participants to meet program goals. An under funded program may never fully attain momentum to entice enough participants.

Experienced program administrators constantly review incentives levels against program activities and budgets, conduct cost-benefit analyses to gauge performance, and evaluate performance against goals. As a result, incentives are adjusted up or down. In recent years, the trend has been to provide incentives that are adjusted periodically in a downward scale.

### **Timeliness of Processing**

The timeliness of incentive payments is critical to keeping customers and dealers interested in the program, as well as to develop a stable installer and dealer network. Payments that are late or delayed can cost system owners or installers finance charges that cut into profits thereby reducing the effectiveness of the incentive. Inquires and complaints from unhappy customers and installers can further clog administrative pathways.

### **Marketing and Program Promotion**

Marketing and program promotion is critical to program success. The larger the program and the lower the incentive, the more promotion and marketing are needed to attract applicants. For example, a rebate program in the state of Delaware was originally funded with no provision for marketing (or administration), low response from the community and little interest from installers convinced the Delaware legislature to provide a small marketing budget. The majority of the programs we reviewed use trade ally networks to promote the program. This is an innovative and efficient way of increasing marketing activities in programs with smaller or limited budgets.

### **Evaluation**

Evaluation is an important function of program design. Programs that are not evaluated (at least informally) may not have the benefit of unbiased review from experts not fixed on a particular approach or program function. A key function of evaluation is the quantification of program aspects in terms of performance metrics.

### **Factors External to the Program**

State renewable energy initiatives are affected greatly by forces internal and external to a program. External forces affecting a program include the following:

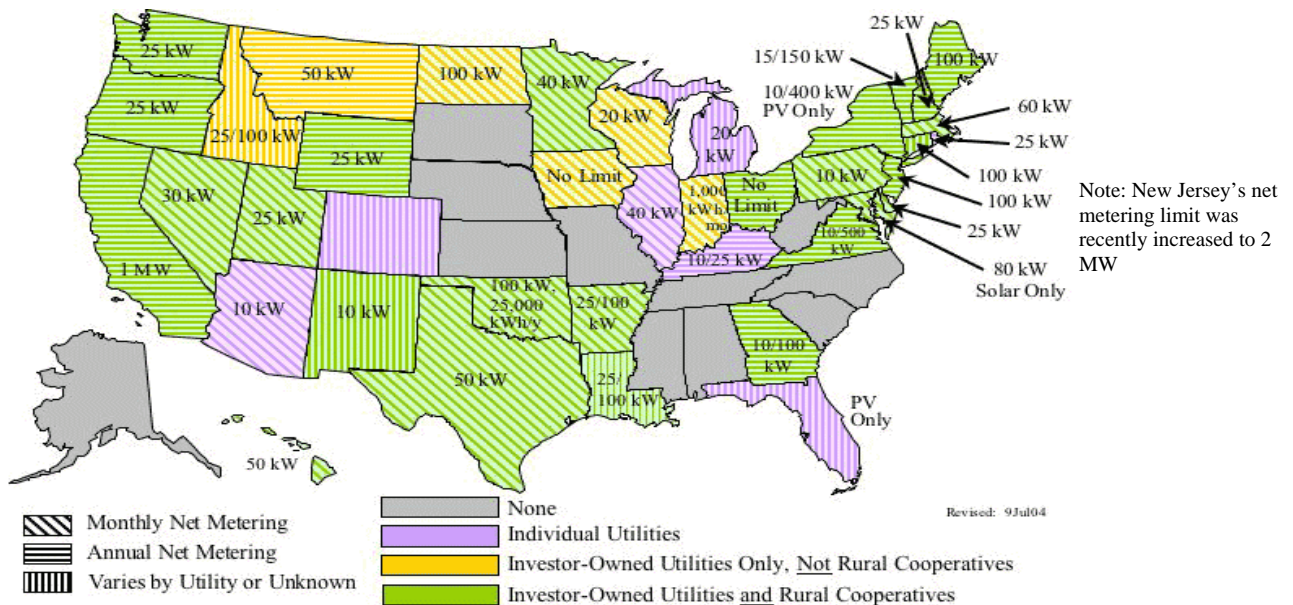
- ◆ Grid Interconnection and Net Metering,
- ◆ Renewable Energy Markets: Green Power, Renewable Energy Certificates,
- ◆ Taxes, and
- ◆ Renewable Energy Resource Availability

### Grid Interconnection and Net Metering

Many, if not most, renewable energy programs desire an electrical output to the utility grid. However, this is a major barrier for onsite generators to overcome, as project expenses are compounded by extensive feasibility studies, and delayed by negotiations with the utility to meet the requirements of the Public Utility Regulatory Policies Act of 1978 (16 U.S.C. 824a-3) (PURPA). However, some states and a few utilities have instituted simplified standards, usually in concert with net metering, to ensure that potential onsite generators can obtain access to the grid. Some of these standards are very simple, particularly for generators less than 40 kW and increase in complexity as installed capacity increases.

Many states have also mandated net metering, ensuring that installers of onsite systems get a fair return on their investment “netting” out the generated electricity from their actual consumption at retail rates. Excess above “net zero” varies from state to state. In some states payments are made at the retail price while others payments are made at the avoided cost or electricity defaults (at no cost) to the utility. The map below provides a quick snap shot of net metering activities throughout the United States.

**Exhibit 2.1-1 Net Metering in the United States**



Source: U.S. Department of Energy Efficiency and Renewable Energy Green Power Network

To date over 39 states have implemented a net metering regulation but the scope of these regulations varies greatly. Some include only investor owned utilities (IOU), but have exempted cooperatives, while in others states net metering is applicable to both. Municipal utilities are rarely covered in the scope of net metering regulations. The amount of energy that can be net metered also varies greatly with most participating states allowing between 10 kW and 60 kW of renewable energy capacity. Net metering is also often technology specific; it is common for net metering to apply to solar or small wind systems only.

Both interconnection and the specifics of net metering can affect the design of renewable energy programs. A low net metering limit may force a program to offer a large number of small installations, such as residential PV, while a high limit will help entice commercial and industrial customers to participate. Likewise, lack of regulations specifying interconnection standards, or interconnection standards that allow the utilities considerable latitude can hinder program's aiming for large numbers of installations. More stringent interconnection and net metering requirements can predispose a program to be designed for large grants and loans funding the development of large installations and wholesale independent power producers (IPPs).

### **Renewable Energy Markets: Green Power, Renewable Energy Certificates**

In a market based economy, where every product needs a consumer, green power markets are one of the most critical factors for the success of renewable energy. There are three primary ways from which demand for green power can emerge.

- ◆ Voluntary public demand for green power,
- ◆ Renewable Portfolio Standards, or
- ◆ Market incentives.
- ◆ State and local government mandates

As environmental awareness grows among the public the demand for green power has increased, especially in deregulated states, with many people willing to pay a premium for power (at least partially) generated from renewable sources. Green power has been adopted extensively by the residential and municipal/governmental operators where offered as a means of demonstrating environmental commitment. Unfortunately, commercial and industrial customers have been less apt to adopt green power due to the effect that even a small increase in operating cost can have on profits. The U.S. Environmental Protection Agency's (EPA) Green Power Partnership attempts to stimulate demand from major energy consumers from the commercial and industrial sectors. In addition, a variety of non-government organizations such as the Coalition for Environmentally Responsible Economies, encourage the same commercial and industrial entities to undertake voluntary actions to participate in green power programs. Though important, voluntary demand side efforts are not likely to increase the amount of green power generated in the United States more than a few percentage points.

Regulatory forcing of green power supply almost always includes a Renewable Portfolio Standard (RPS). Although the United States does not have a national RPS, 17 states have

developed statewide RPSs and a handful of others have initiated efforts to develop one. Unfortunately, though these RPS's provide a requirement that utilities provide a percentage of their power from renewable sources they are less than consistent. Many states have different definitions as to what constitutes a renewable, though most agree that the definition includes solar and wind power there is more disagreement over power generated from biomass energy, hydro, and waste. Also RPSs usually only address electricity, neglecting other significant energy uses including natural gas and transportation fuels. These challenges aside, RPSs are one of the most effective ways of encouraging a Green Power market that leads to the installation of renewable energy technologies.

Renewable Energy Certificates (REC) (also often called green tags, tradable renewable certificates, and renewable energy credits) have been developed to support RPS and Green Power markets. These RECs represent a quantity of renewable energy, and can be traded between utilities, IPPs, and onsite generators, leading to the development of a market, and perhaps more importantly, a commodity price for a unit of green power.

In addition, to those RECs developed as part of state RPS's, a number of national green power traders are active in most states. One of the most notable of these REC traders is Mainstay Energy. Mainstay offers incentives for production from IPPs, to purchase the renewable attributes of their systems and brings these certificates to market as part of Certified Green-e energy.

Production and market incentives, offered to increase the value of a unit of renewable energy production (e.g. kWh) also help stimulate renewable energy technologies by decreasing the payback of onsite installed systems, and increasing the profit potential (while reducing risk) for independent power producers and utilities.

Carbon and emissions trading have the potential to significantly impact green power trading by increasing costs for fossil based power generation, and providing opportunities for investment into offsets such as renewable energy.

### **Taxes**

Benjamin Franklin once said "But in this world nothing can be said to be certain, except death and taxes", this credo can be easily applied to renewable energy development. Taxes, particularly for programs targeting commercial and industrial interests, can hinder the deployment of renewable energy. With respect to renewable energy, taxes can be divided into property, sales, income, property, and excise taxes.

Depending on the location, a renewable energy system may increase the assessed value of a residential, commercial, or industrial property, thus increasing the property tax burden of the



system owner. Over 20 states have mandated exemptions on property taxes, and another five provide a local option to mitigate this barrier.<sup>2</sup>

Sales taxes are relevant to renewable energy when it is levied against the purchase of systems and components. Sales taxes can add significantly to the cost of a renewable energy system. To help alleviate this additional deterrent to renewable energy development, 15 states have provided sales tax exemptions for renewable energy equipment.<sup>3</sup>

Corporate tax credits, which are offered by only 16 states, help encourage renewable energy installations by offsetting some of the corporate tax burden. In addition, the Federal government offers accelerated depreciation on renewable equipment.

Even small interruptions in corporate tax credits can cause considerable downturns in renewable energy development. An example is the 2003 expiration of the wind energy production tax credit. The extension of the credit was mired in attempts by congress to develop a broad national energy policy. The PTC provided a \$0.18 kWh incentive for the first ten years of wind farm operation. Industry association estimates claim that uncertainty about the renewable of the wind energy PTC has prevented the installation of up to 2,000 MW of new wind capacity in 2004. Fortunately, on September 24<sup>th</sup> both houses of congress approved an extension of the credit through 2005 (which the president is expected to sign as part of a broader tax relief extension) with actions proceeding to continue the credit through 2006 and many developers are already reactivating projects that were pending.

Excise taxes, that are levied on the price of a particular good such as transportation fuels, can increase the cost of using these fuels dramatically and prevent installers from considering clean fuel alternatives. Various state and federal activities have helped mitigate these taxes, particularly for biomass-based fuels such as E85 and biodiesel where exemptions have been approved that reduce or completely eliminate excise taxation on these goods.

### **Renewable Energy Trends**

Renewable energy is broadly defined as energy that is of a nearly inexhaustible supply. True renewable energy resources (often called Class I or Tier I) include energy derived from the sun, wind, oceans, plant growth, or the heat of the earth's crust. However the definition of renewable energy has been extended to include energy sources derived from the waste of human activities such as municipal solid waste, waste from coal mines, fossil fuels that are converted to energy by high efficiency technologies (e.g. fuel cells) and landfill methane. Sometimes these resources are grouped into the broader definition of "clean energy". Renewable and clean energy technologies harvest these resources to produce useful power in the form of electricity, heat, or mechanical power (e.g. shaft power).

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<sup>2</sup> [http://www.dsireusa.org/library/docs/PropertyTax\\_Map.doc](http://www.dsireusa.org/library/docs/PropertyTax_Map.doc)

<sup>3</sup> [http://www.dsireusa.org/library/docs/SalesTax\\_Map.doc](http://www.dsireusa.org/library/docs/SalesTax_Map.doc)

According to the July 2004 report *Renewable Energy Trends for 2003* published by DOE's Energy Information Association (EIA), renewable energy use increased 3 percent in 2003. This increase was due in large part to hydropower, followed by biomass. Solar and wind renewable energy saw just a modest increase. The nation's energy supply for 2003 was comprised of 40 percent from petroleum, 23 percent from natural gas, 23 percent from coal, 8 percent from nuclear power and 6 percent from renewable energy.

Biomass accounted for 47 percent of the renewable energy produced in 2003, followed closely by 45 percent produced from hydroelectric power. Geothermal accounted for 5 percent, while wind and solar accounted for 2 and 1 percent respectively. According to the EIA, biomass energy consumption is primarily used for useful thermal output. Only 28 percent of the energy generated from biomass is converted into electricity. Given the new development of wind farms, off-shore and on-shore, and the increase in PV installations, EIS reports that renewable energy use will continue to increase in the United States.

One of the most common renewable energy technologies promoted nationally is photovoltaic (PV) solar. PV cells produce no emissions in operation, and with a high quality inverter are relatively simple to integrate into the utility grid. Most of the country has sufficient solar insolation to make this technology effective. However, PV has relatively low conversion efficiency, capturing only a small fraction of the solar energy falling on the panel. In addition, losses in the inverter and other reduces the efficiency of the typical crystalline silicon system to around 12 percent. With the average daily solar insolation across much of the country being between 3 and 6 kWh/m<sup>2</sup>, the electrical generation per of an array may be only about 0.4 kWh/day/m<sup>2</sup>. Conversely, PV offers many advantages providing electricity when it is typically needed most, helping to stabilize the grid by adding peak capacity during summer peaks when air conditioners systems are operating. This characteristic also benefits customers, particularly commercial and industrial ones, in states where net metering is not available by offsetting energy use during the highest utility rates of the day. PV also can be integrated into building design and sited on roofs with little competition for valuable space. Small PV systems can also be replicated and installed "en mass" across entire communities with nearly the same design, creating a potential economy of scale. However, though PV system costs have come down, current bottleneck in critical raw materials and manufacturing shortages combined with increasing demand from several state programs keeps the price of PV elevated.

Wind power, one of the most proven and lowest cost per unit of capacity renewable resources is gaining rapid momentum worldwide with total installed capacity approaching 40,000 MW. Combined with offshore wind development and improvements in turbine design and reliability, some projections predict wind will provide 20% of the world's electricity in the next few decades. In the United States, wind installed capacity reached 6,374 MW. In 2003 alone, 1,687 MW of wind capacity was installed.

Biomass is projected to be the only renewable resource that alone can provide most of the nation's energy needs (including transportation fuels). Biomass energy installations range from

low (e.g. stokers and co-firing with coal) to high cost (anaerobic digesters, and gasifiers). Biomass is abundant and widespread; logging and forest thinning operations yield copious amounts of woody residue; mills and woodworking operations provide waste bark, and sawdust; staple grain crops such as wheat yields chaff and straw, corn yields stock and stubble; specific agricultural crops can provide raw fuel (e.g. switchgrass) or the basis for liquid biofuels (e.g. corn and soybeans); dairy operations, feedlots, and chicken coups provide carbon and nitrogen rich wastes that can be converted into methane by digesters. Even municipal waste can yield useful quantities of energy by combustion or land fill methane. Biomass projects are applauded for providing valuable carbon neutral energy while establishing markets for new agricultural commodities. However, many biomass resources are already highly utilized for other uses, or conserved onsite to meet specific objectives. For example, agricultural residues are very often left in the field to prevent erosion and enrich soils or alternatively harvested and used as animal feed (e.g. silage for dairy operations). Sawdust and planing mill waste is sold for animal bedding, planing mill waste for example is very lucrative as a packaged pet bedding, and landscaping material. Alternatively sawmills, planing mills, paper mills, and secondary wood processing firms, often convert much of their waste to energy directly onsite. Conversely, with increasing emphasis on watershed management many potential animal manures and wastes that were formerly sprayed liberally on fields as fertilizer are now a disposal problem. Meanwhile federal efforts to limit methane emissions, a potent climate change agent, provide an additional push towards renewable energy technologies such as anaerobic digesters that convert waste to fuel in a controlled environment yielding heat, electricity, and even animal bedding from the lignin residue. Unfortunately, though technologically proven, digester technology is considered emerging and too expensive for most agricultural entities to invest in.

Low-grade geothermal resources are utilized by ground source heat pumps and included in some renewable energy and energy efficiency programs. Geothermal electric generation is often included in the scope of many programs, but due to the low level of incentives and extreme localization and high cost of a geothermal electric facilities these type of funding mechanisms are only practical for isolated projects. Likewise, many states incentive programs still include hydroelectric, but the development of more large-scale projects is unlikely due to conflicts with waterway fishers and other objectives.

### **Collaboration with Other Sources of Funding and Expertise**

Another avenue that can help a program succeed or fail is the ability to tap other financial and technical resources to leverage or offset the cost of a renewable energy project. Collaboration between states with private sector groups, industry financial vehicles, and federal agencies can encourage projects by leveraging larger pools of financial resources, harnessing technical resources, and reducing the cost of installations through aggregations.

## 3 State by State Analysis of Renewable Energy Programs

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This section of the report provides a summary of the following selected states: California, New York, Massachusetts, Wisconsin, Pennsylvania, Delaware, Illinois, Connecticut, Vermont, Arizona, Texas, New Mexico, Colorado, Oregon, and Washington.

For each state, we provide an overview of the following:

- ◆ Resource availability,
- ◆ Regulations pertaining to net metering,
- ◆ Regulations pertaining to standardized grid interconnections,
- ◆ State tax incentives,
- ◆ Renewable energy portfolio standards, and
- ◆ Renewable energy programs
- ◆ Other relevant of unique renewable energy activities

### 3.1 California

California has been a leader in renewable energy development for three decades. Much of the existing capacity for generating energy from renewable resources, including large wind, geothermal, and concentrated solar power, was developed under the PURPA. Retail deregulation in the mid-1990s heightened interest in renewable energy as public-benefits funding became available and as incentives helped to make “Green Power” the leading product-category in the direct-access market. Subsequently, the West Coast energy crisis in 2000 to 2001 emphasized the need for electrical capacity and portfolio diversity. In addition, California’s environmental awareness and its concern for natural gas price volatility further ensured that development of renewable energy would remain a state priority. Renewable energy already accounts for 11 percent of California’s energy production and an accelerated 20 percent Renewable Portfolio Standard (RPS) goal by 2010. In its comprehensive assessment of state renewable energy programs,<sup>4</sup> the Union of Concerned Scientists gave only California and Nevada its highest grade—and this assessment predated the state’s accelerated RPS policy.

Early in his administration, California’s current governor, Arnold Schwarzenegger, pledged to heighten the state’s renewable energy profile. Among his priorities are the following:

- ◆ Requiring performance metrics,
- ◆ Introducing new strategies to achieve a 50 percent market penetration for solar PV on new homes,

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<sup>4</sup> *Plugging in Renewable Energy: Grading the States*, May 2003 from Union of Concerned Scientists, [www.ucsusa.org](http://www.ucsusa.org).

- ◆ Implementing transmission expansions needed to increase reliability and to facilitate renewable energy development,
- ◆ Initiating a Green Building Bank, which would facilitate both energy efficiency and distributed renewable energy, and
- ◆ Increasing the RPS standard (which has already been accelerated) again, to achieve 30 percent renewable energy utilization by 2020.

In partnership with New Mexico Governor Bill Richardson and others in the Western Governors' Association (WGA), Governor Schwarzenegger has led the call for renewable energy development throughout the West. In June, the WGA released a plan to achieve 30,000 MW of new clean energy in the West and to aggressively pursue energy efficiency efforts.<sup>5</sup> Driven largely by the governors' interests, the WGA also plans to complete the Western Renewable Energy Generation Information System (WREGIS) in 2005. This system will facilitate renewable energy data tracking and, potentially, renewable energy trading.

The California Climate Registry ([www.climateregistry.org](http://www.climateregistry.org)), a non-profit carbon-trading program enabled by state law, will also promote regional clean energy development.

The California Energy Commission's (CEC) *Renewable Resources Development Report*, November 2003, offers a thorough assessment of the state's renewable energy resources.<sup>6</sup> It was developed pursuant to RPS (SB 1078, 2002) and to legislation (SB 1038, 2002) that funded Supplemental Energy Payments for above-market renewable energy purchases. The report concludes that California could increase in-state renewable energy production *ten-fold*. It assesses wind, geothermal, biomass, concentrating solar power, solar PV, ocean energy, and small hydroelectric resources.

Current renewable energy generation in California is about 30,000 GWh, or 11 percent of the state's electricity. Already-planned renewable energy projects could account for another 26,000 GWh per year. This strong short-term outlook lends credibility to California's accelerated (20 percent by 2010) RPS goal.

The *Renewable Resources Development Report* estimated gross technical potential for renewable energy in California at 262,000 GWh per year—96 percent of total in-state electricity generation today. It based this estimate on studies by the California Public Interest Energy Research (PIER) program, using in-house research, data from the *Renewable Energy Atlas of the West* ([www.energyatlas.org](http://www.energyatlas.org)), and data from Regional Economic Research (now Itron, Inc.)<sup>7</sup>

Practical issues, such as transmission access and cost considerations, are reflected in the CEC Report. This report used a variety of sources to ascertain the current cost of renewable energy

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<sup>5</sup> Summarized on the Western Governors Association Website, [www.westgov.org/wieb/wregis](http://www.westgov.org/wieb/wregis)

<sup>6</sup> *Renewable Resources Development Report*, CEC 500-03-080F, November 2003.

<sup>7</sup> See *PIER Preliminary Renewable Resource Assessment*, CEC 500-03-080F, July 2003.

generation, as well as cost trends over time. A levelized cost-of-energy model prepared by Navigant Consulting, a subcontractor to XENERGY, Inc., indicated that a number of renewable-energy technologies would be competitive in California by 2005, even without the federal production tax credit.<sup>8</sup> Technologies listed as most competitive include wind, landfill gas, anaerobic digesters (livestock waste), biomass combustion, and geothermal energy. In addition, the CEC considered indirect costs, not included the levelized-cost model. A final PIER report on renewable-energy integration costs is expected in 2004.

The profile of renewable resources targeted for development in California will be set by a balanced-energy policy informally called “least-cost-best-fit.” This policy was formalized by the California Public Utilities Commission (CPUC) Decision 03-06-071, establishing the criteria for procuring renewables under the state RPS. Pursuant to the decision, IOUs must prepare annual RPS procurement plans.

In January 2004, the CPUC adopted a diversified-portfolio approach to investor-owned utility planning (Decision 04-01-050), which is compatible with RPS procurement rules.

Another consideration for California renewable energy planners is the re-establishment or retirement of aging renewable energy systems. The *Renewable Resources Development Report* (CEC 500-03-080F, November 2003) notes that much of California’s wind generation capacity was installed prior to 1990, and much of its geothermal capacity was installed in the 1970s or early 1980s.<sup>9</sup> An assessment of whether these systems will remain online in the next decade is a significant part of state renewable energy planning.

California’s striking commitment to developing solar energy is best understood in light of best-fit objectives and long-term price forecasts. The PV market in the United States is growing 15 to 20 percent annually, largely due to incentivized market activity in California and other states such as New York and New Jersey. This growth supports cost reductions and technology improvements. The CEC staff predicts that, based on current market development and technology trends, solar PV will be nearly cost competitive in California, without financial incentives, by 2017.<sup>10</sup> In addition to solar PV, California also expects to employ concentrating solar power (CSP) systems. California currently has the largest operating CSP system in the world. New CSP systems are expected to average 100 MW each and to include thermal energy storage using molten salts.

#### NET METERING

California introduced net metering in 1995 for solar and wind power. Net metering applies to systems of 1 MW or less owned by residential and small commercial customers and served by either investor-owned or publicly owned utilities. Original legislation has been amended repeatedly, most recently in 2002 (AB 58). Among other changes, AB 58 provides for a pilot

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<sup>8</sup> CEC Renewable Energy Program Contract No. 500-01-036.

<sup>9</sup> *Renewable Resources Development Report*, CEC 500-03-080F, November 2003.

<sup>10</sup> *Ibid.* p. 25.

project to assess net metering for agricultural biogas projects.<sup>11</sup> Net metering regulations are included in the California Public Utility Code, Section 2827.<sup>12</sup>

Net metering in California is subject to annual accounting of Net Excess Generation. On the anniversary of the agreement, the customer is billed for the net electricity used in the previous 12 months. Customers may request monthly billing, based on estimated annual net energy used, subject to periodic adjustment. This is beneficial compared to state net metering policies that use monthly accounting. Customers may, in effect, “bank” excess power generated for up to 12 months. Energy is valued at retail rates if it is drawn from this “bank” during the accounting year. Energy not used during this time may or may not be compensated for, depending on utility policies.

Utilities may not charge customers extra fees or higher rates because they are net metered, but if a customer elects to use time-of-use rates, they may be charged for the meter.

AB 58 also set a limit for net-metered capacity: 0.5 percent of peak capacity for each investor-owned utility, which corresponds to about 270 MW total statewide. Upon reaching that maximum, a utility will not be required to provide net metering. This is significant because SDG&E will soon reach that level of market penetration for net metering.

Net metering assurances act as a low-cost incentive for solar development. The CEC is considering alternatives to address this problem. AB 58 calls for a CEC study by January 2005 to assess net metering costs and benefits. A current CPUC Rulemaking, 04-03-017, examines a variety of distributed generation issues, including net metering. Among other things, it calls for a cost-benefit analysis of net metering, which can inform policymaking.

#### GRID INTERCONNECTION

In 1999, California first adopted a standard practice for interconnection of customers’ distributed energy generators, including renewable energy systems. The California PUC issued an order calling for a Distributed Energy Resource rulemaking (PCU 99-10-025). The result was a collaborative process involving the CEC and utilities. The product of this process, known as Rule 21, was approved by the PUC in December, 2000 (Decision 00-12-037). It was subsequently adopted by the CEC, and the collaborative process to assess and refine Rule 21 has continued to date. The CEC released the draft *California Interconnection Guidebook* in September 2003.<sup>13</sup> This *Guidebook* is expected to be officially adopted by fall 2004.

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<sup>11</sup> For a summary of all related California net metering legislation, see [www.californiasolarcenter.org/legislation.html](http://www.californiasolarcenter.org/legislation.html).

<sup>12</sup> See the Code, Section 2827, and search for Section 2827 at [www.leginfo.ca.gov/calaw.html](http://www.leginfo.ca.gov/calaw.html)

<sup>13</sup> *California Interconnection Guidebook: A Guide to Interconnecting Customer-owned Electric Generation Equipment to the Electric Utility Distribution System Using California’s Electric Rule 21*, CEC 500-03-083, September 2003.

Web links to PUC documents and to investor-owned utility interconnection programs are available at [www.energy.ca.gov/distgen/interconnection/california\\_requirements.html](http://www.energy.ca.gov/distgen/interconnection/california_requirements.html). Rule 21 interconnection is compatible with the Institute of Electronic and Electrical Engineers (IEEE) 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems.<sup>14</sup>

Rule 21 allows customers with peak demand of less than 20 kW to install systems of 10 kW or less that meet safety standards and qualify for Simplified Interconnection, involving minimal documentation. Systems must comply with the requirements of the National Electrical Code Article 690 and UL 1741. For qualifying small systems, no supplemental documentation or review is required.

Pre-approved equipment is also a factor in speeding application processing for the CEC Emerging Renewables Program. The *Emerging Renewables Program Guidebook* (P500-03-001F2, July, 2004) provides eligibility criteria for PV modules, inverters, small wind systems, fuel cells, and metering equipment.<sup>15</sup> Solar thermal equipment is eligible only after proven operation, and other renewable energy equipment must be reviewed based on eight technology-specific criteria. All equipment must have a minimum five-year warranty, and must be installed by licensed contractors. The CEC recommends but does not require that installers be certified by the North American Board of Certified Energy Practitioners.

If the system (up to 10 MW) does not pass the screening test for Simplified Interconnection, it must undergo a more extensive Supplemental Review Process. Project installers must work closely with utility staff for approval of the design and installation. As part of the Supplemental Review, the utility may request testing and verification in parallel with the grid, followed by a series of commissioning tests. Rule 21 recommends the least extensive testing that is practical. The use of pre-certified equipment, listed on the CEC Website ([www.energy.ca.gov/distgen](http://www.energy.ca.gov/distgen)), can speed the interconnection approval process. If the Supplemental Review Process is not adequate to satisfy interconnection requirements, the utility may require the generator to provide a more complete Interconnection Study.

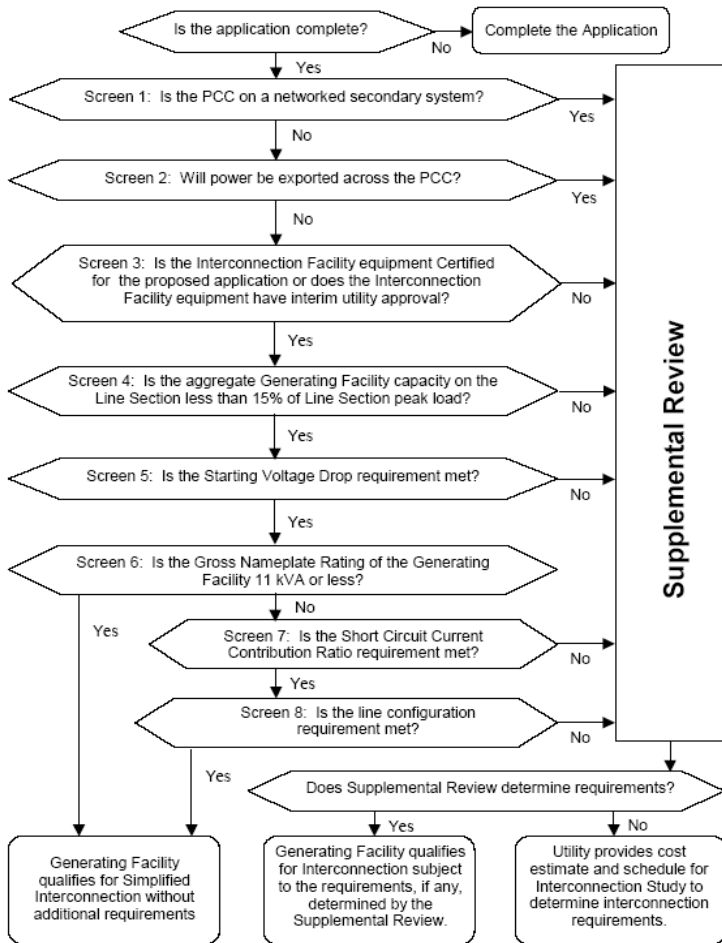
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<sup>14</sup> See [www.standards.ieee.org](http://www.standards.ieee.org)

<sup>15</sup> *Emerging Renewables Program Guidebook*, CEC 500-03-001F2, July 2004



**Exhibit 3.1-1: Rule 21 Initial Review Flowchart**



Source: *California Interconnection Guidebook*, Draft, September 2003 (p.14)

By the first quarter of 2004, California’s IOUs had authorized DG interconnections (renewable and non-renewable) under Rule 21 totaling about 400 MW. Applications for another 160 MW were pending.<sup>16</sup> A current CPUC Rulemaking, 04-03-017, examines a variety of distributed generation issues, including resolving remaining technical issues that pertain to Rule 21.

**STATE TAX INCENTIVES**

Tax incentives provide significant support for renewable energy development in California. They are summarized in Exhibit 2.1-2.

In addition, the CEC provides information on financing options for residential, commercial, and institutional customers. See fact sheets 500-03-031F, 500-03-032F, and 500-03-033F from

<sup>16</sup> See [www.energy.ca.gov/distgen/interconnection/rule21\\_stats.html](http://www.energy.ca.gov/distgen/interconnection/rule21_stats.html)

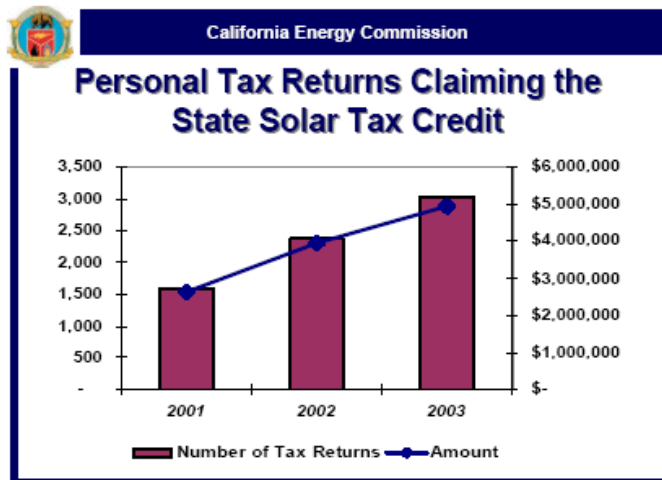
[www.consumerenergycenter.org](http://www.consumerenergycenter.org). Outreach on financing and incentives is part of the public-benefits funded Renewable Energy Program.

**Exhibit 3.1-2: California State Tax Incentives**

	<b>Solar or Wind Energy System Personal or Corporate Tax Credit (2004-06)</b>	<b>Property Tax Exemption (1999-05)</b>	<b>Tax Deduction for Interest on Loans for Energy Efficiency (solar energy) (2001-indefinite)</b>
<b>Eligible technologies and sectors</b>	Solar PV, wind Personal (residential) or Corporate (C/I)	Solar water or space heat, solar thermal process heat, PV, solar mechanical energy All sectors	Solar energy systems
<b>Amount</b>	7.5% of the cost, after deducting other local, state, federal incentives	Systems are not subject to property taxes	All interest paid on loan specifically for solar systems
<b>Terms and limitations</b>	7-yr carry-forward 5-yr warranty required, certified equipment as listed	Does not include swimming pool and hot tub heaters	Interest from home equity or home improvement loans qualified for customers for publicly owned utilities that do not offer other financing
<b>Legislation, references</b>	SB17x2 (2001) <a href="http://www.ftb.ca.gov">www.ftb.ca.gov</a>	CA Revenue and Taxation Code, section 73 <a href="http://www.boe.ca.gov">www.boe.ca.gov</a>	CA Revenue and Taxation Code 17208.1 <a href="http://www.ftb.ca.gov">www.ftb.ca.gov</a>
<b>Comments</b>	Incentive reduced by half from 2001-03. Utilizes a simplified "self-certification" form		No deduction allowed if a credit is taken for the purchase

The CEC considers the personal tax credit to be an important component of its solar development strategy. Use of the tax credit has steadily increased (see Exhibit 2.1-3), as has the total revenue loss to the state income tax fund.

### Exhibit 3.1-3: Personal Tax Returns Claiming the State Solar Tax Credit



Source: Presentation by Tim Tutt, CEC Renewable Energy Program, June 8, 2004 to the Joint Committees Workshop before the California Energy Resources Conservation and Development Commission.

#### RENEWABLE PORTFOLIO STANDARD

In 2002, SB 1078 established the RPS, which requires IOUs to increase their sales of renewable-generated electricity by 1 percent per year, to achieve a goal of 20 percent by 2017. Publicly owned utilities are expected to set goals that are compatible with the RPS and to voluntarily participate. New legislation, expected in 2005, is likely to mandate acceleration of the RPS, targeting the 20 percent goal by 2010. This would codify a policy that was jointly adopted in late 2003 by the CEC, the Consumer Power and Financing Authority, and the CPUC. The policy is detailed in the CEC's November 2003 *Renewable Resources Development Report* (CEC 500-03-080F).

Implementation of the RPS has begun, including current renewables procurement solicitations from PG&E and San Diego Gas & Electric. Notably, Southern California Edison reports that it will reach a 20 percent renewables target in 2004, and thus is not procuring renewables through the RPS process in this cycle.

The process for RPS implementation includes the following steps:

- ◆ CPUC sets targets for each IOU's renewable resource procurement, based on retail sales.
- ◆ The utility submits a procurement plan to the CPUC for approval.
- ◆ After approval, and assuming utility creditworthiness, the utility issues a solicitation to procure renewable-generated electricity in keeping with the plan. Generally, contracts must be for a term of at least 10 years.
- ◆ The utility ranks bids according to "least-cost, best-fit" guidelines.

Based on the plans previously submitted, the CPUC will have set a confidential market price referent for each energy type. This is the price that the IOU would pay to meet its specific needs if it were not purchasing electricity generated from renewable energy. After solicitation bids are reviewed, the CPUC will compare the renewable contract cost with a price referent.

The Supplemental Energy Payments (SEPs) covers any approved contract costs above these referents. The New Renewable Facilities Program, which receives public benefits money, funds these payments. If SEP funding is not adequate to cover the above-market costs, utilities are permitted to limit their procurement to those renewable resources that can be adequately incentivized.

Details of RPS implementation are included in the *Renewables Portfolio Standard Eligibility Guidebook*<sup>17</sup>. Out-of-state renewable generators that meet RPS requirements may qualify for sales to California utilities. In addition to meeting general RPS requirements, a qualifying out-of-state generator must meet one of the following conditions:

- ◆ It must be located near the border of the state with the first point of interconnection to the Western Electricity Coordinating Council (WECC) transmission system located in California, or
- ◆ It is or will be connected to the WECC system, and is developed with guaranteed contracts to sell its generation to end-use customers located in California service territories while it receives SEPs.

Implementation issues that are still active include the following:

- ◆ Allocating and awarding SEPs;
- ◆ Developing a process to certify in-state resources; and
- ◆ Developing an RPS tracking and verification system, the WREGIS.

The CEC and CPUC are collaborating on RPS program design and implementation. Relevant CPUC proceedings include Rulemaking 04-04-026 and 03-IEPR-01, the updated Integrated Energy Policy Report. The RPS proceeding, 03-RPS-1078 is also relevant. Relevant CEC publications include the following:

- ◆ *The Renewable Resources Development Report*, CEC 500-03-080F, November, 2003;
- ◆ *The Renewable Energy Program Overall Program Guidebook*, CEC 500-04-026, May, 2004;
- ◆ *The Renewables Portfolio Standard Eligibility Guidebook*, CEC 500-04-002FD, May, 2004; and
- ◆ “The Notice of Renewables Committee Proposed Decisions on the New Renewable Resources Account,” posted to [www.ca.energy.gov](http://www.ca.energy.gov), on June 18, 2004.

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<sup>17</sup> Renewables Portfolio Standard Eligibility Guidebook. CEC 500-04-002F, May 2004.

## GREEN TAG/RENEWABLE CERTIFICATE TRADING

RECs represent a way of trading green power attributes among varied market participants and renewable energy generators. By most definitions, one REC represents the green power benefits of one MW of renewable energy generation.

Numerous states are involved in some aspect of developing REC markets. According to a 2003 study for the Clean Energy States Alliance, at least five states provide incentives to companies that sell REC, and five states, including New Jersey, take title to REC based on project funding.<sup>18</sup>

In California, the management of RECs is still largely undecided. It will be part of RPS implementation, pursuant to the creation of the RPS by SB 1078. The *Renewable Portfolio Standards Eligibility Guidebook* (CEC 500-04-002FD) considers REC trading as one of a handful of outstanding issues that the CEC and the CPUC still must resolve:

“A formal definition of a REC is being developed through the CPUC regulatory process, and these guidelines do not attempt to supplant that process. Consistent with CPUC Decision 03-06-071 (June 19, 2003), generation currently must be bundled with the associated RECs to qualify for the RPS. Any action by the Energy Commission and CPUC to allow RPS eligibility for RECs that are traded separately from energy would require further deliberations and public input.”<sup>19</sup>

The *Guidebook* stresses that utilities are considered to procure RECs bundled with electricity when they procure renewable-based electricity. Once a utility gains credit for the renewable energy, the REC cannot be resold. According to a recent CEC white paper, “the REC tracking system envisioned by the Energy Commission to meet SB 1078 requirements is not intended to be a trading system, and information prices will not be recorded”.<sup>20</sup>

However, the tracking system that the Commission will use could feasibly support REC trading as well. As mentioned before, the WGA, the Western Regional Air Partnership, and the CEC are funding the WREGIS as a broadly functional tool.

WREGIS released draft interim operating rules in April, 2004 (see [www.westgov.org/wieb/wregis/documents.htm](http://www.westgov.org/wieb/wregis/documents.htm)), and expects to begin operating in 2005. The system is geared to serve the entire Western Electricity Coordinating Council, a region including 11 states and two Canadian provinces. It will do the following:

- ◆ Verify renewable energy generators and generation within the region;
- ◆ Create RECs with unique serial numbers, allow renewable energy generators, utilities, and other market participants to establish active REC and retired REC accounts;

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<sup>18</sup> *The Experience of State Clean Energy Funds with Tradable Renewable Certificates*, by Fitzgerald, Wisner, and Bollinger, Lawrence Berkeley National Laboratory, 2003

<sup>19</sup> *Renewables Portfolio Standard Eligibility Guidebook*, CEC 500-04-002FD, May 2004, p 2.

<sup>20</sup> *Accelerated Renewable Energy Development* CEC 100-04-003, July 2004. p. 53

- ◆ Verify ownership, trading, and retirement of RECs;
- ◆ Track wholesale transactions involving RECs; and
- ◆ Create independent activity reports.

For additional discussion and a record of public comments on REC tracking and trading issues, see *Accelerated Renewable Energy Development*, 100-04-003, July 2004, a white paper developed in support of the 2004 Integrated Energy Policy Report Update Proceeding (03-IEPR-01).

#### PROGRAMS AND INCENTIVES

California is now at a crossroads. Renewable energy development is vulnerable because of policy decisions that have been keyed to incentives. Incentives programs have stalled several times in recent years because of legislative or administrative delays, including the temporary shutdown of all incentive programs during a budget-crisis review in 2003. Notably, the Renewable Energy Trust Fund has lent more than \$6 million to the state General Fund.

Exhibit 2.1-4 summarizes recent allocations and current and projected spending from the state's Renewable Energy Trust Fund. Note that the *Consumer Credit Program*, which paid incentives to direct-access Green Power customers, was discontinued in April 2003. Forty-five percent of its remaining funds were reallocated to the *Emerging Renewables Program* and 10 percent were reallocated to the *Consumer Education Program* (to support RPS implementation). Rebate levels for the *Emerging Renewables Program* are being reduced to stretch program viability, but it is expected that by the end of 2004 the program will have encumbered funding allocated to it through 2006.

**Exhibit 3.1-4: California Renewable Energy Trust Fund**

	Existing Renewable Facilities	New Renewables	Emerging Renewables	Customer Credit	Consumer Education	Total
<b>Collected Funds (SB 90)</b>	243.000	162.000	69.000 <sup>11</sup>	75.600	5.400	555.000
<b>Collected Funds (SB 1038)</b>	68.000	175.100	59.500	34.000	3.400	340.000
<b>Total Disbursements</b>	-195.604 <sup>13</sup>	-39.233	-154.064	-65.319	-4.823	-459.043
<b>Intra-fund Reallocations<sup>14</sup></b>	-83.00	33.800	99.800 <sup>15</sup>	-44.000	3.400	10.000
<b>Intra-fund Transfers</b>	0.000	0.000	0.000	0.000	0.000	0.000
<b>GeneTransfer</b>	0.000	0.000	-6.308 <sup>16</sup>	0.000	0.000	-6.308
<b>Subtotal</b>	32.396	331.667	67.928	0.281	7.377	439.650
<b>Encumbrances</b>	-7.980 <sup>17</sup>	-156.567 <sup>18</sup>	-67.928 <sup>19</sup>	-0.280	3.400 <sup>20</sup>	-229.356
<b>Committed Funds<sup>21</sup></b>	24.417	175.100 <sup>22</sup>	0.000	0.000	10.777 <sup>23</sup>	210.294
<b>Loan Balance</b>						<b>-155.645</b>
<b>Committed Funds Less Loan Balance</b>						<b>54.648</b>
<b>2<sup>nd</sup> Quarter '04 Disbursements</b>	<b>-2.528<sup>25</sup></b>	<b>-3.326</b>	<b>-23.686</b>	<b>-0.117</b>	<b>-0.675</b>	<b>-29.619</b>

Incentives to wholesale energy generators to implement the RPS may prove insufficient, too. The California Energy Commission (CEC) plans to assess the *New Renewables Facilities Program* for its ability to support expected Supplemental Energy Payments.<sup>21</sup>

*California Renewable Energy Programs Supported by Public Benefits Funding*

In order to fund public benefits programs in energy efficiency and renewable energy, California passed legislation (AB 1890, Chapter 854, 1996) placing a surcharge of approximately 3 percent on electricity sold by IOUs. The bill authorized \$540 million in total funding for renewable-energy market development through 2002. The following year, SB 90 established the Renewable Resource Trust Fund under the administration of the CEC. In 1998, the CEC began to implement the current Renewable Energy Program.

In 2000, the legislature (SB 1184 and SB 1038, 2000) renewed public-benefits funding. Exhibit 2.1-5 summarizes overall public-benefits funding in California, including renewable energy components through 2011. The Renewable Energy Programs are supported by the Trust Fund at an inflation-adjusted level of \$135 million per year through 2011.

<sup>21</sup> Renewable Energy Program Quarterly Report to the Legislature, CEC 500-04-017, April 2004, p. 18.

**Exhibit 3.1-5: Annual Funding Levels for All California Public-Benefits Energy Programs\***

<b>Public-Benefits Program</b>	<b>Annual Funding Level (2002-2011)</b>
Energy Efficiency	\$228 million
Renewable Energy Programs (5)	\$135 million
PIER (energy-efficiency & renewables R&D)	\$62.5 million
<b>Total:</b>	<b>\$448.5 million</b>

\* As of July 2004.

Source: California Solar Energy Industries Association, [www.calseia.org/CECPGC3web.html](http://www.calseia.org/CECPGC3web.html)

The major components of the California Renewable Energy Program include the following:

- ✓ *The Existing Renewable Facilities Program* offers incentives to existing generators based on the difference in cost between conventional and renewable generation.
- ✓ *The Ag-Bio Program* funds generation using agricultural biomass. It is a small program that was added to the Renewable Energy Program pursuant to SB 704 in 2003. It is funded by a reallocation of funds from the Existing Renewable Facilities Program.
- ✓ *The New Renewable Facilities Program* offers incentives for utility-scale renewable generation technologies that are likely to become competitive with conventional technologies after the five-year incentive period.
- ✓ *The Emerging Renewables Program* grants rebates to lower the cost to customers (mostly residential and small commercial) for onsite renewable energy generation.
- ✓ *The Consumer Education Program* aims to increase public awareness of and support for renewable energy.
- ✓ *The Consumer Credit Incentive Program* will be discontinued after closing out 2003 activities.

The California Renewable Energy Program is focused on energy production, but several activities dovetail with energy-efficiency programs and goals.

***Special funding for affordable housing projects***

California AB 58 (2002) established an additional rebate for renewable energy systems installed on affordable housing projects. Applications are fulfilled in a first-come, first-served basis. This rebate is 25 percent above the standard rebate level, not to exceed 75 percent of the system cost, so long as the applicant meets three special criteria:

- ◆ It must meet health and safety code requirements;
- ◆ Each home or unit must be individually metered; and



- ◆ The project must meet an energy efficiency requirement 10 percent above the standards specified in Title 24 of the California Code of Regulations, either through initial construction or through efficiency measures taken;

### ***Special funding for public and charter schools***

The Solar Schools Program was created through the Interagency Agreement No. R500-02-006, amended in February, 2004, between the CEC, the California Power Authority, and the Attorney General's Alternative Energy Retrofit Account (AGAERA) This program provides twice the standard Emerging Renewables Program rebate, up the total system cost for solar PV systems under 30 kW. For example, relative to the standard rebate level of \$3.00/Watt, qualified schools would receive \$6.00/Watt, half provided by the Emerging Renewables Program and half by AGAERA. The program offers an 18-month reservation period to support project planning, and it provides loan financing from the CEC for costs not covered by the rebate. To qualify, a school must meet the following criteria:

- ◆ It must be a public or charter school serving any grade from K through 12,
- ◆ It must establish a curriculum tie-in to educate students about energy conservation and renewable energy, and
- ◆ The building must have installed high-efficiency lighting or equivalent energy improvements.

Schools that do not meet these criteria may apply for the standard Emerging Renewables rebate. Schools are also eligible for loans through the CEC Energy Efficiency Financing Program. Note that as of June 2004, the Solar Schools Program is no longer accepting reservation requests. A previous funding shortfall resulted in a backlog of projects, for which funds are now encumbered.

### ***Energy efficiency financing through the CEC***

A separate energy efficiency financing program within the CEC provides low-interest loans for both energy-efficiency and renewable energy projects in schools, hospitals, local government buildings, special district buildings, and public care institutions. Criteria do not directly tie renewable energy and energy efficiency requirements. They include the following:

- ◆ Maximum loan of \$3 million per application,
- ◆ Projects must have a simple payback of 10 years or less based on energy cost savings,
- ◆ Loans must be repaid within 15 years, and
- ◆ There is a 0.1 percent incentive for early project completion.

For details, see [www.energy.ca.gov/efficiency/financing/index.html](http://www.energy.ca.gov/efficiency/financing/index.html).

### ***PIER Program Research***

The PIER Program was established in 1996 pursuant to passage of AB 1890. Administered by the CEC, it uses \$62.5 million of public-benefits funding per year, primarily for renewable

energy research. According to the CEC, passage of the RPS (SB 1078) in 2002 has recently influenced the direction of PIER research, which focuses on the following:

- ◆ Activities that help build a roadmap for meeting the RPS goal;
- ◆ Demonstrations for near- and medium-term deployment of renewable energy;
- ◆ Research focused on renewable technology areas and leveraged with partner funding, to address unique needs and opportunities in the state;
- ◆ Funding in partnership with individuals, businesses, utilities, and public or private research institutions.

The PIER Program supports the Zero Energy New Home (ZENH) initiative for California. At a staff workshop in July, 2004, the PIER Buildings Program Manager and PIER Renewables Program Manager jointly presented plans for a ZENH Program. The Commission has chosen Navigant Consulting, Inc. to facilitate a participatory process for developing ZENH solar business models, which will result in the release of a program solicitation in September 2004.

Goals for the ZENH include the following:

- ◆ Improve building energy performance by 25 percent over Title 24 efficiency requirements,
- ◆ Reduce net energy home consumption by 70 percent, compared to a model baseline,
- ◆ Reduce peak demand to no more than 1 kW, and
- ◆ Reduce the incremental cost to the homeowner of a ZENH to near zero.

PIER hopes to make an award announcement before 2005. Funding may be approximately \$20 million per project, with at least one selected project involving a 50-plus home subdivision.

Other ZENH activity in the state, assisted by PIER funding, has been centered at Sacramento Municipal Utility District (SMUD), a national leader in solar development. Since 2000, SMUD has worked with eight production home builders, resulting in a total of 124 completed homes in 19 subdivisions, plus 100 homes under construction in summer 2004.<sup>22</sup> SMUD reports good performance, energy and demand savings, and high customer acceptance. It recommends efforts to expand the roof-integrated PV market and to further explore and amplify the benefits of Zero-Energy Homes to utilities.

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<sup>22</sup> Stephen Frantz, SMUD Program Planner in a Presentation to the CEC, July 2004.

### **California New Home Initiative**

A strategy to promote solar PV through new home construction is being driven by both Governor Arnold Schwarzenegger and members of the California legislature. SB 1652, proposed to the legislature in summer 2004, would establish a new standard requiring solar PV systems on 5 percent of new homes per year. The target would increase by 5 percent per year, topping off at 50 percent of new homes. The bill includes \$100 million per year as incentives for builders, supported by a 3 percent surcharge on electric bills.<sup>23</sup> Reportedly, if 15 percent of California new homes included 2 kW PV systems, total growth in PV would increase by about 40 MW. Initial opposition from the building industry has focused on the cost of meeting both a high energy-efficiency standard and a PV standard. In August, SB 1652 failed to advance from committee, and was deemed unlikely to pass in the 2004 session. However, alternative bills are expected in 2005.

The *LA Times* reported in August that the Schwarzenegger administration submitted a draft plan to the CEC for a similar bill, which included incentives for homebuilders and, to a lesser degree, for homebuyers.<sup>24</sup> Like the Senate bill, this proposal would use a utility bill surcharge to raise about \$1 billion over 10 years. The Governor did not officially endorse this draft plan, but it was in keeping with his pledge to include solar on half of all new homes within a decade.

The policies and programs needed to support a solar homes initiative are under consideration by the CEC as part of Integrated Energy Policy Report Update Proceeding (03-IEPR-01), and discussed in the *Accelerated Renewable Energy Development* white paper (CEC 100-04-003, July 2004, pp. 78-80). Interest groups, including Environment California and CalSEIA have been outspoken in favor of this type of strategy, citing a statewide poll that indicated consumer support.

### CEC EMERGING RENEWABLES PROGRAM

The Emerging Renewables Program (ERP) is one of six programs supported by the Renewable Resource Trust Fund, a public-benefits fund administered by the CEC.

The ERP was formerly known as the *Renewable Energy Buydown Program*, but the program was renamed when it was reauthorized in 2003. It provides rebates to lower the cost to customers (mostly residential and small commercial) for onsite renewable energy generation, thereby stimulating demand for such systems and increasing their sales. To date, more than 9,700 systems, representing about 39 MW, have received funding, totaling more than \$154.1 million. An additional \$70 million in incentives for another 4,600 systems, representing about 6 MW, are currently encumbered. In June, 2004, \$86 million remained for payments through 2006. Latest staff reports indicate that \$60 million remained on August 1, 2004 for payments through 2006.<sup>25</sup>

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<sup>23</sup> SolarAccess.com June 25, 2004, also *California lawmakers stall on electricity bill surcharge*, The San Diego Union-Tribune, August 13, 2004.

<sup>24</sup> *State Seeking to Boost Use of Solar Energy* by Miguel Bustillo, LA Times, August 3, 2004

<sup>25</sup> Interview with Colin Leiberger, ERP Call Center staff, July 28, 2004.

The latest program guidelines and objectives are detailed in the *Emerging Renewables Program Guidebook*, CEC P500-03-001F2, July, 2004.

As described above, the ERP is funded by a public-benefits charge to IOU ratepayers. See Exhibit 2.1-6, *Trust Fund Funding and Expenditures as of June 30, 2004*, for a current reporting of funding sources and expenditures.

While the program is authorized through 2011, with funding allocated through 2006, funding is being depleted prematurely. According to Tim Tutt, Technical Director of the CEC Renewable Energy Program, current ERP funding will probably last through 2004.<sup>26</sup> This includes \$86 million that was reallocated to the program in May and June, 2004, from other renewable energy programs and Trust Fund interest. Additional funding should be allocated in 2007, but funding for 2005-06 is less certain. Tutt laid out three scenarios to estimate the need for additional funding (possibly requiring legislative action). Using the current rebate schedule, with the rebate level declining 20 cents every six months, the current level of program participation would cause a shortfall of about \$140 million by the end of 2006. If the rebate level were readjusted to decline twice as quickly as planned, the program would experience a shortfall of about \$20 million by the end of 2006. On the other extreme, if the solar industry continues to expand and interest in solar PV increases at a healthy rate, Tutt suggested that demand for rebates could increase markedly. In this case, the ERP could need \$250 million by the end of 2006.

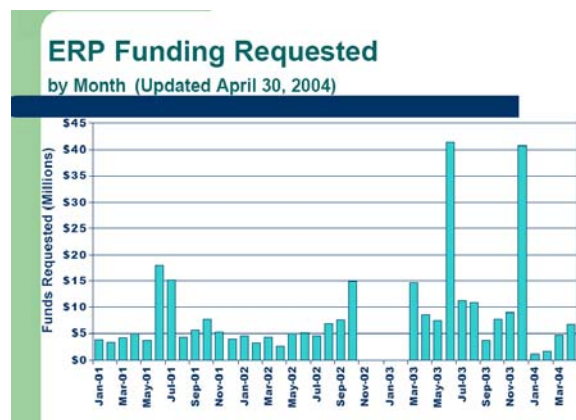
The challenge before the CEC will be to provide enough of an incentive that solar markets will grow to the point where they are self-sustaining, while conserving rebate funding as much as possible. Program design issues are discussed below.

The ERP has undergone several revisions since it was first implemented as the Renewable Energy Buydown Program in 1998. It was reauthorized in 2003 through 2011 as the Emerging Renewable Program, with funding authorized through 2006. The program has operated steadily, except for peaks prior to incentive declines and a temporary shutdown because of lack of funds in fall 2003. Exhibit 3.1-6, ERP Funding Requested, reflects these shifts.

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<sup>26</sup> Presentation by Tim Tutt, Technical Director of the CEC Renewable Energy Program, *CEC Energy Resources Conservation and Development Commission Workshop for the 2004 Integrated Energy Policy Report Update* June 8, 2004, pertaining to Docket Nos. 03-IEP-01, 02-REN-1038, and 04-Dist-Gen-1

### Exhibit 3.1 -6: Funding Requested



The *ERP Program Guidebook* (CEC P500-03-001F2, July 2004) outlines the application and approval process for the ERP.<sup>27</sup> Guidelines and applications are also accessible at [www.consumerenergycenter.org](http://www.consumerenergycenter.org).

The rebate process begins with a funding reservation. This provides the applicant with an assurance that rebate funds will be available once the system is installed. The reservation period for systems less than 30 kW is six months. The application requires the following:

- ◆ A completed reservation form,
- ◆ Copy of agreement(s) to purchase and install a system,
- ◆ Evidence that the site is served by an eligible utility, and
- ◆ A Payee Data Record form.

Reservation requests for the ERP Solar Schools and affordable housing sub-programs require additional information, as outlined in the *Guidebook*.

In 2004, the CEC began to accept reservation applications only by mail. Postmarks are used to confirm eligibility for rebate levels, which change every six months. CEC staff will return an application unprocessed if it needs significant changes or additions. Reservation applications typically take six to eight weeks to process, except during peak periods when the staff workload may quadruple.

When the application is approved, the CEC issues a Rebate Payment Claim Form. This claim form must be completed and submitted after the system is installed and operating, but during the reservation period. The reservation period is six months for most applicants, with 18 months allowed for new construction and school projects. Extension requests are currently allowed.

Documents required to receive rebate payment include the following:

<sup>27</sup> *ERP Program Guidebook*, CEC P500-03-001F2, July 2004.

- ◆ Rebate Payment Claim Form,
- ◆ Documentation confirming final payment and system installation,
- ◆ Initial building permit and final signoff,
- ◆ Five-year warranty for the system, and
- ◆ Proof of utility service, including performance meter installation.

If the claim application is complete, the CEC will generally process it for payment within six to eight weeks. However, the CEC has experienced dramatic fluctuations in the number of applications submitted, typically peaking in the month before the rebate level is adjusted downward. According to Tony Brasil, Emerging Renewables Program Customer Accounts Supervisor, processing may extend as long as three months. No additional staff may be hired during peak times.

The ERP is targeted primarily at residential and commercial customers requiring renewable energy systems of less than 30 kW. The majority of rebates have supported residential retrofits, with a fraction (currently less than one sixth) directed to commercial projects. Residential new construction represents a growing program sector; almost no new construction was funded until 2003.<sup>28</sup> Self-installed systems are allowed, but they receive a 15 percent lower rebate. Installations through June 2004 are summarized in Exhibit 2.1-7 below.

### Exhibit 3.1-7: Systems Installed through the Emerging Renewables Program

Year	Number	MW	Payments (\$ Millions)
1998	41	181	\$0.5
1999	197	1,060	\$2.9
2000	235	802	\$2.2
2001	1,292	4,294	\$16.9
2002	2,331	8,501	\$36.4
2003	3,023	12,919	\$52.1
2004	2,282	9,723	\$37.0
<b>Total</b>	<b>9,401</b>	<b>37,480</b>	<b>\$148.0</b>

Source: Presentation by Tim Tutt, Technical Director of the CEC Renewable Energy Program, *CEC Energy Resources Conservation and Development Commission Workshop for the 2004 Integrated Energy Policy Report Update* June 8, 2004.

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<sup>28</sup> Presentation by Tim Tutt, Technical Director of the CEC Renewable Energy Program, *CEC Energy Resources Conservation and Development Commission Workshop for the 2004 Integrated Energy Policy Report Update* June 8, 2004, pertaining to Docket Nos. 03-IEP-01, 02-REN-1038, and 04-Dist-Gen-1. Slide 15.

Another 4,630 systems are in various stages of development under the program, representing another 19 MW. The grand total of systems installed and in process is 14,330, representing 58 MW.<sup>29</sup>

The ERP targets two special sectors: developers of affordable housing and public or charter schools participating in the Solar Schools program. The affordable housing program, which provides a rebate 25 percent greater than the standard ERP rebate, has resulted in about 340 approved systems, totaling more than 800 kW so far. The Solar Schools program, which is cosponsored by the CEC and California Consumer Power and Conservation Financing Authority (CPA), has resulted in 30 school projects, totaling 700 kW of PV capacity.

Beginning in 2004, systems sized 30 kW or greater may be accepted into the ERP. Large systems are also incentivized by a separate CPUC program, the *Self-Generation (Self-Gen) Incentive Program*. However depletion of funds in the Self-Gen program has increased large customers' interest in the ERP. The CEC plans to use \$10 million in program funding to implement a trial performance-based incentive program for these larger systems.

Eligible systems and their components include the following:

- ◆ *Photovoltaics*: The PV cells, modules, mounting or tracking structures, wire, inverters, foundation if needed, simple performance meters, and utility-required interconnection equipment.
- ◆ *Small wind*: The wind turbine, tower, wire, inverter, foundation if needed, simple performance meters, and utility-required interconnection equipment.
- ◆ *Solar Thermal*: The concentrating and collecting apparatus, tracking and mounting structures, wiring, thermal engines or conversion devices, generator, inverter, support structure or foundation, simple performance meters, and utility-required interconnection equipment.
- ◆ *Fuel cells using renewable fuel*: The renewable gas pre-treatment equipment, fuel processor/reformer, cell stacks, inverter and power conditioning equipment, cooling equipment, foundation, simple performance meters, and utility-required interconnection equipment.

Energy storage equipment, tools, indirect installation costs, and financing fees or costs are not eligible under the ERP. More details about eligibility are included in the ERP *Guidebook* and on the Website ([www.consumerenergycenter.org](http://www.consumerenergycenter.org)). A CEC contractor, KEMA-Xenergy, regularly updates the online list of eligible PV systems, as part of its field verification effort.

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<sup>29</sup> Data sources include *Renewable Energy Program Quarterly Report to the Legislature*, CEC 500-04-050, July 2004 and *Renewable Energy Program Annual Project Activity Report to the Legislature*, CEC 50-03-103F, December 2003.

The size of eligible systems and corresponding rebate levels are summarized in Exhibit A2, Rebates Available for Emerging Renewable Systems. Under a new incentive structure incentives will continue to decline by \$0.20 per Watt every six months.

**Exhibit 3.1-8: Rebates Available for Emerging Renewable Systems (Last half of 2004)**

Technology Type	Size Category	Rebate Offered*
Solar Photovoltaic	<30 kW	\$3.00 per Watt
Wind	First 7.5 kW, up to 30 kW	\$0.90 per Watt
Solar-Thermal Electric and Fuel Cell	<30 kW	\$3.40 per Watt
Renewable Energy Systems (all types)	>= 30 kW	Subject to performance incentive TDB

\* Rebates for owner-installed systems are 15 percent less. All rebates will decline by \$0.20/Watt every six months.

Source: *ERP Guidebook*, CEC P500-03-001F2, July 2004, p. 8.

The CEC administers the ERP. It works with other state agencies on specific program aspects. For example, the Solar Schools Program is run in collaboration with the California Power Authority. Funding for this sub-program of the ERP includes matching funds from AGAERA. The Solar Schools staff is housed at the CEC.<sup>30</sup>

The Affordable Housing sub-program of the ERP involves coordination with the California Department of Housing and Community Development. Again, the program is housed at the CEC. State facility energy systems are managed by the Consumer Finance and Conservation Financing Authority, but the staff coordinates with CEC staff on renewable energy development strategy and issues.

Aspects of the ERP program pertain to other state agency interests. For example, the California Contractors' State Licensing Board provides licensing for renewable energy system installers.

The ERP and other programs funded by the Renewable Energy Trust Fund also coordinate with the CPUC in updating the state's Integrated Energy Policy. In particular, these agencies jointly endorsed the state's accelerated RPS, and they have coordinated in developing implementation strategies. Recent joint workshops and program planning have centered on extending funding for both the ERP rebates and the CPUC Self-Generation Incentive Program. The ERP has focused on renewable energy systems under 30 kW and the CPUC program has focused on renewable energy systems 30 kW and greater. Both programs face funding shortfalls, and both are working toward coordinated solutions.

<sup>30</sup> Interview with Maria Krapceovich, CEC/ERP Solar Schools Program, August 11, 2004.



Public-benefits funded renewable energy programs, including the ERP, report quarterly and annually to the California Legislature.

The ERP has sought periodic input from a variety of stakeholders, including the renewable energy industry (solar, wind, and fuel cell), utilities, and non-government organizations (NGOs), usually through its relationship with the CPUC and with other CEC programs involved in the *Integrated Energy Policy Report* process.

Utilities are not directly involved in ERP program implementation. However, the state's IOUs collect public-benefits funds, and it is their customers who are eligible for program rebates. The utilities post ERP information on their Websites and support aspects of implementation (system interconnection, net metering, etc.).

Since the ERP is aimed directly at boosting the renewable energy industry, the involvement of industry organizations is key. CalSEIA is an active educational and lobbying organization. CalSEIA advances legislation and specific policies, which are summarized on its Website, [www.calseia.org](http://www.calseia.org). Notably, CalSEIA has proposed a strategy to remedy the rebate shortfall of the ERP and of the PUC Self-Gen program (see [www.calseia.org/onepagerKMGJEM.html](http://www.calseia.org/onepagerKMGJEM.html)). The three main aspects of this strategy are the following:

- ◆ Funding PV and solar thermal programs with performance-based incentives, based on generation rather than on system size;
- ◆ Phasing out these state performance-based incentives as technologies mature and become cost-competitive; and
- ◆ Meeting the Governor's 50 percent goal for PV on new homes through a negotiated agreement between the building and solar industries, backed up by purchase orders, state rebates, and regulatory certainty.

Other stakeholder groups, including those representing the wind and fuel cell industries, the building industry, labor, environmental concerns, and consumers' concerns, have participated actively in developing and fine-tuning the ERP. Coordination with these groups is often led by other, closely related CEC programs, including the Consumer Education Program and PIER, or by the CPUC.

The ERP coordinates closely with other CEC programs funded by the Renewable Resources Trust Fund, especially the Consumer Information Program, which funds and implements much of the ERP outreach, and the PIER program, which funds renewable energy research.

Training activities related to the ERP are administered through the CEC Consumer Education Program. According to program staff, training activities had included a two-day installer's workshop for solar PV. In coordination with the ERP, the Consumer Education Program contracted with a trade group to implement this training several times a year, in different parts of the state. This activity was suspended because of budget constraints and of the relative maturing

of the solar industry in California. If funding were available, however, CEC staff would prefer to continue some level of training for installers, permit officials, and others.<sup>31</sup>

Aspects of ERP program design that address quality assurance include the following:

- ◆ Comprehensive five-year warranty requirement;
- ◆ Performance meter requirement;
- ◆ Compliance with net metering rules and pending California interconnection standard (“Rule 21” guidebook expected in fall 2004), including testing or use of pre-qualified equipment;
- ◆ Consumer education program;
- ◆ Installer technical assistance and recommended training/certification; and
- ◆ Verification process for the program.

A case study, *Quality Assurance for Photovoltaic Systems*, by Ryan Wiser (U.S. Department of Energy, Lawrence Berkeley Laboratory, September, 2002, at <http://eetd.lbl.gov/ea/ems/cases>), provides useful discussion of quality assurance in California and other states.

The primary tool for ERP quality assurance is its required verification process. This task is currently assigned to a contractor, KEMA-Xenergy. KEMA has not yet submitted a report on its work.

Washington-based Regional Economic Research, Inc. (now Itron) implemented earlier program verification activities. A final report, *The California Energy Commission Emerging Renewables Buydown Program: Onsite Verification Report Phases I, II, and III* was submitted in June, 2002. It is available on the CEC Website ([www.ca.energy.gov](http://www.ca.energy.gov)). It covers installations from the inception of the program through April 2002.

Objectives of the verification process include the following:

- ◆ To ensure that installations matched information submitted on the ERP claim form,
- ◆ To ensure that systems met building codes and accepted installation practices,
- ◆ To confirm that systems were operating properly, and
- ◆ To gather market and program information.

With approximately 3,000 systems installed under the program by early 2002, the Itron verification of a total of 132 (in five separate data-collection efforts) represents about 4.5 percent of all installations. The verification sample included nearly all PV systems, except for seven hybrid PV-wind systems and one wind system. The sample provided an overview of systems in nearly all settings, from large commercial and public facility installations to residential ones. Verification costs were a consideration; sites were selected within areas that were manageable

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<sup>31</sup> Interview with Tony Brasil, Emerging Renewables Program Customer Accounts Supervisor, August 14, 2004.

for verification staff. The report included detailed recommendations for properly budgeting time and cost of site verifications.

Overall ERP recommendations, highlighted in the 2002 verification report include the following:<sup>32</sup>

- ◆ Continue the verification program;
- ◆ Utilize information to resolve program planning questions (e.g., verifications tend to confirm that builder-installed systems should be allowed) and to flag problems;
- ◆ Improve customer information about taxability of rebates;
- ◆ Improve customer information about proper wind installation;
- ◆ Collect data and advise customers about actual PV performance;
- ◆ Require performance meters;
- ◆ Continue training for local permitting staff, inspectors, installers, and customers;
- ◆ Some of these (notably, the recommendation to require performance meters) helped to spur program improvements. Others provided insights for estimating energy impacts and for preparing better program outreach;
- ◆ Marketing and Outreach Activities;
- ◆ Marketing and outreach activities for the ERP are managed through coordination with the CEC Consumer Education Program (see below); and
- ◆ Overview of Program Process.

Other sources of information on the evolution of the ERP include *Learning by Doing: The Evolution of State Support for Photovoltaics*, by Mark Bolinger and Ryan Wiser of the U.S. Department of Energy Lawrence Berkeley National Laboratory (LBNL-52398, June 2003); and *The Use of Capital- and Performance-Based Buy-Down Programs for PV in California, Pennsylvania, and Massachusetts*, by Mark Bolinger and Ryan Wiser, a case study jointly published by LBNL and the Clean Energy Group (see <http://eetd.lbl.gov/ea/ems/cases>).

Incentive level setting has been a major issue for the CEC. At the inception of the Buydown Program, the CEC divided the \$54 million that was available to the program over its first four years into approximately five equal funding blocks of decreasing rebates. According to Bolinger and Wiser, “Once all the funds in the first block (\$10.5 million at \$3/W up to 50 percent of installed cost) were committed, the next block offering a lower buy-down (\$2.5/W up to 40 percent of installed cost) would become available. By the fifth block, the incentive would drop to \$1/W up to 20 percent of installed costs. In this way, California intended to gradually wean the PV industry off of public support.”<sup>33</sup>

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<sup>32</sup> *Emerging Renewables Buydown Program—Onsite Verification Phases I, II, & III*, submitted to the CEC by Regional Economic Research, Inc., June 30, 2002. Pp. 6.2 to 6.4.

<sup>33</sup> *The Use of Capital- and Performance-Based Buy-Down Programs for PV in California, Pennsylvania, and Massachusetts*, by Mark Bolinger and Ryan Wiser, a case study jointly published by LBNL and the Clean Energy Group, September 2003, p. 5.

However, program experience triggered changes in the original design. In 2001, the ERP determined that the program was not moving quickly enough to achieve its goals in solar market development. The legislature authorized funding increases (SB 90). It also expanded net metering provisions for systems up to 1 MW, authorized \$8 million for rebates to municipal utility customers, and allowed the CEC to adjust rebate levels. The CEC increased the rebate to the lesser of \$4.50/W or 50 percent of the system installed cost. The results included an increase in installations and an apparent decrease in the market cost of PV, but the program began to deplete its funds very quickly. An additional funding increase in 2002 was followed by a closure of the reservation process, as funds were expected to run out. In 2003, the CEC introduced another declining-rebate structure. This, too, proved inadequate, and the CEC instituted additional changes in 2004. Yet more changes are likely. California is still working to create the best possible balance among incentive levels, customer demand, and solar industry response.

It is important to recognize that the installed cost of PV systems seems to have responded to increases in ERP participation since 2002. Some stakeholders have expressed doubts that the current plan for more declines in California rebates can support necessary market growth.<sup>34</sup> However, the CEC and various stakeholders, notably the CalSEIA, have advanced proposals to redesign the program with more a sustainable rebate plan, such as a shift to performance-based rather than capacity-based rebates.<sup>35</sup>

Total staffing for the ERP program includes about 23 part-time employees who serve on an alternating basis staffing the call center (usually two staff per day) and processing applications. These employees are entry level, including many college students. In addition, the program has about five management-level employees. (Employee responsibilities shift within CEC from time to time.) In July 2004, when application volume was high, staff processed about 50 applications per day. However, management staff notes that this level of effort cannot be sustained.<sup>36</sup> The program employs contractors for validation, though details were not available on how many contract staff are committed to this work.

According to Tony Brasil, ERP Customer Accounts Manager, some process improvements have been aimed at solving problems recognized by staff and contractor-validation teams.<sup>37</sup>

The following steps have been taken to improve the process by which customers file applications:

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<sup>34</sup> CEC Energy Resources Conservation and Development Commission Workshop for the 2004 Integrated Energy Policy Report Update June 8, 2004, pertaining to Docket Nos. 03-IEP-01, 02-REN-1038, and 04-Dist-Gen-1. Transcript, available from [www.energy.ca.gov](http://www.energy.ca.gov) tracks this discussion. See also, the July proposal from the California Solar Energy Industries Association, [www.calseia.org](http://www.calseia.org).

<sup>35</sup> Presentation on the Emerging Renewables Program, by Tony Brasil, ERP Customer Accounts Manager, California Solar Forum, May 5, 2004, confirmed in interview August 14, 2004.

<sup>36</sup> Ibid.

<sup>37</sup> Ibid.

- ◆ Reducing reservation period to six months (18 months for new construction), so that customers who do not plan to complete the process are identified and reservations may be more quickly reassigned;
- ◆ Providing online application ([www.consumerenergycenter.org](http://www.consumerenergycenter.org)), including online vendor/installer information and calculator tools (though a PIER contract). This provides a printout to be mailed with attachments;
- ◆ Simplifying the application process, including eliminating the requirement for itemized costs and providing an option to allow the CEC to access utility information directly (eliminating interconnection data requirements); and
- ◆ Defining customer site as a legal parcel instead of a utility meter (eliminates confusion over rebate amounts for multiple meters).

To improve processing efficiency, the following steps have been taken:

- ◆ Changing guidelines so only mailed-in reservation requests are accepted (uses post mark as official received date to eliminate disputes);
- ◆ Introducing a 60-day limit for customers to respond to requests for application corrections; and
- ◆ Introducing a CEC option to deny an incomplete reservation applications promptly (eliminates queue advantage of partial applications).

According to Brasil, the greatest improvements in the process since inception include the following:

- ◆ Eliminating the option to apply for a rebate valued at 50 percent of project cost;
- ◆ Requiring the license number of contractors on the application, thus resolving questions about whether the installation was professional or self-installed; and
- ◆ Reducing the reservation period for most applicants to six months.

The reservation-through-claim completion rate has improved since the early days of the program, from 70 percent historically to 80 percent by mid-2003. Minor applicant errors are still common. Brasil reported that in April 2004, 18 percent of equipment purchase agreements submitted did not match the equipment listed on the reservation form; 12 percent of claim applications did not provide adequate purchase-agreement information. Labor contract information was incomplete or unacceptable on more than 20 percent of the applications.

About half of payment claim applications included minor errors, ranging from lacking claim forms and other attachments to missing final sign-off on building permits. Brasil noted that improvements in the latest ERP *Guidebook* still might not go far enough to maximize processing efficiency. He recommended eliminating reservation extensions entirely and setting stricter guidelines to encourage proper, complete applications. He noted that most applications are completed by installers, who understand the process and should be adept at it.

Data on the ERP Program is tracked relatively simply, using MS Access database software. While the software has some drawbacks, Brasil says it is not worth the risk of losing time and/or data to upgrade.

Financial auditing of the program goes through the standard State of California audit procedure. No details were provided, except that the audit is performed at least annually. In contrast to the CPUC Self-Generation Incentive Program, the ERP has little budget set aside for external evaluation. The required Quarterly Reports to the Legislature fulfill basic program tracking and evaluation requirements. Verification is ongoing, and contractors prepare reports periodically. Management regularly extracts various performance measures from available data. In addition, an evaluation of the process was completed in response to issues raised by CalSEIA. The goal was to verify the fairness of the process. The report has not yet been published, though data from it is publicly shared.<sup>38</sup>

In addition, the ERP has been studied by outside agencies and organizations that wish to learn from California's experience. Studies of the California experience are available from DOE's Lawrence Berkeley National Laboratory, the Renewable Energy Policy Project, the Union of Concerned Scientists, among others.

#### CPUC - SELF GENERATION INCENTIVE PROGRAM

The Self-Generation Incentive Program, known as the Self-Gen or SGIP, is California's second rebate-incentive program for renewable energy. It is directed by the CPUC and administered by IOUs (SCE, PG&E, SoCal Gas) and the San Diego Regional Energy Office (SDREO), on behalf of SDG&E. The CPUC has no involvement on the day-to-day operation of the program. While the CEC Emerging Renewables Program focuses on smaller renewable energy systems (less than 30 kW), the SGIP provides rebates for renewable energy systems with capacities of 30 kW, up to 1.5 MW (with rebates for 1 MW maximum). The program is aimed at controlling peak demand, enhancing reliability, and addressing clean-air concerns.

The CPUC initiated the program with Decision 01-03-073 in March 2001 and launched implementation that June. Five relevant goals include the following:

- ◆ Develop the cost-benefit analysis methodologies for DG and for net metering.
- ◆ Address administrative questions regarding the SGIP optimize coordination of this program with the CEC Emerging Renewables Program.
- ◆ Develop further guidance for California utilities on the use of DG as a planning and procurement resource.
- ◆ Examine as necessary the outstanding technical issues arising from the Rule 21 interconnection process, which is managed by the CEC.
- ◆ Examine as practical, associated emerging technologies for DG.

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<sup>38</sup> Ibid.

The program was authorized by legislation (AB 970, 2000) that outlined load control and DG activities in response to the California energy crisis. Initially, the program was authorized through 2004, with annual funding of \$125 million. Early modifications to the program were adopted in CPUC Decision 02-09-051. Assembly Bill 1685, passed in 2003, extended the program through 2007, and provided continued funding of \$125 million per year. Rebates account for \$100 million of the annual budget. This funding is divided among the administrators proportionally: PGE receives 48 percent, SCE 26 percent, SoCalGas 13.6 percent and SDREP 12.4 percent.<sup>39</sup>

The SGIP is aimed at host facilities in IOU territories that can use DG systems that are 30 kW or larger. While residential customers are not explicitly excluded, they generally cannot use such large systems. Some specific exclusions include customers that have entered into DG service contracts, customers that are engaged in exporting/selling electricity from their site, and any portion of a customer load that is already covered by a demand-response rate or program. Building types for DG installations represent a range of commercial and industrial profiles, including commercial and industrial businesses, schools and institutions, agricultural facilities, and local government facilities. Program evaluators found that the targets that were most responsive to the program represented the manufacturing, government, and education (college and school) sectors.

Program administrators reached these ultimate customers largely through trade ally relations. They targeted vendors and installers, who in turn provided marketing and customer support to building owners.<sup>40</sup> Third-party vendors and energy services companies submitted about two-thirds of the applications to the SGIP during program year 2002. These included companies that took ownership of the DG, as well as companies that merely assisted customer-owners. Eighty percent of third-party applicants that applied to the program in 2002 had applied in 2001 as well. Twenty percent of those applying in 2002 had applications to more than one program administrator. These trade allies continue to play a key role in facilitating DG installations of all kinds in California.<sup>41</sup>

Eligible equipment must be sized to meet all or a portion of the customer's onsite peak electric demand, while remaining connected to the grid. Back-up generation equipment does not qualify. Equipment must be new and permanent. Capacity may be as great as 1.5 MW, but the incentive only applies to 1 MW. A list of equipment types and rebates is provided in Exhibit 2.1-9.

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<sup>39</sup> <sup>39</sup> The *Self-Generation Incentive Program Handbook*, Revision 4, January 2004, p. 17. The *Handbook* is available from administrator Websites, including [www.sce.com/sgip](http://www.sce.com/sgip)

<sup>40</sup> *Self-Generation Incentive Program Second Year Process Evaluation* by Itron, Inc. for the CPUC April 2003, p. 5-11.

<sup>41</sup> *Ibid.*, pp. 4-68, 4-69.

**Exhibit 3.1-9: Summary of Self-Gen Incentive Technologies and Rebate Levels, 7/2004**

Incentive Category	Maximum Incentive Offered (\$/Watt)	Maximum Incentive as a % of Eligible Project Cost	Minimum System Size (kW)	Maximum System Size Incentivized (kW <sub>e</sub> )	Eligible Generation Technologies
Level 1	\$4.50	50%	30	1,000	PV Fuel Cells <sup>1</sup> Wind Turbines
Level 2	\$2.50	40%	None	1,000	Fuel Cells <sup>2</sup>
Level 3-R	\$1.50	40%	None	1,000	Microturbines <sup>1</sup> Internal combustion engines and small gas turbines <sup>1</sup>
Level 3-N	\$1.00	30%	None	1,000	Microturbines <sup>2,3</sup> Internal combustion engines and small gas turbines <sup>2,4</sup>

- 1 Operating on renewable fuel.
- 2 Operating on non-renewable fuel.
- 3 Using sufficient waste heat recovery and meeting reliability criteria.
- 4 Both utilizing sufficient waste heat recovery and meeting reliability criteria.

Waste heat utilization is required for Level 1 and Level 3 technologies. Hybrid systems, using more than one technology, qualify based on the project portion under any or each qualifying technology. The *Program Guidebook* details all program qualifications.

Statewide program statistics (as of late July 2004) are summarized in Exhibit 2.1-10. The total capacity of all SGIP program projects completed and encumbered to date is about 184,000 kW.

**Exhibit 3.1-10: Summary of SGIP Projects Complete Statewide, Reported July 2004**

	Level 1 (Photovoltaics)	Level 3 (IC Engines)	Level 3 (Microturbines)	Other* (wind, fuel cell)
Completed (kW capacity est.)	153 (16,190 kW)	42 (26,700 kW)	22 (4,350 kW)	N/A*
Active applications (kW capacity est.)	400 (62,769 kW)	95 (57,770 kW)	53 (10,230 kW)	N/A*
Total (kW capacity est.)	553 (78,950 kW)	137 (84,470 kW)	75 (14,580 kW)	4 wind, 6 fuel cell (3,260 + 2,750 kW)

\* Data posted to administrator Websites indicates only completed projects for these technologies.

According to CPUC interpretation of AB 1685 legislation<sup>42</sup>, the SGIP may be extended indefinitely, so long as funding is provided. However, like the CEC Emerging Renewables

<sup>42</sup> CPUC analysis of AB 1685, internal memo, May 16, 2003.



program, the SGIP is currently expending funds quicker than expected, especially for Level 1 projects. According to CPUC *Energy Division Recommendations to Improve the Self Generation Incentive Program and Implement Assembly Bill 1685* (Attachment A to ALJ Request for Comments, Rulemaking 04-03-017, July, 2004), funding for Level 1 projects is expected to be depleted before the end of 2004.

Level 1 applicants reserved \$228.4 million Level 1 funds from SGIP this year alone. Program administrators have exercised the discretion granted in Decision 01-03-073 to reallocate unencumbered funds from other incentive categories or administrative budgets, and to carry forward unused funds from prior program years. Even so, as of May 31, 2004, SCE, SoCalGas, and SDREO have an approximate combined total of \$27 million Level 1 funding remaining, and PG&E has a waiting list of Level 1 projects totaling 11.76 MW.<sup>43</sup>

A review of program administrators' Websites in August suggests that SDREO also has created a waiting list for Level 1 and Level 2 projects, anticipating a reallocation from Level 3 funding. PGE has more than \$80 million in requested incentives on its Level 1 waiting list.

Current activity under CPUC Rulemaking 04-03-017 is focused on making program improvements that include resolving long-term funding issues and developing a program exit strategy.

The application process is outlined in the *Self-Generation Incentive Program Handbook*.<sup>44</sup> The *Handbook* was reviewed by the CPUC and developed by a program working group, which included all affected administrators. The *Handbook* is published by each administrator (utilities or SDREO).

The process for application approval involves the following steps:

- ◆ Applicant provides a reservation form with required attachments including proof of utility service, system sizing calculation, waste heat calculations (for Levels 2 and 3), and a system description.
- ◆ If the application is acceptable, the administrator sends a conditional notice letter and program contract. The conditional notice includes a reservation number and estimated incentive reserved.
- ◆ The applicant must respond to the conditional notice within 90 days with proof of project advancement, including an air permit application (if required), a utility interconnection application, signed purchase order or contract, project cost breakdown, insurance documentation, and signed program contract. These items must be sent by mail.

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<sup>43</sup> *Energy Division Recommendations to Improve the Self Generation Incentive Program and Implement Assembly Bill 1685*, Attachment A to ALJ Request for Comments, Rulemaking 04-03-017, July 2004, p. A-7.

<sup>44</sup> The *Self-Generation Incentive Program Handbook*, Revision 4, January 2004, is available from administrator Websites, including [www.sce.com/sgip](http://www.sce.com/sgip).

- ◆ Project administrator logs the receipt of necessary items. If acceptable, the administrator sends a reservation confirmation and incentive claim form.
- ◆ The applicant has up to 12 months from the date of the conditional reservation notice letter to purchase and install the equipment and to begin operation. Once this is done, the applicant submits a completed reservation confirmation and incentive claim form, with attachments. These include proof of interconnection, final building inspection report, final air permits, final project cost breakdown and documentation, proof of warranty, and planned maintenance coordination letter.
- ◆ Upon logging the completed claim application, the administrator completes field verification and authorizes payment.

**Coordination with Other Stakeholders.** The CPUC has staff in its Energy Division to provide Self-Gen program information to Commissioners and stakeholder involved in CPUC processes. The SGIP Working Group, including representatives of utility administrators, SDREO, the CEC, and CPUC, collaborates on developing program guidelines, identifying issues, of recommending program improvements.

Another current CPUC activity that affects the SGIP through a coordinated interagency effort is the Informational Proceeding and Preparation of the 2004 Integrated Energy Policy Report (Docket Nos., 03-IEP-01, 02-REN1038, 04-DIST-GEN-1). The IEP will guide Self-Gen program development as it pertains to broader California energy policy goals. The proceeding also deals with issues surrounding the rapid depletion funding for both the CEC Emerging Renewables Program and the CPUC SGIP.<sup>45</sup>

The CEC coordinates with the CPUC on the SGIP through participation in regulatory proceedings and through membership in the SGIP Working Group. Both agencies (supported by their in-house and consultant-led evaluations) believe that better coordination between the SGIP and the Emerging Renewables program is needed, both in design and implementation. In addition, the CEC Public Interest Energy Research Program has spent an estimated \$80 million on DG-related research and development<sup>46</sup>. Finally, outreach and education from the CEC Consumer Education Program has not been directly aimed at supporting the SGIP, but it provides information to all Californians interested in renewable resources. The SGIP *Handbook* directs applicants to the CEC outreach Website ([www.consumerenergycenter.org/erprebate](http://www.consumerenergycenter.org/erprebate)) to review the list of eligible renewable energy equipment, noting that this equipment also prequalifies for the SGIP.

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<sup>45</sup> For a useful review of these issues, see *Transcript of the Joint Committee Workshop before the California Energy Resources, Conservation, And Development Commission, Regarding Docket Nos. 03-IEP-01, 02-REN1038, 04-DIST-GEN-1*, June 8, 2004

<sup>46</sup> *Briefing on DG OIR 04-03-17*, prepared by John Nimmons, J.D. for the California Alliance for Distributed Energy Resources, see [www.cader.org](http://www.cader.org)

The California Air Resources Board (CARB) plays a key role in the SGIP because the program is aimed partly at reducing air pollution. By January, 2005, the ARB is required by law (AB 1685) to work with the CPUC and the SGIP Working Group to incorporate new emissions and efficiency requirements into SGIP requirements. The *Self-Generation Incentive Program Second Year Process Evaluation* calls for some improvements in coordination between air-permitting offices and the SGIP, as a means of speeding the application process.

The California Independent System Operator (CAISO) has raised issues and opportunities related to the SGIP. CPUC staff has worked with CAISO on DG system-impact and tariff issues. CAISO initiated a project in 2002 to assess the potential for aggregating DG into block of up to 10 MW, for potential participation in the Supplemental Energy Market. The project was never fully implemented because of a lack of participants.

As noted in the discussion of targeted sectors, trade allies play a key role in the SGIP. Evaluators report that both customers and trade allies (primarily vendor/suppliers and energy services companies) have benefited from this program. The trade allies improved customer outreach for the program in return for the opportunity to build their businesses.<sup>47</sup>

Currently, trade allies are not represented in the program working group, which is limited to representatives of administrators, SDG&E, CPUC, and CEC. However, the CPUC has periodically requested input from trade allies and other stakeholders. Recently, the CPUC in Rulemaking 04-03-017 specifically requested comments on the Energy Division's recommendations to improve the SGIP. Seventeen parties submitted comments, primarily trade allies (see [www.cpuc.ca.gov](http://www.cpuc.ca.gov) for service list on the proceeding). The California Alliance for Distributed Energy Resources ([www.cader.org](http://www.cader.org)) serves as a clearinghouse for trade allies interested in DG and in state government proceedings. The California Solar Energy Industries Association ([www.calseia.org](http://www.calseia.org)) also tracks the SGIP for its members.

Notably, at least three CPUC staff recommendations in proposed in Rulemaking 04-03-017 pertains to improving stakeholder involvement and communications in the SGIP. These include the following:

- ◆ That the CPUC should expand participation in the working group and create opportunities for participation in other venues.
- ◆ That the CPUC must ensure appropriate dissemination of SGIP data, including further improvements upon those recently instituted to provide statewide application and completion tallies on administrator Websites.
- ◆ That the CPUC should direct the working group to develop an exit strategy in collaboration with industry participants.

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<sup>47</sup> *California Self-Generation Incentive Program Evaluation*, by Brenda Gettig (Itron, Inc.), et al., *ACEEE Summer Study Proceedings 2004*, available from Itron or [www.aceee.org](http://www.aceee.org).

A decreased and declining incentive structure is likely to be implemented, and the CPUC is concerned about its impact on economic, environmental and societal benefits that the program now provides.

In addition, the *Self-Generation Incentive Program Second Year Process Evaluation* recommended that the CPUC assign a working group representative or subcommittee to educate and coordinate with outside agencies. This recommendation refers to the numerous agencies, including air-permitting offices and local building permit offices that are engaged in the SGIP process.

IOUs administer this program, so they may not be considered “stakeholders” in the usual way, but they do participate in regulatory processes related to the program. Consumer-owned utilities are not directly affected, except for Los Angeles Department of Water & Power (LADWP), whose customers may receive incentives from SoCalGas. Some consumer-owned utilities are engaged, not as direct program players, but as stakeholders in overall DG policy and development.

Environmental groups (e.g., NRDC) have participated in CPUC processes related to the SGIP. Their comments have been generally supportive.

Aspects of SGIP design that address quality assurance include the following:

- ◆ System warranty requirements—minimum 5 years for Level 1 and 2, 3 years for Level 3R and 3N or an equivalent maintenance contract;
- ◆ Reliability criteria, including coordination with the utility on planned maintenance for systems larger than 200 kW;
- ◆ Compliance with net metering rules and pending California interconnection standard (“Rule 21” guidebook expected in fall 2004), including testing or use of pre-qualified equipment;
- ◆ Field verification and inspection; and
- ◆ Planned program evaluations by a third party.

Warranty requirements for Level 1 and 2 systems match those for the CEC Emerging Renewables Program; additional requirements are added for other levels/technologies. These requirements, as well as reliability, equipment eligibility, and interconnection requirements, are detailed in the program Handbook.

Field verification and inspection fulfills CPUC Decision 01-03-073, to “ensure that the self-generation units installed at customer sites are installed and operating properly and have the potential to deliver electric generation.”<sup>48</sup> Each SGIP administrator performs its own site inspections, each using a different contractor’s support.

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<sup>48</sup> CPUC Decision 01-03-073, pg. 28.

According to the CPUC *Self-Generation Incentives Program Second Year Impacts Evaluation Report* by Itron, Inc., (April 2003, Section 7) the generic onsite verification process includes the following:

1. Verification contractor receives documentation from the administrator.
2. Contractor customizes field-review forms with information from the Reservation Request Form and Claim Form and schedules visit.
3. Contractor completes onsite verification, including
  - a. verifying application data and eligibility;
  - b. documenting system characteristics;
  - c. adding photo documentation;
  - d. verifying outputs (kW and BTU and power factor where metered);
  - e. verifying how the generator is controlled;
  - f. verifying and documenting monitoring equipment;
  - g. identifying safety hazards; and
  - h. verifying other measures, specific to the type of system as detailed in protocol.
4. Contractor completes analysis and prepares report.
5. Contractor delivers report to administrator, possibly including suggestions for correction before follow-up inspection.
6. Follow-up inspection, if needed.

According to Itron, the verification process was successful. Among the few drawbacks cited for the process was the contractors' finding that host customers were seldom onsite and thus could not gain educational benefit from the inspection. This problem was deemed practically irresolvable. Another recommendation based on contractor experience was to involve contractors early, since they may identify problems as early as the "Reservation Request" stage.

The extensive evaluation and monitoring activities provided under the SGIP are another aspect of quality control, as evaluations provide feedback for improvements in program design and implementation.

The CPUC utilizes monitoring and evaluation reports as well as stakeholder input and staff analysis in periodic rulemaking procedures, related to DG and/or to improvements to the SGIP.

According to the *Self-Generation Incentive Program Second Year Process Evaluation* (Itron, Inc., April, 2003), marketing budgets varied widely among the four SGIP administrators. In 2002, they ranged from an estimated \$10,000 to \$187,000, and in 2003, they ranged from an estimated \$65,000 to \$182,000. Many factors affected these budgets: size of customer market, geographic spread, internal and external collaborations, etc. The evaluation deemed all administrators' approaches to be adequate, and to have improved from one year to the next<sup>49</sup>

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<sup>49</sup> *Self-Generation Incentive Program Second Year Process Evaluation*, Itron, Inc., April 2003, pp. 5-9 to 5-12.

Marketing activities have included workshops, promotional material, conference participation with trade allies, coordination with other organizations and administrators, online information, utilization of customer service staff for telemarketing (inbound and outbound calls), internal outreach, targeted marketing, direct mail, e-mail, press releases, and media advertising.

The evaluation found marketing through trade allies most effective. Both administrators and host/customers have reported satisfaction with the information and support provided by trade allies. Twenty-eight percent of 2001-02 host/customers surveyed said they first heard of the program when an energy services company or vendor brought it to their attention. As this trend has continued from year to year, administrators have increased their focus on working with trade organization and targeted media or events to keep these trade allies fully informed. The only other stand-out source for initial program information among those surveyed was utility representatives (reported by 16 percent of those surveyed). Government agencies were a source for just 6 percent of host/customers, and various other options all scored less than 5 percent.<sup>50</sup>

Although the marketing process for the program is reportedly successful, the job of informing and motivating potential customers is not complete. The evaluation process has yielded a great deal of market research that will be helpful to program administrators and to trade allies. For more information refer to the *Second Year Process Evaluation*. Program promotion *per se* is currently not a major issue, however, as program funds have been rapidly depleted.

Other considerations include the following:

*Aspects presenting difficulties to system/applicants.* The difficulties that applicants experienced in completing various program requirements seem to have had the greatest impact on processing delays. Commonly reported difficulties were subsequently addressed in evaluation recommendations.

*Process duration per system/application.* The time to complete the process from the time that the applicant submits Proof of Project Advancement through delivery of the rebate check varies by technology. Evaluators found that for utility administrators this ranges from a mean low of 203 days for renewable-fueled microturbines to a mean high of 482 days for a non-renewable-fueled fuel cell. The mean for utility-administered PV projects was 283 days. The processing times required by the SDREO were higher in every case, including 378 days for PV systems. The differences between processing times for utilities compared to the SDREO was deemed to be largely outside the administrator's control<sup>51</sup>

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<sup>50</sup> See Figure 5-1, Customer's Initial Source of Information, *Self-Generation Incentive Program Second Year Process Evaluation*, Itron, Inc., April 2003, p 5-15.

<sup>51</sup> See *Self-Generation Program Administrator Comparative Assessment*, submitted by Itron, Inc., September 2003. Factors ranged from the impact of SDG&E rate increases on customer questions and applications in 2001, to the fact that SDREO must report to SDG&E in an added level of administrative oversight. Itron has suggested simplifying the SDREO administrative process.

The processing times had a great deal to do with the specific types of projects and their requirements (new construction versus add-on systems, air permit requirements, interconnection complexities, etc.). Also, it became apparent (as reflected in survey data, above) that applicants in all technology areas have had trouble meeting the requirement to show Proof of Project Advancement within the required 90-day period. Evaluators recommended eliminating some requirements, such as proof of air permit applications and interconnection applications at this time. Evaluators also recommended lengthening the deadline for project completion from one year to two years for new construction projects, while adding a Proof of Progress milestone at the one-year mark.

In a separate recommendation, evaluators suggested simplifying the rebate structure to eliminate the percent-of-project-cost option. Whether or not this recommendation was implemented, the detailed cost breakdown requirement could be simplified, evaluators said. Finally, the requirement for a (final) Permit to Operate might be replaced by a required construction or Temporary Permit to Operate.<sup>52</sup>

*Administrative costs.* There are several ways to measure administrative costs. The data below were drawn from *Self-Generation Incentive Program Administrator Comparative Assessment*, submitted by Itron September, 2003 (pp. 5-5 and 5-6):

- ◆ Administration costs as a percent of program budget
  - Utility annual average: 1.55 percent
  - SDREO annual average: 2.00 percent
- ◆ Administration cost per application, utility annual average: \$8,590
- ◆ Administration cost per application, SDREO annual average: \$15,494
- ◆ Administration costs per kW of system capacity, utility annual average: \$37
- ◆ Administration costs per kW of system capacity, SDREO annual average: \$77

The improvement trend in costs from 2002 to 2003 is lost in these averages, but is apparent in the *Assessment* data. The higher costs experienced by SDREO are also examined in the *Assessment*. Figures reported give a general estimate of typical costs.

Also note that the costs per kW of system capacity do not account for some values specific associated with one technology versus another (relationship to peak load control or reliability objectives; societal or environmental benefits, etc.). The CEC is considering performance-based incentives for the Emerging Renewables Program, but the wider range of technologies in the Self-Gen program makes simple performance incentives for this program problematic.<sup>53</sup> The details of the process have been thoroughly documented and evaluated and may be reviewed in the 380-page *Self-Generation Incentive Program Second Year Process Evaluation*. This

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<sup>52</sup> Self-Generation Incentive Program Second Year Process Evaluation, submitted by Itron, Inc., April 2003, pp. 8-16, 17.

<sup>53</sup> Interview with Brenda Gettig, Itron, Inc., August 17, 2004

discussion will focus on the identification of improvements that have been implemented or are planned.

Administrators reported many improvements in the process took place in 2002<sup>54</sup>:

- ◆ Increased staffing to manage applications, including at least one FT employee per administrator;
- ◆ Improved Handbook;
- ◆ Improved Website outreach;
- ◆ Improved education, both internally and with third-parties and host/customers;
- ◆ Refinements to tracking databases; and
- ◆ Procedures for contacting applicants.

While minor improvements in the process took place during the past three years, the CPUC is now considering major changes and improvements through Rulemaking 04-03-017. This rulemaking covers a number of issues related to DG, in addition to specific SGIP issues. Recommendations specific to the program were published by CPUC staff in July.<sup>55</sup> These recommendations were based on Itron evaluations and stakeholder comments are listed below. An evidentiary hearing is set for mid-November.

*Eliminate the maximum project percentage cap option.* The cost percentage cap program-design structure has already been eliminated from the CEC Emerging Renewables Program. This structure requires judgments on eligible/ineligible cost components, and is prone to both applicant misuse and administrative delays.

*Reduce the dollar per Watt payment for solar and wind projects to \$4.05 in order to support maximum participation.* As of July 2004, rapid depletion of funding for solar projects had caused PGE to cease processing new reservations and to close its (full) waiting list. SDREO is no longer processing new reservations, but has a waiting list. Administrators have used their authority to reallocate funding this year, as in past years, from other technology areas to fund solar rebates. Still, Level 1 will likely be spent-down statewide by the end of 2004.

If reduced to \$4.05 per Watt and ramped down periodically, the SGIP incentive would still provide greater rebates than the ERP currently does. Notably, the ERP is still experiencing excessive demand for the program, even with rebates decreased to \$3.00 per Watt in July, 2004. Stakeholders have expressed a range of opinions on the SGIP rebate level. The CalSEIA proposal matches the recommended \$4.05 per Watt level. Notably, the CPUC has called for benefit/cost analyses of distributed generation to help resolve this and other related issues.

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<sup>54</sup> *Self-Generation Incentive Program Second Year Process Evaluation*, submitted by Itron, Inc. April 2003, pp. 5-76 to 5-77

<sup>55</sup> CPUC Rulemaking 04-03-017, Attachment A, *Energy Division Recommendations to Improve the Self Generation Incentive Program and Implement Assembly Bill 1685*, filed July 2004



*Increase eligible capacity size to 5 MW.* This recommendation is made with caveats. The Commission should first review pending benefit/costs studies. The goal is to not discourage projects larger than 1.5 MW, but to be cautious about raising the portion of the project (currently 1 MW) that is eligible for the incentive.

*Ensure appropriate dissemination of SGIP data.* This recommendation pertains to improving stakeholder involvement. The four different administrators for the program are housed in different offices or companies, making access to up-to-date statewide information difficult. The CPUC staff has recommended that the program Working Group propose an approach that strikes a balance between protecting customer privacy and meeting public information needs.

*The Working Group* should be directed to develop an exit strategy in collaboration with industry participants. This recommendation also pertains to improving stakeholder involvement. The need for an exit strategy that will not disrupt the emerging renewables industry is increasingly apparent, in light of California's total rebate-funding outlook.

*The program evaluator should assess the cost-effectiveness of the SGIP and Net Metering Program.* In response to legislative mandates, the Commission has taken a number of actions, including calling for development of a DG cost-benefit methodology, as part of Rulemaking 04-03-017. The CPUC Energy Division notes that there is a direct correspondence between net metering above 10 kW and state incentive funding, and for that reason, net metering should be assessed. Evaluators should submit the recommended cost-effectiveness analysis by year-end 2005.

*The commission should retain SDREO as a program administrator through 2007.* While recognizing the costs of non-utility administration, the CPUC staff also recognizes the benefits. It also recommends providing greater administrative authority to SDREO in relation to SDG&E, which currently oversees the SDREO program.

*Specific program changes must be introduced to support administration of new emission and efficiency eligibility requirements that go into effect in January 2005.* The basic design of the SGIP is adequate to accommodate these changes, but the program will be affected.

*Current funding levels should continue through 2007.* This does not preclude changes in overall funding as part of a longer-term exit strategy.

*The Commission should expand participation in the Working Group and create opportunities for participation in other venues.* According to the Energy Division report, its recommended improvements (notably removing the percent-of-project-cost rebate option) "will allow the Working Group to focus on developing a data release format, program exit strategy, and cost-

effectiveness schedule... These activities will benefit from the experience of program and industry participants.”<sup>56</sup>

*Clarify that electric distribution companies should be ineligible to receive SGIP rebates.* Staffing for the SGIP differs with each of the four administrators, based on the relative size of the program and on internal preferences. Each program has one full time employee (FTE), who manages the program, including the Working Group, evaluation, and trade ally relations, marketing, and administrative review. PGE, which administers nearly 50 percent of the funds, has three full-time program employees and a varying number of part-time staff. SDREO, which administers less than 15 percent of the funds, has worked with an administrator and one FTE, but is currently hiring additional help. According to that administrator, 1.5 FTE can usually staff the program adequately, but there have been occasions when extra help is needed.<sup>57</sup>

Details on financial auditing were not available. Those interviewed reported only that the program was audited according to standard practice.

Exhibit 2.1-11 summarizes measurement and evaluation activities budgeted for Program Years 1 through 4 (2001-04), under the direction of the CPUC.<sup>58</sup> Specific data-collection, analysis, and reporting tasks were divided among the program administrators and two selected consultants.

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<sup>56</sup> *Ibid.*, p. A-20.

<sup>57</sup> Interview with Kevin Anders, SDREO, July 21, 2004

<sup>58</sup> Source: Exhibit 2-5 from *Self-Generation Incentive Program Second Year Process Evaluation*, p. 2-8

**Exhibit 3.1-11: Measurement and Evaluation Activity Summary**

Program Year	Process Evaluation	Impacts Evaluation	Thermal Monitoring Systems	Administrator Comparison	M & E Activities Added by D 02-09-051	Total Annual M & E Budget
PYI (2001)	\$452,038	\$0	\$544,279	\$0	\$0	\$996,317
PYI (2002)	\$250,000	\$329,058	\$413,456	\$90,170	\$223,200	\$1,195,884
PYI (2003)	\$0	\$345,511	\$389,898	\$0	\$130,280	\$865,689
PYI (2004)	\$0	\$362,786	\$153,085	\$0	\$134,360	\$650,231
Subtotals	\$702,038	\$1,037,355	\$1,500,718	\$90,170	\$377,840	\$3,708,121
Total M & E Net Generator Output and Natural Gas Metering Costs (see Exhibit 2-4)						\$2,140,495
Total M & E Estimated Budget for the Authorized Program Period:						\$5,848,616

Specific program measurements are provided in the evaluation reports. Three reports (evaluating impacts, process, and administration approaches) have been submitted by evaluators to date. The contract administrator for these evaluations was SCE, though the reports were, in turn, submitted to the CPUC. Itron is currently engaged in one more evaluation, which will focus on system performance and the relationships among utilities, customer, vendors, and other players after the systems become operational. The evaluation will shed light on issues such as how the Rule 21 Interconnection Standard is being implemented and to what effect. This evaluation will be completed by the end of 2004.<sup>59</sup> Specific monitoring activities, required under CPUC Decision 02-09-051, are ongoing.

The CPUC utilizes monitoring and evaluation reports as well as stakeholder input and staff analysis in periodic rulemaking procedures related to distributed generation and/or to the SGIP in particular.

CITY OF LOS ANGELES -LADWP RENEWABLE ENERGY PROGRAMS

The City of Los Angeles has a mixed reputation for renewable energy development. Its *Green Power for a Green LA Program* repeatedly ranked as one of the top green power marketing programs in the U.S., according to NREL.<sup>60</sup> High-profile PV installations and a solar incentive program that began relatively early put Los Angeles in the spotlight. Within the state of California, the LADWP program is the fourth-largest PV incentive program (i.e., next in size after the CEC, CPUC, and SMUD programs). LADWP has 12 percent of all the incentive-driven solar PV in the state, a total of 9 MW.<sup>61</sup>

<sup>59</sup> Interview with Brenda Gettig, Itron, Inc., August 17, 2004.

<sup>60</sup> See [www.eere.energy.gov/greenpower](http://www.eere.energy.gov/greenpower) for rankings of utility green power programs by sales, customers, and other measures.

<sup>61</sup> Presentation by Tim Tutt, CEC Renewable Energy Program, June 8, 2004 to the Joint Committees Workshop before the California Energy Resources Conservation and Development Commission.

Nevertheless, LADWP has been subject to controversy because the utility has remained dependent on conventional resources. In 2002, LADWP claimed 8 percent renewable energy in its portfolio, but this was almost all large hydropower. A City Controller's audit of the *Green Power for a Green LA Program* revealed that little of the revenues collected specifically for the Green Power program actually went to purchase renewable energy.<sup>62</sup> In discussions with the CEC, CPUC, and pro-renewables stakeholders, LADWP argued that the utility has its own generation resources, adequate to serve 117 to 123 percent of its native load through at least the next decade. Its 2000 Integrated Resource Plan (IRP) called for meeting load growth with a combination of energy efficiency and renewables, but in light of supply and demand forecasts, the need for new renewables seemed slight.

Stakeholders, including Environment California ([www.environmentcalifornia.org](http://www.environmentcalifornia.org)), launched a campaign to counter the utility's stand. A 2003 study indicated that Los Angeles could cost-effectively meet up to 20 percent of its needs with renewable energy by 2012.<sup>63</sup> The City initiated plans to meet the public-policy goal of complementing the statewide RPS, while using the most cost-effective means possible.

On June 29, 2004 the City Council approved a resolution asking LADWP to adopt an RPS by the end of 2004. In the resolution, LADWP was directed to meet a 20 percent renewable portfolio goal by 2017. It also set an interim target of 13 percent by 2010. Arguments for the RPS included not only meeting a growing need for energy, but also advancing clean-air goals and stimulating the local economy. The City's plan to formally adopt an RPS includes the following:<sup>64</sup>

- ◆ LADWP will issue a Request for Proposals to develop a significant amount of renewable energy resources;
- ◆ The utility will solicit feedback from stakeholders on the costs and benefits of renewable resource acquisitions;
- ◆ The City will complete an independent review of the resulting plan and subject the plan to an annual compliance audit; and
- ◆ LADWP will implement a renewable surcharge (in addition to the current public-benefits programs charge) to recover the anticipated additional costs for renewable energy.

Many aspects of the RPS plan have not been determined yet. For example, utility strategy depends largely on whether or not large hydro will be defined as a renewable resource under the RPS. (It is not accepted as a renewable resource under the statewide RPS.) The rate impacts of the utility's RPS plan may also be contentious.

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<sup>62</sup> Audit findings cited in *Report on the Department of Water and Power RPS Programs*, from the Chief Legislative Analyst, December 9, 2003, p. 11. These findings were covered extensively in the utility trade press at the time of the audit. The utility took corrective action.

<sup>63</sup> *Clean Energy at the Crossroads: Charting the Potential for Renewable Energy in Los Angeles*, Environment California, March 2003. See [www.environmentcalifornia.org](http://www.environmentcalifornia.org).

<sup>64</sup> General and detailed information on the LADWP RPS plan are at [www.ladwp.com](http://www.ladwp.com), search "Renewable Portfolio Standard."

In July 2004, LADWP issued an RFP for renewable energy resources, in keeping with the RPS plan. The RFP called for 1,320,000 MWh of power annually produced from renewable sources by the end of 2010. The RFP described the utility's plans to develop and own these resources. It requested proposals for tapping a range of renewables, including hydropower, wind, geothermal, biomass, solar, and others.<sup>65</sup>

These resources will add to the renewables acquired under the utility's IRP. Those include a 120-MW wind project and an agreement to purchase 40 MW annually from a green-waste digester project. Other projects underway include a hydro facility upgrade and a complex of landfill-based microturbines.

### ***LADWP Solar Rebate Program***

The LADWP Solar Rebate program is funded through public benefit funds collected from all ratepayers. The burden amounts to 2.85 percent of LADWP's retail Power Fund Revenues, plus interest earned on those funds. A total of more than \$330 million was collected in fiscal years 1998-2003. Exhibit 2.1-12 indicates program categories and funding.

The utility has had a solar rebate program in place since 2000, when Commissioners approved funding totaling \$150 million through 2011. Prior to the current (August 2004) guideline revision, the program offered rebates of \$3.50 per Watt for most systems, and \$5 per Watt for systems manufactured locally. As of July 2004, the program had incentivized more than 8.5 MW of customer-installed systems.<sup>66</sup> In addition, the City installed 756 kW on public facilities, for a total solar installation of 9.3 MW.

High demand for the program resulted in the depletion of annual funds and program closure in June 2003. Reauthorization of funding in June 2004 included revisions to the program aimed for implementation in August. These include reducing the incentive, introducing three categories of applications, and other changes discussed below. However, it is important to recognize that funding for the 2004-05 program is not even adequate to serve customers that are currently on the program waiting list.

### **Exhibit 3.1-12: Public Benefits Funding, FYE 1998 – 2003**

<b>Program Category</b>	<b>Funding (Million \$)</b>
Demand-side management/efficiency	\$ 80.8
Renewable technology	\$ 55.8
Research and development	\$ 60.9
Low-income subsidy	\$130.6

<sup>65</sup> "Los Angeles Issues Renewable Energy RFP," July 8, 2004, SolarAccess.com news. The RFP is posted on [www.ladwp.com](http://www.ladwp.com).

<sup>66</sup> Data source [www.dsireusa.org](http://www.dsireusa.org).

Program operations/administration	\$ 6.7
Total:	\$334.8

Source: Report on the Department of Water and Power RPS Programs, from the Chief Legislative Analyst, December 9, 2003 p. 9.

In 2003, the Board of Water and Power Commissioners voted to extend public benefits program funding to 2012, for an additional \$550 million.

In June 2004 the Board approved funding specifically for the solar program, allocating \$79 million from FY 2004-05 through 2010-11. Of this, it directed use of about \$50 million for incentive payments. Funding for incentive payments in 2004-2005 is \$7.1 million. The size categories and anticipated funding shown in Exhibit 2.1-13 were specified, but the Board authorized LADWP to reallocate funds from category to category as necessary.

**Exhibit 3.1-13: Proposed Rebate Funding 2004-05, by Category**

Size Category	Funds Allocated by %	Funds allocated (\$millions)*	Est. No. of Applications	Est. Capacity Installed (kW)
< 30 kW	20%	\$1.4	66	375
30 – 100 kW	30%	\$2.1	12	632
> 100 kW	50%	\$3.6	8	1,139
Totals:	100%	\$7.1	86	2,146

\*An additional \$0.75 million has been allocated for installations on affordable housing.

Funding was approved August 17, 2004 for FY 2004-05. The rebate program is authorized through 2011, but funding is only in effect for the current year. Staff expects funds to be fully expended by applicants that already on a waiting list. The waiting list includes 523 applicants, representing 18,400 kW of PV.<sup>67</sup>

Applicants on the waiting list since 2003 will be asked to confirm their interest on a first-come, first-served basis. Once applicant interest is confirmed, the applicant must follow the process detailed in the program guidelines, including new and amended rules.<sup>68</sup> This includes applicants who may have completed a solar installation since they first applied to the program. Guidelines note that communication will be with the customer, not the installer or contractor, so that customers may reassess their vendor relationships as they deem necessary. Process steps are summarized below.

1. Applicants on the waiting list receive a conditional reservation.

<sup>67</sup> Data source: LADWP Approval Board Letter, August 2, 2004. Status confirmed by interview with Paul Costa, Solar Rebate Program Manager, August 25, 2004.

<sup>68</sup> LADWP Solar Incentive Program Guidelines, August 2004, published as Attachment 1 to LADWP Approval Board Letter, August 2, 2004.

2. If applicants choose to participate, they must return the conditional reservation confirmation within 90 days, including a copy of the purchase order with documentation indicating a 10 percent down payment and/or documentation of electric permit applications. Large projects over 100 kW must submit plans and additional documentation.
3. Project applicants receive a reservation request form. This form requests additional project information, including confidential taxpayer information needed for rebate payment. The reservation period will generally be six months for projects under 30 kW and 12 months for projects equal to or larger than 30 kW. A three-month extension may be granted upon request.
4. After the reservation confirmation is completed, the customer or contractor must contact appropriate LADWP personnel to begin inspections. Three inspections are required before the PV system may be placed in service. These include Building and Safety, LADWP Solar Inspector, and LADWP Electrical Service Representative inspections. These inspections are prerequisite to the interconnection agreement.
5. Once the eligible PV system is placed in service, the applicant may submit a payment claim. This follows at least one final inspection. LADWP reserves the right to perform additional inspections and verifications. The final payment claim includes confirmation of the reservation amount, documentation on the system equipment installed, and documentation of any modifications. Attachments include final building permit and signoff, final invoices, interconnection application, and for new sites, a copy of the utility bill from the site of service at the time of reservation.
6. Applicants wishing to receive the higher incentive for locally manufactured equipment must submit additional documentation. A minimum of 50 percent of modules and equipment must have been manufacturing in Los Angeles in order to qualify for this incentive. Some substitution of equipment from outside Los Angeles is allowed, if the company also manufactures the same kind of equipment locally.

PV systems of all sizes are targeted. In addition, \$750,000 in incentives is set aside for affordable housing projects.

Notably, the program expects to spend 50 percent of funds on large solar projects greater than 100 kW. Seventy percent of program funds are tentatively allocated for projects equal to or greater in size than 30 kW. According to staff, it is expected that many of these projects have applied or will apply to the CPUC Self-Generation Incentive Program, administered for the CPUC through SoCalGas, a Los Angeles-area utility.

The Program anticipates that customers will use both the LADWP rebate and the SoCalGas rebate, to the extent possible. LADWP guidelines cap maximum payment at 50 percent of project

cost for projects 30 kW or larger, regardless of the incentive level.<sup>69</sup> Staff indicated that before this program change, some applicants were able to incentivize 85 percent or more of project cost. This should no longer be a problem.<sup>70</sup>

Details regarding system eligibility are included in the *LADWP Solar Incentive Program Guidelines*, August, 2004, available from the LADWP.

Eligible PV systems may be sized no more than 100 percent of the average annual electricity consumption as shown on the LADWP billing record for the two years prior to application. New construction eligible system size will be estimated based on available data.

System components and the entire system must meet national standards. A list of prequalified components is provided on the utility Website, [www.ladwp.com](http://www.ladwp.com). Types of components include PV cells, modules, mounting or tracking structures, wiring, inverters, performance meter, foundation (for free-standing systems) and utility-required interconnection equipment. Systems must carry a five-year minimum warranty. They must be installed at the customer's premises, in accordance with the utility's interconnection agreement, and a separate performance meter is required.

Exhibit 2.1-14 summarizes incentives provided for PV systems under this Program. Note that the incentive is based on output according to standard PV test conditions (PTC), less the following losses:

- ◆ Actual rated inverter loss per CEC listing
- ◆ 13 percent losses for wiring and other performance losses

The calculation for applicable energy output is:

$$\text{Panel PTC value} \times 0.87 \times \text{Inverter losses} = \text{Expected Watt Output}$$

**Exhibit 3.1-14: Incentives for LADWP Solar Program\***

Capacity < 30 kW <sub>e</sub>	Capacity 30 kW <sub>e</sub> and above
\$3.50 / Watt PTC (base incentive)	\$3.25 / Watt PTC (base incentive)
\$1.00 / Watt PTC (only for local mfctr)	\$0.75 / Watt PTC (only for local mfctr)
\$4.50 / Watt maximum incentive	\$4.00 / Watt maximum incentive
Estimated maximum after losses: \$3.48/W	Estimated maximum after losses: \$3.27/W

\*Some conditions apply. See *LADWP Solar Incentive Program Guidelines*, August 2004.

<sup>69</sup> Interview with Paul Costa, Solar Rebate Program Manager, August 25, 2004. Costa indicated that both the Self-Gen Program and the LADWP Program aim to close loopholes that in the past inadvertently allowed customers to incentivize more of the project than either program intended.

<sup>70</sup> Interview with Paul Costa, Solar Rebate Program Manager, August 25, 2004.



The LADWP Solar Program staff communicates on a fairly regular basis with staff at the CEC, involved in implementing the California Emerging Renewables Program. That program, for customers of IOUs, is similar to the LADWP Solar Rebate Program. More important, the LADWP staff communicates with the staff of the CPUC Self Generation Incentive Program, administered in the Los Angeles area by SoCalGas. That program serves customers installing systems of 30 kW or above, a category that is also covered by the LADWP program.

Specifically with regard to the rebate program design, the Board of Water and Power Commissioners has instructed LADWP staff to work in collaboration with interested stakeholders (primarily the solar industry) in revising the incentive so that it will be based on actual system performance. This program revision is due in time for 2005 to 2006 implementation.<sup>71</sup>

As a public-benefit program, the LADWP Solar Rebate Program relates in some direct ways to other LADWP public-benefit programs. For example, when the utility Board increased long-term funding for the solar rebate program in 2003, other public-benefits-funded renewable energy programs suffered a loss in long-term funding.<sup>72</sup> Under the 2004 RPS initiative, LADWP expects to pursue additional funding besides current public-benefits funding in order to support a more robust renewable energy effort. This may take the form of an additional universal fee.

To date, the solar rebate program has operated separately from the utility's other renewable energy development programs, including the solar development program. That program funds solar installations on public buildings and solar research and demonstration. The rebate program and R&D Program jointly assess project results, such as tracking and assessing the actual performance of solar installations.

In addition, LADWP has had a significant research and development program focused on non-solar DG. Both renewable resources and natural gas are used in a variety of DG technologies. In April 2004, the utility won an Environmental Achievement Award from the U.S. EPA for its Fuel Cell Demonstration Program. Under this Program, LADWP has installed 1 MW of fuel cell generation capacity, including four molten carbonate fuel cells in both commercial-building and wastewater treatment plant settings.<sup>73</sup>

Solar installers working in Los Angeles must attend a one-day PV installation workshop that is coordinated by LADWP, with contractor support. Contractors must be licensed in the State of California. Customers planning to self-install also must attend the workshop. The workshop is repeated several times per year

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<sup>71</sup> LADWP Approval Board Letter, August 2, 2004, p. 2.

<sup>72</sup> Report on the Department of Water and Power RPS Programs, from the Chief Legislative Analyst, December 9, 2003, p. 10.

<sup>73</sup> See distributed generation activity summaries on [www.ladwp.com](http://www.ladwp.com), and "LADWP Honored by EPA for Fuel Cell Program" press release, April 20, 2004.

Equipment and installation guidelines are geared toward quality assurance. See discussion above. Interconnection guidelines, including required inspections, are also geared to ensure proper and safe system operation.

In addition, the reservation process requires a solar site analysis. Daytime shading (9 a.m. to 3 p.m. PST and 10 a.m. to 4 p.m. PST) is limited to 10 percent.

Verification is performed on all installations. Performance meters are required, and data are compiled for various research and reporting efforts.

Program outreach has been minimal, especially since over-subscription to the Program in 2003. Media attention to the LADWP RPS issue and to statewide solar incentive issues has resulted in coverage of the LADWP Solar Rebate Program as well as other Los Angeles renewable-energy program activities.

Changes from the program that closed in 2003 to the current program include the following:

- ◆ The creation of three categories for systems of different sizes, plus a category for qualifying affordable housing projects, consistent with Housing Department policies;
- ◆ The authorization of changes in allocations to these categories, based on need, and authorized LADWP to fine-tune non-substantive, technical program guidelines without external review;
- ◆ The reduction of the base incentive from \$4.50/Watt to \$3.50/Watt for smaller systems and \$3.25 for systems 30 kW and larger. The additional reduction for larger systems reflects their eligibility to also apply for the CPUC Self Generation Incentive Program;
- ◆ The reduction of the local manufacturers' incentive from \$1.50/Watt to \$1/Watt for smaller systems and \$0.75/Watt for systems 30 kW and larger;
- ◆ The addressing of system performance issues by de-rating system output, based on inverter losses and losses related to wiring, soiling, mismatch, and other factors;
- ◆ The requirement that performance meters be installed for all systems;
- ◆ The reduction of project completion time to 12 months for systems smaller than 30 kW and 15 months for systems over 30 kW, based on six- and twelve-month reservation periods, respectively; and
- ◆ The establishment of a maximum incentive cap per site or per customer of 200 kW per year.

Most of these changes came as a result of program over-subscription. The experience of the CEC Emerging Renewables Program suggests that program participation will remain high, even at the lower incentive levels. Statewide experience, including local experience, also suggests that maintaining high incentive levels for several years running is not necessarily an effective way to lower solar PV system prices. Volume installations regionally or statewide is apparently

somewhat effective,<sup>74</sup> but incentive program delays and uncertainties have adversely affected the solar industry. Staff acknowledges that this detracts from program impact.

Another secondary focus of these changes is reflected in measures to match the rebates to actual system performance. By 2005 to 2006, the program guidelines must reflect a true performance-based measure, probably relying on performance-metered data.

With regard to program improvements, program manager Paul Costa noted that the internal methods for data collection and record keeping have improved greatly. Data on the program had been filed by customer name, and not by system size, location, or characteristics. This is being corrected. Mr. Costa said that the initial choice of database software is important for any incentive program. The LADWP program is tracked on a simple MS Excel spreadsheet. While that simplified database management when the program was small, it is now inadequate. But making changes in the database system once the program is underway can be time-consuming and risky, Mr. Costa said.<sup>75</sup>

According to Mr. Costa, the program has operated in past years with two full time staff and a varying number of student part-time employees. Due partly to the backlog of preliminary applications, the program may hire another full-time employee. In addition, Mr. Costa noted that a number of utility staff members contribute to program implementation on and as-needed basis. These include promotional and customer-service staff, Building Safety Inspectors, Electric Service Representatives, an in-house verification inspector, and support contractors. Municipal utilities seem relatively better able than other utilities to coordinate staff and to complete a multi-disciplinary project with in-house staff, Mr. Costa noted.<sup>76</sup>

The City of Los Angeles Comptroller has authority to oversee the administration of program funds. The proposed RPS plan includes an auditing provision.

Staff were not aware of any recent program evaluations, although the program is internally monitored. For example, a study of local solar sites with system performance meters yielded noteworthy if disappointing results. According to one internal assessment, the average cost for electricity from Los Angeles PV systems is more than \$0.82 per kWh.<sup>77</sup>

This information led to some of the current program changes. The information is also considered controversial by some stakeholders.<sup>78</sup> The 2003 Report on the RPS from the Los Angeles Chief

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<sup>74</sup> Presentation by Tim Tutt, CEC Renewable Energy Program, June 8, 2004 to the Joint Committees Workshop before the California Energy Resources Conservation and Development Commission. Between 1999 and 2003, prices for PV systems in California decreased by about 10 percent. Price drops during that time in Japan and Germany were more significant, probably due to the size and consistency of their programs.

<sup>75</sup> Interview with Paul Costa, Solar Rebate Program Manager, August 25, 2004.

<sup>76</sup> Ibid.

<sup>77</sup> *Report on the Department of Water and Power RPS Programs*, from the Chief Legislative Analyst, December 9, 2003, p. 11.

<sup>78</sup> See *Clean Energy at the Crossroads: Charting the Potential for Renewable Energy in Los Angeles*, Environment California, March 2003. See [www.environmentcalifornia.org](http://www.environmentcalifornia.org)

Legislative Analyst takes a skeptical view of renewables, especially solar PV, based on cost relative to existing generation resources. Independent program analysis may be useful for checking the conflicting conclusions of city analysts versus stakeholder advocates.

The current LADWP Solar Rebate Program is a temporary solution to a growing problem all over California. The utility has a backlog of “unconfirmed program reservations” valued at about \$109 million.<sup>79</sup> Funding allocated for 2004-05 can only begin to address program demand. However, changes to the program this year will provide useful information for future program funding cycles. The utility is testing improvements that move the program toward a performance incentive. It is also closing the loophole that allowed large customers to use both the CEC SGIP and the LADWP Program to access PV systems at a discount as high as 85 percent or more.

The local manufacturing credit has been decreased, but remains in place, making this one of only a handful of programs with that kind of incentive. The impact of this incentive on the local economy has not been thoroughly assessed.

The relationship of the LADWP Solar Rebate Program to the utility’s overall RPS process will be very important. One internal viewpoint is that solar PV is not cost-effective, and that future funding for the rebate program will preclude other renewables development. Stakeholders have been invited into the RPS-development process and specifically into the process of setting a new performance-based incentive for PV. This will be a challenge for stakeholders, especially working in the more insulated environment of a municipal utility, relative to the publicly supported CPUC and CEC processes.

Some California publicly owned utilities are also major players in renewable energy development. In particular, the Sacramento Municipal Utility District (SMUD) and the Los Angeles Department of Water and Power (LADWP), as noted above, have made significant contributions to the state’s renewable generation capacity, especially in solar photovoltaic development. According to the CEC, the state’s 75 MW of incentivized PV installations are primarily attributable to the CEC (46 percent), the CPUC (17 percent), SMUD (15 percent), and LADWP (12 percent), with the balance of 4 percent dispersed around the state.<sup>80</sup>

Notably, some parts of the state that are served by publicly-owned utilities are far behind the statewide goal for developing renewables or have used a definition of renewables that includes large hydro. The effort to transform energy markets statewide is a major part of current planning to accelerate renewable energy development.<sup>81</sup>

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<sup>79</sup> *Report on the Department of Water and Power RPS Programs*, from the Chief Legislative Analyst, December 9, 2003, p. 15.

<sup>80</sup> Presentation by Tim Tutt, Technical Director of the CEC Renewable Energy Program, June 8, 2004 to the Joint Committees Workshop before the California Energy Resources Conservation and Development Commission.

<sup>81</sup> *Accelerated Renewable Energy Development*, CEC 100-04-003, July 2004, pp. 40-47.

## SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

SMUD is a lead player in renewable energy development in California and worldwide. SMUD is one of the nation's largest consumer-owned utilities, serving about half a million electric customers. The utility's commitment to renewable energy, including wind, geothermal, landfill gas, and small hydro, goes back 20 years. And its long-standing commitment to solar PV is especially strong. It is reportedly the leading solar utility in the world, and it is the third ranking source of PV capacity in California, after the CEC's *Emerging Renewables Program* and the CPUC's *Self Generation Incentive Program*.<sup>82</sup> As of spring 2004, SMUD had 11 MW of grid-tied PVs, representing 15 percent of the state's PV resource.

An updated utility strategic plan, completed in 2004, places a high priority on renewable energy development. According to a July 2004 SMUD Board report, renewable energy development supports the utility's core values of moving toward long-term competitive rates, system reliability, customer satisfaction, and environmental protection. In addition, renewables support SMUD's current emphasis on local benefits, reducing peak demand, a preference for clean distributed generation, and meeting a local RPS of 10 percent renewables by 2006 and 20 percent by 2011.<sup>83</sup>

Notably, the SMUD RPS nearly matches the state's recently accelerated statewide goal of, 20 percent by 2010.<sup>84</sup> California does not require consumer-owned to adopt the statewide RPS, but they are encouraged to adopt compatible goals. SMUD's robust RPS predates the statewide accelerated goal. The utility excludes large hydropower from its RPS, but it notes that if large hydro were included, SMUD could meet a 40 percent RPS goal by 2006. In 2002, it had 115 MW of non-hydro renewables, accounting for about seven percent of its total power-supply resources.

In addition to its RPS-driven renewables acquisitions, SMUD is providing "Green Power" through its *Greenegy Green Pricing Program*. This program offers customers the chance to make payments on their bills to support green power. The program ranks among the nation's top-ten Green Power marketing programs, as reported by NREL.<sup>85</sup>

In June 2004, SMUD announced a solicitation for renewable energy to meet the needs of both RPS procurement and the *Greenegy Green Pricing Program*. The announcement projected the

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<sup>82</sup> Presentation by Tim Tutt, CEC Renewable Energy Program, June 8, 2004 to the Joint Committees Workshop before the California Energy Resources Conservation and Development Commission.

<sup>83</sup> *Sacramento Municipal Utility District: A National Leader in Renewable Energy Development*, released by the SMUD Board of Directors, July 29, 2004. p. 2.

<sup>84</sup> The CPUC, Consumer Power and Finance Authority, and CEC jointly adopted the accelerated RPS in late 2003. See PUC proceeding R.04-04-026.

<sup>85</sup> See [www.eere.energy.gov/greenpower](http://www.eere.energy.gov/greenpower) for rankings of utility green power programs by sales, customers, and other measures.

utility's needs for 2,250 gigawatt-hours (GWh) per year by the end of 2011.<sup>86</sup> SMUD expects to initiate some procurement contracts by early 2005. The solicitation requests both conventional, low-cost renewables projects and innovative "next-generation" projects, including solar energy, biomass gasification, and others.

Because it is consumer-owned, SMUD does not have access to state Supplemental Energy Payments, which IOUs in California are using to subsidize new renewable resource acquisitions.<sup>87</sup> Its own public benefits fund supports a solar hot-water program, solar PV incentives, and new renewables technology development. Yet SMUD is prepared to make significant investments in renewables that are not covered by the public benefits fund or by other special fees.<sup>88</sup> SMUD's non-hydro renewables portfolio currently includes:

- ◆ Wind: 45%
- ◆ Biomass: 22%
- ◆ Geothermal: 26%
- ◆ Small Hydro: 6%
- ◆ Solar: 1%.

Sacramento's approach to PV development is not widely duplicated by other utilities, although it has been extremely effective. A 2003 study by the Solar Energy Power Association (SEPA) notes that "the lessons learned from the implementation of such a significant program as SMUD's do not appear to be adequately documented and reported."<sup>89</sup> The SEPA report cites utility staff turnover and a lack of external program evaluation as reasons why SMUD program data is currently incomplete. For all of its achievements, the utility has taken a relatively low-profile approach to program promotion, outside and within its service territory. In fact, the SEPA report is a prime source for the information presented below, since it represents the only complete outside evaluation of the SMUD program that is readily available.

#### RENEWABLE GENERATION R&D (REGEN) PROGRAM

In addition to the solar program described below, SMUD is engaged in research, development, and demonstration to an unusual degree through its Renewable Generation R&D Program (ReGen). This program was initiated in 2001, with support from the California CEC Public Interest Energy Research (PIER) program. It is funding 19 renewable energy projects.

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<sup>86</sup> "SMUD looking for new block of renewable power," SMUD press release, June 16, 2004. See also, reference to the RFP in *Sacramento Municipal Utility District: A National Leader in Renewable Energy Development*, released by the SMUD Board of Directors, July 29, 2004. p. 5.

<sup>87</sup> See information on statewide RPS implementation at [www.energy.ca.gov](http://www.energy.ca.gov)

<sup>88</sup> This contrasts SMUD with the Los Angeles Department of Water and Power, which is proposing a new universal fee to fund RPS-related renewables investments.

<sup>89</sup> *SMUD's PV Program and Sacramento Markets Report*, SEPA, 2003, Deliverable 1.2.2.1, Contract 4500015118, funded by the SMUD ReGen Program. p. 27.

The PIER program awarded SMUD a \$13.6 million contract to implement renewable energy RD&D. According to SMUD, co-funding from the utility, other funding agencies and participating R&D contractors increased the total program budget to \$24 million.

The program began in 2001. Many of the 19 R&D contracts will be completed in 2004. Some funding is expected to be reallocated from projects that did not continue as originally planned, and that funding will support additional follow-up projects. The program may continue indefinitely, but additional funding from the CEC is not certain.

The ReGen program does not operate as an incentive program. It is aimed at making SMUD a center for renewable energy RD&D, for the utility's own benefit and for the general benefit of the CEC and the solar industry. The 19 projects that were included in the original program budget covered technologies such as wind turbine drive train design, biomass generating systems, concentrating solar power and PV components and systems. Most of the projects pertain to PV. Marketing studies were also included.<sup>90</sup>

According to a July 2004 CEC report, a partial list of ReGen Program accomplishments includes:<sup>91</sup>

- ◆ Developed the first successful building-integrated PV system for the residential new construction market,
- ◆ Developed a non-penetrating, non-ballasted mounting system for commercial-sector sloped roofs,
- ◆ Developed a building integrated PV technology for standing-seam sheet-metal roofs,
- ◆ Made product modifications for better PV production efficiency,
- ◆ Developed the first wind turbine to use multiple generators,
- ◆ Produced a software package that allows SMUD to identify under-performing PV systems, and
- ◆ Funded a state-of-the-art landfill gas generation project.

Some project reports and technology updates from the ReGen Program are available from [www.smud.org](http://www.smud.org).

#### SOLAR RESOURCE ACQUISITION PROGRAMS

Among SMUD renewable energy efforts, its solar energy acquisitions are outstanding. The utility has about 10 MW of grid-connected solar capacity, spread over 900 individual sites. On August 24, 2004, the utility celebrated the twentieth anniversary of its first major solar installation, the PV1 utility-scale power plant at Rancho Seco. On that anniversary, it dedicated the addition of a new solar array at the site. This was the sixth addition to the Rancho Seco solar

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<sup>90</sup> Ibid. p. 14. A list of the original 19 projects is included in this study.

<sup>91</sup> *Sacramento Municipal Utility District: A National Leader in Renewable Energy Development*, released by the SMUD Board of Directors, July 29, 2004. p. 13.

power plant, bringing total capacity there to more than 3 MW. SMUD also operates a 500-kW utility-scale PV system at a substation.

Centralized and grid-based solar PV represents one strategy that SMUD has utilized for solar development. Today, the ReGen program and large-scale solar acquisitions are organized under the Energy Supply Business Unit, while the incentivized residential and commercial solar applications are organized under the utility's Customer Service Business Unit.

### ***Customer PV Programs***

The PV Pioneer model for residential installations is a turnkey installation approach. Initially, under *PV Pioneer I*, the utility owned the systems. More recently, the utility has promoted customer ownership of PV through incentives, which is the predominant approach for solar PV programs worldwide today. Yet SMUD still uses one contractor for most residential retrofits, which are designed according to utility specifications. As of 2004, it uses a buydown of total system cost rather than a set \$-per-Watt incentive. And SMUD has offered to directly finance the non-incentivized portion of system. This is an unmatched level of utility involvement. Total capacity from both *PV Pioneer I* and *II* now stands at more than 5 MW.

The overall goal of the PV Pioneer program is to support the gradual and sustained growth of the solar market in Sacramento. Initially, objectives included:

1. Create opportunities for the utility to gain experience with a PV resource.
2. Develop long-term market development and business strategies.
3. Accelerate cost reductions through sustained bulk purchasing agreements.

As the utility moves close to achieving these objectives, it is focusing more closely on types of installations and market incentives that it believes are most cost-effective and mutually beneficial for the utility and for the customer. Its overall goal has broadened somewhat, pertaining to making the right match between solar resources and utility needs.

For 2004, funding for residential and commercial solar PV incentives was set at \$2.5 million. This was a decrease from the previous year, but SMUD management stressed that improvements in the program design would increase the impact of dollars spent.<sup>92</sup> According to John Bertolino, Superintendent of Renewable Generation Assets, the budget for residential retrofits has been nearly half of the total solar program budget, though SMUD would prefer to put relatively more emphasis on the commercial incentive program. This should be the case in future budget years.<sup>93</sup>

Exhibit 2.1-15 summarizes the overall public benefits fund budget for 2004. The majority of funds for renewable generation apply to PV incentives.

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<sup>92</sup> *Budget Letter to the Board* from SMUD General Manager Jan Schori, November 2003.

<sup>93</sup> Interview with John Bertolino, SMUD Superintendent of Renewable Generation Assets, August 30, 2004.



**Exhibit 3.1-15: 2004 Public Benefits Budget for SMUD (Thousand Dollars)**

Program Type	Customer Business Unit	Energy Supply Business Unit	Total
Energy efficiency	\$ 15,177	-	\$15,177
Low income/life support	\$ 9,906	-	\$ 9,906
Renewable Generation	\$ 1,510	\$ 1,376	\$ 2,886
RD&D	\$ 1,581	\$ 873	\$ 2,454
<b>Totals</b>	<b>\$ 28,175</b>	<b>\$ 2,247</b>	<b>\$ 30,423</b>

Source: SMUD budget summary, [www.smud.com](http://www.smud.com), November 13, 2003.

SMUD initiated the *PV Pioneer Program* in 1993, before the initiation of public benefit funds. It has been subject to annual funding allocations and periodic program changes. The most significant change to the program occurred in 1999, with the introduction of customer ownership and the *PV Pioneer II* designation. Another significant change occurred in 2003-04, with emerging interest in new construction in the residential sector. During this same timeframe, the commercial PV program took a form that more closely resembles the typical California PV buydown strategy. SMUD solar program is subject to annual internal review and modification, but it is expected to continue indefinitely.

Sacramento's solar programs are diverse, and are highly customized. For the residential market, the *PV Pioneers II* retrofit program relies on an initial interview of prospective participants followed by a customer's letter of intent. Once the customer is accepted into the program, the utility and its contractors manage a turnkey installation. As part of the agreement, customers may obtain a low-interest loan from the utility for the portion of the project cost that is not directly incentivized.

The program provides incentives in a first-come, first-served basis, and may run short of funds before the end of a budget year. This occurred in 2003. Current and expected program changes are aimed at reaching an optimal balance between attracting customers and getting the greatest practical benefit per incentive dollar spent.

Targeted sectors have changed over the life of the program. Historically, the *PV Pioneers I* program sought building owners to host solar systems, which were owned and operated by the utility. Customers were asked to pay \$4 per month to participate in the program. The benefits are similar to those presented by green power marketing programs—a chance to support renewable energy on the grid. Customers also benefited from the prestige of making a visible commitment to renewables. The utility shouldered the new-technology risk, providing complete installation and service for the life of the system.

In 1999, SMUD introduced the *PV Pioneers II Program*. The program was similar to the CEC *Emerging Renewables Program*, in that customers would own their systems. However, SMUD specified turnkey systems and bought down the system price rather than providing a dollar-per-

Watt incentive. It also provided a loan for the remaining cost of the system. Customers then qualified for net metering. The program was promoted to all residential customers. Interest increased from 300 letters of intent in 1999, to 2100 letters of intent in 2001.<sup>94</sup> Undoubtedly, the California energy crisis influenced the program's popularity in 2001. As a result, SMUD found itself facing the same kinds of over-subscription challenges that the CEC incentive program faces today.

As of summer 2004, the *PV Pioneer II Program* had not spent down its annual budget, but this is expected to occur by year's end. Subsequently, the program will be redesigned for 2005 as a more conventional and less costly buydown program. Management estimates that 70 residential *PV Pioneer II* retrofits will be completed in PY 2005. In addition, SMUD will increase its focus on new home construction. This is and will remain a first-come-first-served program, provided customers meet participation criteria.<sup>95</sup>

Interested *commercial customers* will find information about PV on the Website. They also may learn about the program through trade-ally marketing channels. Sacramento businesses with natural gas service from PG&E qualify for the CPUC SGI Program. The SMUD commercial customers' Solar Incentive Program follows a process similar to that of the SGI and CEC's *Emerging Renewables* programs.

*New home customers* can find a number of builders in Sacramento that provide energy-efficient and solar-integrated homes. Historically, the program worked with eight production-home builders. That program, called *Solar Advantage Homes*, is currently suspended. It resulted in construction of some 125 homes and townhouses in 19 subdivisions. Currently, SMUD is focused on projects with two large developers that provide Zero Energy Homes (ZEH).<sup>96</sup> The U.S. DOE subsidizes the initial ZEH program, and it is supported by CEC-funded ReGen program research. The utility's goal for next year is to incentivize 90 ZEH projects, to add a third ZEH developer, and to work on transforming the new home market for energy efficiency and PV.

Eligible technologies differ with the specific SMUD solar incentive program.

### **PV Pioneers II Residential Retrofits**

- ◆ Turnkey grid-tied solar installation,
- ◆ Traditional panels and building-integrated PV (roof shingles),
- ◆ Utility buys down installed cost, typically to less than \$7,000,

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<sup>94</sup> *SMUD's PV Program and Sacramento Markets Report*, SEPA, 2003, Deliverable 1.2.2.1, Contract 4500015118, funded by the SMUD ReGen Program. p. 12.

<sup>95</sup> The Database of State Incentives to Renewable Energy ([www.dsireusa.org](http://www.dsireusa.org)) reports that the PV Pioneer II program was suspended in 2003, when its budget limit was reached. Management reports that almost no program promotion was needed in 2004 to ensure robust participation.

<sup>96</sup> Presentation to the CEC on Zero Energy Homes by Stephen Frantz, June 8, 2004.

- ◆ Equivalent incentive is \$3.50 to \$4.00 per Watt,
- ◆ Customer is responsible for financing remaining cost (equivalent to \$3.50/Watt),
- ◆ Utility provides a 10-year, low-interest loan option,

#### **Commercial PV Incentive**

- ◆ \$2.50/Watt incentive,
- ◆ Up to a total of \$250,000,
- ◆ System must be 30 kW or larger,
- ◆ Qualifying guidelines similar to those in the CEC and CPUC programs,
- ◆ Interconnection agreement ensures on-peak benefits,
- ◆ Program is fully subscribed for 2004.

#### **Zero-Energy Home incentive (first-year experience)<sup>97</sup>**

- ◆ Differs per home,
- ◆ Utilize 2 kW of building-integrated PV modules,
- ◆ Utilize SMA 2500 inverter,
- ◆ \$8.75 to \$7.86 per Watt (AC) BIPV modules,
- ◆ SMUD pays equivalent to \$4.75 to \$3.50 buydown,
- ◆ SMUD pays additional energy efficiency incentives,
- ◆ Marketing support to developer (\$20,000 per multi-home project).

**Relationships with other state agencies.** SMUD is a consumer-owned utility. Its customers do not qualify for state public-benefits funded programs, such as the CEC Emerging Renewables Program. However, commercial customers that are natural gas customers of PG&E may qualify for the CPUC Self-Gen program. This creates a potential overlap between the Self-Gen program and the SMUD commercial solar incentive. With relatively few commercial projects (just two this year), SMUD reports no significant conflict with the Self-Gen program.

SMUD customers also benefit from state tax credits, property tax exemptions, and programs that are not reliant on investor-owned utility public benefit funds.

The SMUD ReGen RD&D program is funded largely by the CEC, and this includes funding that supports PV incentive program refinements and the ZEH program.

Notably, the CEC and CPUC view the SMUD program as a possible prototype for a statewide solar new-construction effort. The increasingly likely possibility of a state law that would mandate a percentage of California homes to include solar and/or provide builder incentives

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<sup>97</sup> Ibid. Note that cost per Watt is expected to decrease further, as SMUD reports the cost is very sensitive to volume purchases. This data is based on June, 2004 data; the SMUD ReGen program will continue monitoring.

would have a significant impact on the SMUD program. SMUD views the impact of statewide solar home standards as for the most part positive. The unsettled issue of whether these homes must comply with Title 24 energy-efficiency requirements could be contentious, however. The SMUD ZEH approach obviously incorporates both solar and energy efficiency.

**Relationships with other stakeholders.** Changes in SMUD PV Pioneers program have been greatly influenced by stakeholders, including solar manufacturers, suppliers, and installers. In its early years, the program addressed inadequacies in the solar supply chain by providing a complete turnkey approach, including sales, supply, installation, and operation. The utility also established direct relationships with local building agencies, which helped to streamline the permitting and inspection process.

As the solar market began to mature, stakeholders complained that they were not able to compete in the Sacramento market. Some stakeholders argued that SMUD's suppression of prices made it difficult for solar companies that did not have the benefits of vertical market integration to match SMUD's prices.<sup>98</sup> The current (PV Pioneer II) model is more flexible, but it still uses one main contractor and a handful of secondary contractors (to meet atypical needs). The ZEH program similarly is tightly controlled. It involves just two (soon to be three) developers.<sup>99</sup>

Many stakeholders recognize the benefits of the SMUD program in terms of regional market development, at the same time as they recognize the above-mentioned drawbacks. The SMUD program has helped to build the California solar market, and it paved the way for other solar incentive programs throughout California and nationwide. The CPUC Self-Gen program, which now serves Sacramento-area natural gas customers, broadened the market for solar PV in the region. The SMUD commercial PV incentive program is now open for participation from range of solar businesses, and the PV Pioneer II program will institute a similar open-market approach next year.

**Coordination among the ReGen RD&D Program and solar implementation programs.** The ReGen program has evaluated specific technologies and approaches that have been or might be used in Sacramento solar installations. The program also provides a basic (if minimal) source of funding for SMUD program evaluation.

Coordination between SMUD energy-efficiency incentives and solar incentives in implementing the ZEH program. SMUD solar programs are increasingly viewed as peak-load-management tools, more likened to demand-side energy efficiency programs than to conventional resource acquisitions. This is a problematic viewpoint, as the utility looks ahead to placing more and more

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<sup>98</sup> *SMUD's PV Program and Sacramento Markets Report*, SEPA, 2003, Deliverable 1.2.2.1, Contract 4500015118, funded by the SMUD ReGen Program. Also confirmed through communication with Dan Pelligrini, Cooperative Community Energy.

<sup>99</sup> Interview with John Bertolino, SMUD Superintendent of Renewable Generation Assets, August 30, 2004.

solar generation on the system. At the same time, this reflects the utility's philosophy that it is providing energy services, not merely kilowatt-hours.<sup>100</sup>

Coordination with SMUD energy efficiency rebate programs in general matters. For example, a solar water heating incentive is managed under the energy efficiency rebate program.

**Training and Quality Assurance/Quality Control Activities.** With the transition from a turnkey program to a more conventional dollar-per-Watt incentive, management expects to need contractor and customer training and education. These activities are expected to begin next year (2005).<sup>101</sup>

The structure of the program as a turnkey approach provided excellent quality assurance and quality control. For the PV Pioneer program, customers that satisfy basic qualifications (screened by customer service representatives) then meet with a SMUD Solar Specialist. This utility representative completes many of the process steps that competitive solar suppliers might otherwise complete: site assessment, structural analysis, system design, and contract development. This eliminates many common errors, including absent-minded mistakes and estimates that might be geared to make a sale.

SMUD turnkey project specifications are based on field experience. Even before the ReGen program, SMUD evaluated field performance of various PV-system components and configurations.<sup>102</sup> Working directly with manufacturers, SMUD helped to design state-of-the-art building-integrated solar (BIPV) modules that set the standard for this technology. According to the SEPA assessment, the program now uses standard installation practices and "simple, low cost, flexible mounting hardware and design layouts," which minimize labor costs while ensuring a degree of quality. Because the program relies on similar system designs for most installations, SMUD can use some factory pre-assembly. This results in lower cost and higher quality installations.

SMUD oversees installer training and works closely with local building permit and inspection agencies. It implements the SMUD interconnection agreement, which was designed under a clear understanding of the types of PV systems and conditions that were likely in Sacramento. In fact, SMUD staff played a strong role in developing the IEEE and UL interconnection standards. SMUD also initiated system warranty requirements in the 1990s, as part of its specifications. Details of the site inspection process were not readily available. A more conventional approach, with guidelines similar to those of the CEC *Emerging Renewables Program*, is expected when the program shifts to a "per-Watt" buy down model in 2005.

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<sup>100</sup> Ibid.

<sup>101</sup> Ibid.

<sup>102</sup> Typical research questions posed for ReGen include testing different building-integrated PV mounting approaches, different panel mounting approaches for flat roof installations, testing PV in worst-case weather conditions, and carefully examining the performance characteristics of different systems and sites.

The SMUD approach to quality control has had some drawbacks. Many observers believe SMUD overstepped its role in quality and price control when, in 1998, it implemented a contract with a solar manufacturer to build a factory locally, to supply *PV Pioneer Program* needs. According to the plan, the facility was to sell 20 to 25 percent of its output to SMUD. The project also promised 100 jobs at the plant and more jobs up the manufacturing supply chain. The factory opened in 2001, but it never met expectations for product cost or quality, and eventually it closed.<sup>103</sup>

SMUD's exclusive relationship with contractors has also had some bad effects. Until the CPUC SGI Program began to serve the Sacramento area, the SMUD program was literally "the only game in town" for solar distributors and installers, and any one that did not win a multi-year contract with SMUD had little chance of local work in Sacramento. According to management, SMUD considers the liability related to direct PV installations to be a drawback as well.<sup>104</sup>

As noted, the PV Pioneers and commercial solar programs require little marketing and outreach at the present time.

The ZEH program component includes providing \$20,000 in marketing support to participating developers. This covers costs such as materials, advertising, and trade show participation. While the homes are well received so far, the ZEH feature is an add-on. Homebuyers still consider energy-saving features as comparable, if not secondary, to other expensive features (custom countertops, high-end flooring), so mass marketing requires investments from homebuilders and SMUD.

As described above, the SMUD solar program has undergone major changes since the 1990s, and it is about to undergo more. Besides the shift to a more conventional dollar-per-Watt buy down approach, the most significant change has been a shift in focus to new construction.

There are many reasons for this shift. The savings in transaction costs from working with a few developers versus many individual homeowners is significant. The cost for new solar construction versus retrofit installations is also much lower. SEPA reported that Sacramento builders can install the SunSlate BIPV on new homes for \$1.00 to \$1.40 per Watt, versus \$2 per Watt for a typical retrofit.<sup>105</sup>

In addition, SMUD recognizes that the market for retrofit applications is beginning to mature. According to SMUD's Superintendent of Renewable Generation Assets, the industry needs a new strategy to end the cycles of over-subscription and budget shortfalls in conventional

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<sup>103</sup> *SMUD's PV Program and Sacramento Markets Report*, SEPA, 2003, Deliverable 1.2.2.1, Contract 4500015118, funded by the SMUD ReGen Program.

<sup>104</sup> Interview with John Bertolino, SMUD Superintendent of Renewable Generation Assets, August 30, 2004.

<sup>105</sup> *SMUD's PV Program and Sacramento Markets Report*, SEPA, 2003, Deliverable 1.2.2.1, Contract 4500015118, funded by the SMUD ReGen Program. p. 16.

incentive programs. It is likely that the PV Pioneers II program will experience just that situation next year, when it shifts to a more conventional buydown model.<sup>106</sup> However, that program will undergo changes as rebate incentives are lowered. The new homes program is self-limiting, based on the number of participating developers. The currently proposed statewide quota system and builder-incentives for new solar homes would, if passed, boost the SMUD program. Under those conditions, the program eventually could deliver PV and energy efficiency to meet a significant portion of new load growth in the residential sector.

To the extent that it can, SMUD is also interested in building the commercial PV program. With only two installations in 2004, the program is already fully subscribed. This is partly because SMUD shifted funds from the commercial program to the PV Pioneers program, to serve a backlog of applications. Reportedly, the utility would like to shift emphasis back. Again, a driving reason would be the lower transaction cost and (in this case) lower incentive per Watt for commercial installations.

The PV Pioneers program currently requires three full-time staff. It also has one installation firm on a major contract, and several other firms on small contracts to perform specialized functions. Staff will be reduced next year, when SMUD shifts to a more conventional buydown model. It anticipates completing 70 solar home installations with two or fewer full-time employees.

The commercial PV program requires a less-than-full-time program manager. This is because the program serves relatively few commercial customers, and because the program does not require turnkey project management.

The ZEH program requires a full time program manager to interface with builders and to coordinate with the RD&D program support. Additional support staff assist with aspects of the program. For example, technical consultations may draw on staff from distribution engineering. Management indicates that the staff is flexible within SMUD business units and that other utility departments' employees provide a great deal of assistance and support on everything from basic customer service to completing interconnection arrangements and agreements.

The SMUD solar program reflects the complexity of solar market transformation. Early on, the program focused on centralized and large-scale projects, as a means of gaining experience with the technology and of priming the industry.<sup>107</sup> The PV Pioneer program gave the utility experience with distributed PV, and it created a low-risk opportunity for customers to support the technology. When SMUD introduced a customer-owned option, it packaged a turnkey installation with an incentive and loan option, to make PV simple and (for many customers) affordable. Relatively long-term supply contracts helped to push prices down, but SMUD

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<sup>106</sup> At \$3.50/Watt, the planned rebate will be higher than the CEC Emerging Renewables Program rebate, per interview with John Bertolino.

<sup>107</sup> Large installations account for about half of Sacramento's solar capacity. Besides installing systems at Rancho Seco and a large substation, SMUD has several projects in the community (public buildings, carports, etc.), which were not detailed in this report.

recognized limitations in this strategy, especially with the failure of its solar manufacturing agreement.

The overall success of SMUD's solar program cannot be denied, but success requires constantly reassessing program strengths and needs. SMUD recognizes the long-term need for solar to "make sense" to utilities if it is to become a significant resource in the future.<sup>108</sup> The utility has made strides in understanding the effect of PV on controlling or reducing peak loads, and it has examined other benefits of distributed solar.

The integration of the SMUD solar-incentive program with the ReGen RD&D program is an advancement. The ReGen program has greatly informed SMUD's program, both in the short run and for longer-term planning. The fact that ReGen is funded in large part by the CEC also creates a much-needed link between the utility's program (which some stakeholders complained was insular) and the broader community of solar technology and market development.

## 3.2 New York

New York has a relatively uniform solar resource for both flat plate collectors (PV and solar thermal) and concentrating solar collectors. Across New York, the energy density is between 3.5 and 4.0 kWh<sub>t</sub> /m<sup>2</sup>/day. The resources available for concentrating solar collectors are fair, ranging between 3.0 and 3.5- kWh<sub>t</sub> /m<sup>2</sup>/day. Many transmission congested areas of New York State that could benefit most from local electricity generation due to well-documented load pockets (e.g., New York City). The performance of PV, concentrating, and solar thermal systems may be reduced by the high levels of air-born particulates and smog.<sup>109</sup>

New York's onshore wind potential is fair to superb throughout the state, with onshore power densities ranging from 0 to 200 W/m<sup>2</sup> to more than 600 W/m.<sup>2</sup> These densities correlate to Class 1 through 6 wind resources (the wind map for New York was generated from measurements at 65 meters instead of the standard 50 meter measurement) making New York ideal wind project development. The strongest of these wind resources are in the Adirondack Mountains, in the higher elevations between New York and Albany, and along the coast of Long Island and the Great Lakes. The wind resources along Long Island offer some of the best offshore potential off the Eastern United States. These resources may provide opportunities for relieving the area's pernicious transmission congestion by providing generation close to the greater New York Metropolitan Area load pocket without competing for high value real estate.<sup>110</sup>

New York has a strong agricultural community, dominated by its dairy industry. Wastes from dairy operations provide a rich energy source that can be used to produce methane using anaerobic digesters. In cooperation with the U.S. EPA's AgStar, NYSERDA has actively promoted anaerobic digester technology programs. New York, with its strong chemical

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<sup>108</sup> Presentation to the CEC on Zero Energy Homes by Stephen Frantz, June 8, 2004.

<sup>109</sup> [http://www.eere.energy.gov/state\\_energy/tech\\_solar.cfm?state=NY](http://www.eere.energy.gov/state_energy/tech_solar.cfm?state=NY)

<sup>110</sup> <http://truewind.teamcamelot.com/NY/>



industries and abundant farmlands, has an opportunity for developing energy crops. NYSERDA has taken steps to actively promote agricultural feedstock for energy generation for the chemical industries.

A 1999 state level analysis conducted by the Oak Ridge National Laboratory (ORNL) provided estimates of the available dry tons of a biomass fuel at several price points. See Exhibit 2.2-1.

**Exhibit 3.2-1: New York Biomass Resources<sup>111</sup>**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	933,000	1,360,000	1,746,400
Mill Residues (sawing, milling, lumber)	28,000	495,000	1,274,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	129,515	129,515
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	0	3,388,035

REGULATIONS PERTAINING NET METERING

Through legislation enacted in 1997 and amended in 2002, net metering became available in New York for residential and farm systems. On a monthly basis, excess electricity generation is credited to the next month’s bill at the same rate paid for electricity used. At the end of the 12-month period, excess generation is credited at the utility avoided cost for that generation. Eligible technologies are listed in Exhibit 2.2-2.

**Exhibit 3.2-2: Eligible Technologies**

Technology	Size
Solar Residential	≤ 10 kW
Wind Residential	≤ 25 kW
Farm Biogas	< 400 kW
Farm Wind	≤ 125 kW

<sup>111</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

## REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTIONS

Since 1997, New York has allowed grid interconnection for distributed generation systems. In 2002, through amendment SB6592, the rules were expanded to include farm systems that use anaerobic digesters to generate electricity. Interconnection must follow IEEE standard 929-2000 and the New York State Public Service Commission's (PSC) interconnection requirements. The 11-step process for grid interconnection can be simplified by installing type-tested systems approved by NYSERDA.

## STATE TAX INCENTIVES

### *Green Building Tax Credit Program.*

Established through state legislation in 2000, this \$25 million corporate tax credit program provides credits to building owner/tenants who implement energy efficiency measures that increase energy efficiency, improve indoor air quality, and reduce environmental impacts through the use of renewable energy technologies, such as passive solar space heat, solar water heat, solar space heat, PV, fuel cells, and daylighting.

### *Solar and Fuel Electric Generating Equipment Tax Credit*

Established through legislation in 1997 in NY Tax Law Article 22, this personal tax credit provides residents with 25 percent or up to \$3,700 for the cost and installation of solar electric systems and 20 percent or up to \$1,500 for the cost and installation of fuel cell systems.

### *Solar and Wind Energy Systems Property Tax Exemption*

Enacted and recently amended in 2002, Property Tax Law Title 2, provides tax exceptions for solar, wind, and most recently farm waste electric generating systems.

## RENEWABLE ENERGY PORTFOLIO STANDARDS

Originally announced in January of 2003 by Governor George E. Pataki in a speech in which he promised to "make New York a national leader in renewable energy use," the governor pledged to support a requirement that 25 percent of the state's energy be provided by renewable energy sources by 2013. On September 24<sup>th</sup>, 2004 the New York PSC adopted the standard. This decision will allow New York State to develop and increase the use of renewable energy technologies while reducing air pollution and utility grid congestion.<sup>112</sup> It is expected that New York will attain 10 percent by 2005, 20 percent by 2010, and finally 25 percent by 2013.

## RENEWABLE ENERGY PROGRAMS

The New York Energy and Research Authority (NYSERDA) and the Long Island Power Authority (LIPA) administer New York's renewable energy programs. These two organizations

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<sup>112</sup> <http://www.eany.org/pressreleases/2004/060304.html>

work closely to coordinate programs and offerings to eligible participants. This section reviews programs offered by both entities.

## NYSERDA

In June, 2004, Governor George E. Pataki announced that \$15 million would be available to support DG and CHP projects throughout New York State. In addition, in 2003 NYSERDA prepared a report titled *Energy Efficiency and Renewable Energy Resource Development Potential in New York State*. This report provided an analysis of the technical and economical potential of renewable technologies in New York. The technologies included biomass, land field, fuel cells, PV, solar thermal, and wind. Through its Energy Smart<sup>SM</sup> Program, NYSERDA offers a wealth of resources to New York State residents who are considering renewable/clean energy technologies for electricity generation. The recent Energy Smart<sup>SM</sup> Program Evaluation and Status Report (May 2004), summarizes NYSERDA's \$57 million incentive expenditures and commitments for research and development by technology area (wind, PV, and DG) as summarized in Exhibit 2.2-3.

### Exhibit 3.2-3: Expenditures and Commitments for R&D by Technology Area

Technology	Percentage
DG/CHP	48%
Wind	35%
PV	9.3%
Other	7.7%

Through its Program Opportunity Notices (PONs), NYSERDA announces new competitive opportunities. Specifically for renewable energy, NYSERDA currently has the following funding opportunities:

- ◆ PON 787 – Renewable Resource Development Program. Through this solicitation process, NYSERDA expects to receive several proposals that provide pre-development of specific sites for feasible renewable energy projects. There are two open solicitation periods through this PON, one that just closed in July of 2004, and another that closes in January 2005. A total of \$4 million is available through this PON. Winning proposals may receive 50 percent of the cost or up to \$200,000 in funding.
- ◆ PON 800 – DG and CHP Systems – \$15 million were awarded in June 2004 to 52 projects.
- ◆ PON 827 – Renewable Energy Technology Manufacturing Incentive. There are three open solicitation periods: July 2004, December 2004, and May 2005. NYSERDA has allocated a total of \$2 million. NYSERDA expects to issue multiple awards to proposals

that expand the level of manufacturing of electric-generating renewable energy products. Among the eligible products are: PV cells, solar and thermal electrical systems, wind energy-conversion devices, major components that support wind-energy systems and power plants, and combustion systems and components specifically designed for biomass feedstocks.

- ◆ PON 831 – Combined Heat and Power and Renewable Generation Technical Assistance. NYSERDA will cost-share up to \$50,000 of the cost of the technical studies selected through this solicitation process. Available funding for this initiative includes \$200,000 from System Benefits Charges (SBC) and \$50,000 from State Energy Programs (SEP).

In the area of **solar** technologies, NYSERDA has two main programs:

- ◆ PON 716-02 – Photovoltaic Incentives for Installers. Revised in June 2004, PON 716-02: *New York Energy \$mart<sup>SM</sup> PV or Solar-Electric Incentive Program (50 kW and smaller)*. This program provides incentives (capped at 60 percent of the total installed cost) for PV systems. In order to be considered for incentives, the systems must be purchased through eligible installers, and be grid-connected with DC or AC electrical output. In addition, only systems of 10 kW or less are eligible for net metering. Systems may not exceed 110 percent of the site’s energy demand. Program rules, eligibility, and forms are available through NYSERDA’s website. Systems must be covered by a five-year warranty. NYSERDA conducts inspections of installed systems. Funding level for this program was started at \$3.5 million and in 2004, increased to its current level of \$7 million. Incentives are paid on a first-come, first-served basis. Installers are responsible for submitting all necessary forms and applications, including the Customer Purchase Agreement. This agreement between installer and customer must include the following specific information: installation location, system description (including components make and model numbers), warranty terms, itemized costs, installation, interconnection and payment schedule, and reference to NYSERDA’s Website and rights to inspect system installation at any time. Cash incentives are available as shown in Exhibit 2.2-4.

**Exhibit 3.2-4: Incentive levels**

<b>System Description</b>	<b>Incentive Level</b>
Grid-connected systems	\$4.00 per Watt
PV system installed in a New York Energy \$mart Home	\$4.50 per Watt
Building Integrated PV System approved under the New Construction Program	\$4.50 per Watt

Incentives are paid directly to installers who pass them through to the end-user, as a credit to the invoice or as a check. Incentives are paid in two installments: the first one for up to 75% of the total incentive amount pre-approved by NYSERDA, and the second installment for the remaining 25%. Applications are submitted to NYSERDA for approval. Processing time ranges from one week (if application and paper work are properly completed) to three weeks (for incomplete applications). The program processes about 120 applications in a 12-month period. Currently there are 165 reservations, of which 27 are commercial and 138 residential. Program activity is tracked using an MS Access database. As program activity increases, NYSERDA will migrate to other more specialized database management systems.

*New York Energy Smart<sup>SM</sup> PV or Solar Electric Systems Incentive Program for Commercial, Industrial and Institutional Buildings (15 kW and larger).* This program supports PV projects in buildings. It is a “sister” program to the one described above.

- ◆ PON 885 – Photovoltaic Practitioner Training. This PON is aimed at the development of training materials and program for accreditation and certification of PV installers. Available funding: \$500,000.

Since 2001, NYSERDA has supported numerous wind projects and wind prospecting efforts. Currently, NYSERDA has the following competitive opportunities:

- ◆ PON 792 – Wind Incentives for Installers – Since June 2003, NYSERDA has provided incentives to installers that specialize in wind technologies. A pool of \$2.5 million is available for eligible projects through December 2005, or when funds are exhausted. Through this initiative, NYSERDA has developed a network of eligible installers. These installers apply for incentives on a first-come, first-served basis on approved, grid-connected, wind systems. This program is available to residential, commercial, industrial and government facilities. NYSERDA keeps a current list of eligible installers on the program’s Website. Interested parties (e.g., owners) contact eligible installers. Installers are responsible for submitting all forms and obtaining all necessary permits. Incentive levels are set as shown in Exhibit 3.2-5 and are paid in two installments. The first installment of 65 percent of the total incentive allowance is paid when the equipment is delivered to the customer site, and all permits, certificates are secured. The second installment for the remaining 35 percent is paid after the systems has been connected with the utility grid and/or inspected by NYSERDA.

**Exhibit 3.2-5: Incentive Levels – Wind Systems**

Installed Wind Capacity	Residential, Commercial, Institutional, and Government	Commercial Farms (\$10,000 of farm related gross sales)	Educational Institutions that Include Wind Curriculum
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500 W – 10 kW	50%	60%	70%
10 kW – 890 kW	Incentive % = [Rated Capacity*(-0.5)+ 55]	Incentive % = [Rated Capacity*(-0.643)+ 66.43]	Incentive % = [Rated Capacity*(-0.786)+ 77.86]
Over 80 kW	15%	15%	15%

- ◆ PON 717 complements PON 792 by providing market support incentives for PV and wind dealers and installers. Incentives are paid for activities related to business plan development, training, and innovative marketing tools.

NYSERDA has also developed other training opportunities in the renewable energy field. These are listed at [www.PowerNaturally.org](http://www.PowerNaturally.org).

Efforts in the area of biomass have resulted in the conversion of wood, corn, and apple waste into fuel sources. NYSERDA has sponsored several projects in this area including a 1999 study to assess the potential of commercialization of corn to ethanol throughout the state. NYSERDA's PON 856, Innovations in Agriculture (August 19, 2004), will award approximately \$1 million for the study and deployment of technologies to optimize the efficiency of farm waste management systems.

In addition to the specific technology oriented programs, NYSERDA's Energy \$mart<sup>SM</sup> Loan Fund works with a network of lenders to provide low interest loans for eligible improvements. Renewable energy projects qualify for financial assistance under this initiative.

Information on all of NYSERDA's renewable energy opportunities, programs and assistance are available through the Energy \$mart<sup>SM</sup> Website. The Website is easy to navigate and has links to other projects, programs, and initiatives (whether Federal, State, or local) to help customers take full advantage of all available opportunities.

NYSERDA has five program managers, supported by technical and administrative staff, dedicated to renewable energy programs. Outside contractors provide assistance in technical analysis, education, and training efforts. In addition technical experts support system inspections.

The recent May 2004 evaluation report credits the New York Energy \$mart<sup>SM</sup> Program with the development of 40 MW of wind generated electricity. Prior to NYSERDA's programs, installed wind capacity in the Energy \$mart<sup>SM</sup> territory was zero. Through NYSERDA's efforts, there are ten wind developers and operators and 11 green power marketers and green power ESCOS in the state.<sup>113</sup> Furthermore, the program has achieved PV installations of more than 600 kW in system capacity through a network of more than 50 PV system installers. NYSERDA supported 18 training sessions. A certification program was introduced in 2003.

<sup>113</sup> <http://www.nyserda.org/04vol2pt1-sbc.pdf>

The evaluation report cites that renewable energy installations have resulted in pollution reductions as shown in Exhibit 2.2-6.

**Exhibit 3.2-6: Emissions Reduction**

NOx	825 tons per year
SO <sub>2</sub>	1,650 tons per year
CO <sub>2</sub>	600,000 tons per year

Finally, the *Evaluation and Status Report* provides summary data for funding status (in millions) of end-use renewable initiatives as shown in Exhibit 2.2-7.

**Exhibit 3.2-7: Funding Status**

Program	Budget (\$ millions)	Awarded (\$ millions)	Co-funding (\$ millions)
Residential PV (Pilot Program)	\$0.3	\$0.3	\$0.9
PV on Buildings	\$9.1	\$4.3	\$3.6
High-Value PV and Wind	\$1.2	\$1.2	\$1.6
Technical Training, Education, Outreach, Market Support	\$2.5	\$0.9	\$0.4
Solar Schools	\$1.8	\$1.8	\$0.2
Technical Assistance and Infrastructure Development Services for End-Use PV and Wind	\$1.0	\$0.0	\$0.0
Accredited Training for Renewable Energy Practitioners	\$1.2	\$0.4	\$0.2
Small PV Incentives	\$3.0	\$2.1	\$1.3
Small Wind Incentives	\$3.0	\$0.0	\$0.0
New Technology Development	\$3.4	\$0.0	\$0.0
<b>Total</b>	<b>\$26.5</b>	<b>\$11.0</b>	<b>\$8.2</b>

NYSERDA’s programs are marketed through trade allies. However, as part of its outreach activity, NYSERDA launched the Power Naturally Website to educate the public and promote use of renewable energy.

LIPA

Since the 1990s, Long Island has been focusing on harvesting renewable resources for energy production. These include solar, wind, and biomass. According to the Long Island Offshore Wind Initiative, “Long Island ... is in short supply of appropriate onshore sites for large-scale wind development. Consequently, turning to the sea is Long Island’s only option if it wants to

make wind power a meaningful part of its energy mix.”<sup>114</sup> Regarding solar energy, Long Island provides an ideal location for the installation of PV systems. In addition, DG using technologies such as fuel cells, CHP, and micro turbines are being promoted and installed in several locations in the Island.

Through the sponsorship of Governor George E. Pataki, LIPA offers a suite of clean energy choices (renewable energy) under the umbrella of the Clean Energy Initiative (CEI). This ambitious initiative, in operation since 1999, seeks to promote the use of renewable/clean electricity generation and renewable technologies. This initiative comprises eight programs. The LIPA 2003 Annual Report indicates that, through the end of 2003, LIPA had spent over \$165 million in this initiative, resulting in energy savings of 624,449 MWh and peak demand savings of 110.5 MW.

In addition, the report sites non-energy related benefits that can be attributed to the CEI programs, such as the creation of 2,000 new jobs and the reduction of emissions, including nitrogen oxides, sulfur dioxide, and carbon dioxide.

Specific CEI programs that use renewable energy technologies include the following:

- ◆ PV
- ◆ Wind Power
- ◆ Fuel Cells
- ◆ Green Power Option

On March 24, 2004, LIPA’s board approved the Green Power Option Program. This program will allow LIPA’s customers to choose renewable energy options and “will foster the development and sale of electricity generated from renewable energy resources such as wind, solar, and biomass.”<sup>115</sup>

#### PROGRAM-SPECIFIC INFORMATION

This section provides a brief summary of program specific information.

##### ***Solar Pioneer***

This program provides residential customers with a 25 percent solar tax credit towards equipment purchase and installation and a 15-year real property tax exemption. Commercial customers are eligible for a 10 percent investment tax credit and a business energy tax credit. In addition, customers may receive rebates of \$4.50/Watt for systems up to 10 kW. This rebate will change to \$4.00/Watt for the next 1,000 kW “block.” For commercial grid connected PV systems, LIPA’s rebate is \$4.50/Watt, with a maximum rebate of \$45,000 (up to 10kW) per PV

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<sup>114</sup> <http://www.lioffshorewindenergy.org/study.html>

<sup>115</sup> <http://www.lipower.org/newscenter/pr/2004/march24.green.html>



installation.”<sup>116</sup> Incentives are paid on a first-come, first-served basis. Exhibit 2.2-8 shows results from the Solar Pioneer program achieved in 2003.

**Exhibit 3.2-8: Results of the Solar Pioneer Program (2003)**

<b>Customer Type</b>	<b>Participants</b>	<b>Energy Savings (kW)</b>
Commercial	12	86
Residential	330	1,544,000
PV Lottery	38	25

In the first quarter of 2004, the Solar Pioneer program paid rebates for 56 installations totaling \$1.7 million. In addition, LIPA has pre-approved another 80 installations totaling \$0.8 million. These installations equate to 548 kW. In coordination with the Community Development Corporation, LIPA’s program installed ten PV systems in low-income housing.

Commercial and residential customers who wish to participate in this program may use LIPA’s Website ([www.lipower.com](http://www.lipower.com)) to:

- ◆ Review general information,
- ◆ Download applications, forms, program eligibility rules,
- ◆ Obtain contractor information, and
- ◆ Obtain other informational resources needed to implement a PV system.

The Solar Choice Act signed by Governor Pataki in 1998 provides customers with net metering opportunities for PV systems – that is, interconnection with utility distribution system.

Furthermore, LIPA continues efforts to streamline the application process, and has helped standardize the building permit process. LIPA receives approximately 150 applications per year. Processing applications takes from a few weeks to six months (depending on completeness of the application and permitting requirements). At the end of the installation process, LIPA sends a letter to the customer indicating rebate amount, whether the rebate will be issued to the customer or assigned to the contractor (if an Assignment Letter has been received), and a pre-addressed envelope with a customer satisfaction survey. This survey allows program managers to review the process and make modifications where needed. Program activity is tracked using a server-based database system with a MS Access front-end. The database has filters that are able to track projects by activity and milestones and generate reminder letters to customers who have passed a specific milestone and show no activity or completion.

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<sup>116</sup> <http://www.lipower.org/cei/solar.rebate.html>

Training is provided in the form of workshops to code officials, contractors, and customers. In 2004 LIPA sponsored trade ally workshops and provided \$100 incentive to contractors who took the NABCEP refresher course.

LIPA markets this program through a network of trade allies, bill inserts, and a monthly advertisement in Newsday—the Long Island daily newspaper with the highest circulation.

### ***Wind Power / LI Offshore Wind Initiative***

In 2002, NYSERDA and LIPA co-sponsored a Phase I Sitting study for offshore wind resources.

In early 2003, the Phase II report published by KeySpan estimated that 40 GE turbines with generating capacity of 3.6 MW each could be installed off the Long Island shores and be interconnected via underground cable to the utility grid.

In addition to the offshore initiative, LIPA offers a land-based initiative: “LIPA is working with the Long Island Farm Bureau (LIFB) to site five 50 kilowatt (kW) electric generating wind turbines on Long Island farms to help demonstrate the feasibility of using wind power technology on the Island. On August 31, 2002, Governor Pataki and LIPA Chairman Richard Kessel dedicated the first LIPA-LIFB wind turbine on the ZEH Farm behind Windy Acres Farm Stand on Route 25 in Calverton. Several other farm sites have been identified on the East End of Long Island. Details on these will be announced once plans for them are finalized.”<sup>117</sup>

LIPA’s 2004 *Quarterly Report* cites that from inception to March 31, 2004, this wind project had generated and fed back to the grid 85,000 kWh.

### ***Distributed Generation – Fuel Cell and CHP***

Since 2000, LIPA has carried out several projects using DG technologies. The main activities under this umbrella include the following:

*Fuel Cell Farms.* As a result of this initiative, beginning in 2001, and through a partnership with PlugPower, LIPA was able to interconnect to the grid more than 75 fuel cells in 2001. In 2003, 50 fuel cells were decommissioned and 25 new added. A total of 45 fuel cells are operational to date.

*Residential Demonstrations.* Beginning in 2003, this initiative resulted in the installation of 20 fuel cells in the residential sector.

*Uninterruptible Power Supply (UPS).* As a result of this initiative, and through a partnership with the Merchant Marine Academy, LIPA conducted a demonstration project consisting of the installation of 3 UPS, which will provide power to the utility grid.

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<sup>117</sup> <http://www.lipower.org/cei/wind.proj.html>

*Remote Fuel Cell Installations.* Beginning in 2002, this initiative accomplished the installation of 17 CHP systems in commercial facilities by 2003.

### ***Green Choice Program***

This program allows Long Island residents to purchase green power. The LIPA Website provides consumers with general program information, a list of green marketers, and updated tariff information. In addition, customers can find eligibility criteria, guidelines, billing information, and FAQ fact sheet. Marketing for this initiative will consist of bill inserts, a web page, and placement of information in the *Newsday* advertisement already used by other LIPA programs.

Green Marketers include Community Energy, Inc., Sterling Planet, and Envirogen.

### ***Geothermal EnergyWise Program***

Through December of 2004, LIPA is offering assistance for the installation of geothermal heat pump systems in the residential sector. Incentive applications are available on-line through the LIPA website. LIPA also provides rebates to commercial customers who install geothermal heat pumps.

## **3.3 Massachusetts**

Massachusetts has good solar resources for PV and flat-plate solar thermal collectors, and a poor to marginal solar resources for concentrating collectors.<sup>118</sup>

### **Exhibit 3.3-1: Massachusetts Solar Resources**

<b>Technology</b>	<b>Energy (kWh/m<sup>2</sup>/day)</b>
PV or Flat Plate Thermal	3.5 to 4.5
Concentrating	3.0 to 4.0

Massachusetts wind resources are benefited by its exposure to the Atlantic Ocean. The most significant resources are offshore with Class 5 to 9 (500 Watts/m<sup>2</sup> to well over 800 Watts/m<sup>2</sup>) resources being available along Cape Cod and Nantucket. In fact despite early legal challenges from tourist groups and criticism from environmental and fisheries groups, Cape Wind is proceeding with the Nation's first offshore wind project and expects to start installing turbines in 2005. Onshore, the Cape, and Nantucket areas have Class 4 to 6 (400 Watts/m<sup>2</sup> to 800 Watt/m<sup>2</sup>) wind resources. Most of the central part of the state has Class 1 to 4 wind resources (0 to 500 Watts/m<sup>2</sup>) providing opportunities for mostly small turbines. In the far western part of the state are some isolated pockets of Class 5 and above (500 Watts/m<sup>2</sup> and above).<sup>119</sup> Exhibit 2.3-2 provides estimates of Massachusetts's biomass resources at several price points.

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<sup>118</sup> [http://www.eere.doe.gov/state\\_energy](http://www.eere.doe.gov/state_energy)

<sup>119</sup> <http://truewind.teamcamelot.com/ne/>

**Exhibit 3.3-2: Massachusetts’s Biomass Resources** <sup>120</sup>

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	196,000	284,000	366,200
Mill Residues (sawing, milling, and planning of lumber)	0	44,000	135,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	0	0
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	0	235,908

The Massachusetts Division of Energy Resources (DOER) works to foster the use of renewable energy resources. The DOER’s mission statement reads as follows:

“Implement energy policies that ensure an adequate supply of reliable, affordable and clean energy for the businesses and residents of Massachusetts.

Improve and streamline energy regulation, promote greater efficiency in all energy uses, reduce energy costs and mobilize energy education.” <sup>121</sup>

To achieve this mission, the Commonwealth of Massachusetts has put together legislation, partnerships, research and support programs, and public outreach and education activities.

REGULATIONS PERTAINING NET METERING

Net metering has been permitted in Massachusetts since 1982 for facilities of less than 30 kW. The 220 Code of Massachusetts Regulation, Section 11.04(7)(C), makes provisions for net metering for all customer classes and facilities with less than 60 kW. It reads as follows:

“A Customer of a Distribution Company with an onsite Generation Facility of 60 kW or less in size has the option to run the meter backward and may choose to receive a credit from the Distribution Company equal to the average monthly market price of generation per kW, as determined by the Department, in any month during which there was a positive net difference between kW generated and consumed. Such credit shall appear on the following month's bill. Distribution Companies shall be prohibited from imposing special fees on net metering

<sup>120</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

<sup>121</sup> <http://www.mass.gov/doer/home.htm>

Customers, such as backup charges and demand charges, or additional controls, or liability insurance, as long as the Generation Facility meets the Interconnection Standards and all relevant safety and power quality standards. Net metering customers must still pay the minimum charge for Distribution Service (as shown in an appropriate rate schedule on file with the Department) and all other charges for each net kWh delivered by the Distribution Company in each billing period.”<sup>122</sup>

#### REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTIONS

The Massachusetts Department of Telecommunications and Energy (DTE) recently completed the process of standardizing the interconnection requirements across the state, including detailed process, fees, tariffs and national safety standards (IEEE 1547, IEEE 929, and UL 1741).

#### STATE TAX INCENTIVES

Massachusetts offers a number of tax incentives aimed at promoting the installation of renewable energy technologies. The *State Income Tax Credit* provides 15 percent or \$1,000 toward the net expenditures of wind or solar powered renewable energy system. The credit is for the residential segment and does not apply to commercial facilities. The *Sales Tax Exemption* provides sales tax exemption on the sale of wind, solar, and heat pump systems for residential projects and does not cover commercial buildings. The *Local Property Tax Exemption* provides a 20-year exemption for local property taxes to residential and commercial customers who install wind or solar technologies. The *Corporate Income Tax Deduction* provides businesses net income tax deductions on the cost of installation of solar or wind technologies. Finally, the *Alternative Energy and Conservation Patent Deduction (Personal and Corporate)* allows deductions on royalties from patents approved by the Commissioner of Energy Resources.

#### RENEWABLE ENERGY PORTFOLIO STANDARDS

As part of Massachusetts 1997 electric utility restructuring legislation, MGL ch 25A, sec 11F, the outlines of a RPS were developed. The Massachusetts Division of Energy Resources in 225 CMR 14.00 issued the final regulations for the RPS that requires all retail electric providers in the state to provide 4 percent of the state’s electricity by 2009.

#### **Exhibit 3.3-3: Schedule of Compliance with Massachusetts RPS**

Year	Percent
2003	1
2004	1.5
2005	2
2006	2.5
2007	3
2008	3.5

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<sup>122</sup> <http://www.ies.ncsu.edu/dsire/library/docs/incentives/MA01R.htm>

2009	4
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## RENEWABLE ENERGY PROGRAMS

In 1998, the Massachusetts legislature established The Massachusetts Technology Collaborative (MTC), an organization dedicated to promoting the use of renewable energy resources in the Commonwealth. In their five-year history, the MTC has had numerous achievements, including the creation of the Green Buildings Program, the Green Schools Initiative, the Green Power Program, the Industry Support Program, and the Community Outreach and Siting Program.

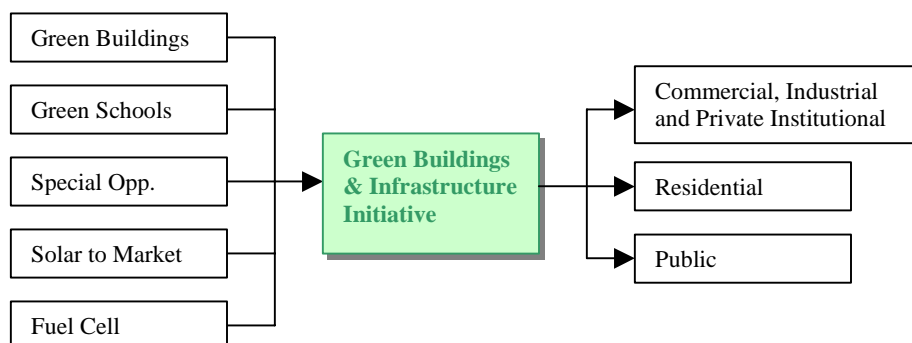
The recently published *Harnessing the Power of Innovation - 2003 Annual Report* summarizes the MTC's achievements. The report indicates that \$43 million was awarded for new programs and projects. Approximately \$4 million was awarded for the installation of more than 300 PV systems in residential and commercial buildings. MTC distributed \$12.5 million in waste-to-energy grants. One of the greatest achievements in 2003 was the development of a \$30 million initiative – the Green Power Partnership that will soon start generating power from renewable energy sources. It is expected that it will generate 100 MW.<sup>123</sup>

In early 2004, the MTC reorganized its programs and initiatives, moving the Green Buildings Program and two initiatives under the Green Power Program under one banner: The Green Building and Infrastructure Program.

### ***Green Buildings & Infrastructure Program***

The goal of this program is to foster renewable energy technologies by providing eligible customers with financial and technical assistance when they install renewable resources and technologies to satisfy a portion of their energy requirements. As mentioned earlier, there are several initiatives under this umbrella. The flow chart in Exhibit 2.3-4 provides a summary of the reorganization of the Trust's programs.

**Exhibit 3.3-4: Green Building and Infrastructure Initiative**



<sup>123</sup> [http://www.masstech.org/NewsandReports/annual\\_2003.pdf](http://www.masstech.org/NewsandReports/annual_2003.pdf)

The main goal of the reorganization was to view programs from a customer perspective, thereby providing a suite of services that are bundled based on customer needs and goals. Each of the three Initiatives will have two major components:

- ◆ New construction and major renovations, and
- ◆ Retrofits.

To qualify under the new construction major retrofit portion of the initiative, a project must meet the minimum LEED requirements. For retrofits, a project must achieve 20 percent reduction in energy compared to the Massachusetts energy code requirements.

*Commercial, Industrial and Private Institution Initiative(C&I<sup>2</sup>)*. The main objective of this initiative is to research and implement viable renewable technologies in commercial, industrial, and private institutions (for profit and non-profit). Facilities include universities, hospitals, manufacturing facilities, and office buildings. This initiative excludes entities whose main function is housing.

*Residential Initiative*. The primary focus of this initiative is housing units, whether they are private, public, for-profit, or non-profit.

*Public Initiative*. This initiative encompasses all municipal, state, and federal buildings. Projects under his initiative must be designed in accordance to LEED standards. The Green Schools Initiative remains under this program.

A total of 20 FTEs provide support to four program areas related to renewable energy. Specialized consultants support these programs providing technology assessments, education, and legal counseling regarding grants.

Grants are awarded via competitive solicited proposals and unsolicited proposals. The majority of the awards are provided through the solicited proposal process. This process requires an internal review, an external peer review, and finally approval by the MTC Board of Directors. Incentives are distributed by type of grantee (private or public). Opportunities are posted on the Website.

Program activities are tracked through an integrated management system.

At present, the program does not require special certification. A contractor license is enough for participating. MTC has contracted with University of Massachusetts at Lowell to assess industry needs regarding certification.

MTC has worked in partnership with local utilities to develop a uniform interconnection standard across all utilities in Massachusetts.

### 3.4 Texas

Texas has superb solar resources for PV and flat-plate solar thermal collectors, and excellent solar resources for concentrating collectors. Resources for concentrating collectors are particularly good in the western parts of the state.<sup>124</sup>

#### Exhibit 3.4-1: Texas Solar Resources

Technology	Energy (kWh <sub>e</sub> /m <sup>2</sup> /day)
PV or Flat Plate Thermal	4.5 to 7.5 +
Concentrating	3.5 to 7.5 +

Texas is an active wind power development state, with well over 800 MW of installed capacity, and has a good to outstanding wind resource. The ridges and mountain passes of the Trans Pecos have the best wind resources in the state with pockets with potential power densities of up to 800 Watts/m<sup>2</sup> (Class 6) measured at 50 meters. The greatest expanse of high-wind resources is located along the panhandle, dominated by wind resources with power densities of 400 to 500 watts/m<sup>2</sup> (Class 4). The south gulf coast of the state offers strong and consistent sea breezes producing onshore sites with fair wind resources with power densities of 300 to 400 Watts/m<sup>2</sup>, slightly less than is considered generally acceptable for utility scale development. As higher resolution wind maps are developed pockets of better wind resources along the gulf may be discovered as well as viable offshore resources. Most of the remaining wind resources in the state range from poor to fair with power densities between 300 and 400 Watts/m<sup>2</sup> (class 3 to 4). Many of these sites may be suitable for small turbines, or community scale mid-sized wind turbine projects.<sup>125</sup>

As one of the nation's leading agricultural states Texas has a large biomass potential. The rice paddies of the gulf produce large quantities of rice hulls, which have been promoted extensively in Asia as a potential energy source. Texas also has a potential for energy crops. Switchgrass, a tall grass, which has been researched extensively by the U.S. DOE and promoted by the USDA as a biomass energy crop, is native to Rio Grande delta and can be cultivated throughout most of the state.<sup>126</sup>

Exhibit 3.4-2 provides estimates of Texas's biomass resources at several price points.<sup>127</sup>

#### Exhibit 3.4-2: Texas Biomass Resources

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<sup>124</sup> [http://www.eere.energy.gov/state\\_energy/tech\\_solar.cfm?state=TX](http://www.eere.energy.gov/state_energy/tech_solar.cfm?state=TX)

<sup>125</sup> <http://www.infinitepower.org/reswind.htm>

<sup>126</sup> <http://www.infinitepower.org/resbiomass.htm>

<sup>127</sup> Walsh et. Al. "Biomass Feed stocks Availability in the United States: 1999 State Level Analysis" Oak Ridge National Laboratory, January 2000



Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	557,000	814,000	1,050,700
Mill Residues (sawing, milling, and planning of lumber)	18,000	1,649,000	4,043,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	4,497,784	4,497,784
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	4,549,899	9,139,885

#### REGULATIONS PERTAINING NET METERING

Established by the PUC of Texas and enacted in 1985, the net metering rule apply to all PTB REPS, TDUs and integrated IOUs; however, it does not apply to municipalities, river authorities, or cooperatives. Eligible systems size is 50 kW or less. Excess generation is purchased based on the utility avoided cost. Austin Energy provides net metering to commercial and residential customers with onsite generating equipment of 20 kW or less. Excess generation is credited to the customer's bill. Customers must follow Austin's interconnection guidelines.

#### REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTION

Interconnection to the grid is available for residential, commercial and industrial customers. Eligible technologies include the following: solar thermal, PV, landfill gas, wind, biomass, fuel cells, geothermal, cogeneration, and distributed generation. Fast-track interconnection is available given certain pre-certification provisions. For systems less than 500 kW there is no interconnection fee.

#### STATE TAX INCENTIVES

The *Solar Energy Device Franchise Tax Deduction* is equivalent to the Corporate Tax Deduction in other states. There are two ways in which a corporation can take advantage of this deduction:

- ◆ Deduct the total cost of the system from the company's taxable capital, or
- ◆ Deduct 10 percent of the system's cost from the company's income.

Texas also has the *Solar Energy System Manufacturer Franchise Tax Deduction*, for corporations dedicated solely to the manufacturing, installing or selling solar energy devices.

Since 1981, Texas residents may take advantage of the *Solar and Wind Powered Energy Systems Exemption*. Residents may take an exemption from taxation of the appraised value of the property arising from installation or construction of solar or wind powered systems.

#### RENEWABLE ENERGY PORTFOLIO STANDARD

In 1999, the Texas PUC issued a renewable mandate, which calls for the production of 2,000 MW of energy from renewable sources. Only systems installed after 1999 qualify. Applicable sources include wind, solar, geothermal, hydroelectric, tidal, biomass, and land field gas.

The City of Austin has a RPS which requires 20 percent by 2010, and is committed to develop 15 MW by 2007.

#### PROGRAM SPECIFIC INFORMATION

This section summarizes the program offered by the City of Austin.

#### CITY OF AUSTIN

The City of Austin, Texas is a national leader in renewable energy development. Under the direction of the Austin City Council, the municipal utility, Austin Energy, has led renewable energy efforts for decades. Austin Energy currently is not mandated to participate in the statewide Texas deregulation plan. Yet, the Austin City Council has recognized the importance of utility portfolio diversification and of encouraging clean energy alternatives. Austin's energy resources currently are predominantly natural gas/oil, followed by coal, nuclear, and renewables.<sup>128</sup>

In 1999, the city committed to meeting 5 percent of Austin Energy's needs with renewable resources by 2005. It will meet that goal. In 2003, the city approved a new energy plan that included a commitment to meet, by 2020, 20 percent of the city's needs with renewable resources and 15 percent of its needs through energy efficiency efforts. A solar incentive program, launched in June 2004, will play a major role in implementing that plan.

Solar Explorers, Austin's solar PV development program popular in the 1990s, used voluntary subscriptions to help finance systems in public places, such as parking lot shelters. The subscription concept was adapted in a novel way when Austin Energy launched its GreenChoice green power-marketing program in 2000. Instead of asking customers to pay for "blocks" of green power in addition to their per-kWh charge for energy use, Austin offered customers the chance to choose a green power fuel adjustment. This is a small charge applied to the customer's actual monthly energy use. In combination with a long-term contract pricing mechanism (which locks in the green power price for 10 years), this marketing approach proved very effective.

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<sup>128</sup> *Silver in the Mine: A Long-Term Comprehensive Energy Plan for the City of Austin*, prepared by Michael Osborne and published by Austin Energy in 2003, provides a data and a framework for the current energy plan, although not all of its independent recommendations were adopted.

Based on the amount of green power sold to its customers, Austin energy has one of the best green power programs in the U.S.

Yet the 20 percent renewable-energy target is challenging. Austin's current renewables portfolio (about 5 percent) is predominantly wind power purchased from West Texas, where transmission capacity is constrained. Austin has relatively little local biomass based electrical capacity (11 MW or 1 percent currently) from landfill gas. The city is looking to solar PV as a major component in its renewable energy portfolio.

The city (with population under one million) has set a goal for 15 MW of solar PV by 2007 and 100 MW of PV by 2020. Austin Energy states that this is a general goal, and that it will be adjusted based on an evolving understanding of the costs and benefits of PV on the system. A study is underway to investigate these costs and benefits.<sup>129</sup>

### ***Solar Rebate Program***

The Solar Rebate Program was authorized in March 2004 and launched in June 2004. The program is aimed at both resource diversification and local economic development. With annual funding of about \$1 million, it will provide rebates for residential and commercial/industrial solar installations at a rate of \$5 per Watt, increasing to \$6.25 per Watt for installations using locally manufactured equipment. Austin Energy is implementing the program.

The funding mechanism is the utility budgetary process, which is authorized by the Austin City Council. The utility funds a variety of "public benefit" programs, but it does not impose a separate fee to ratepayers. The budget of \$933,000 was approved for the current fiscal year, which ends in September 2004. The program is expected to be reauthorized for funding in subsequent years in keeping with the utility's renewable energy mandate.<sup>130</sup>

The application process for this program is open to all Austin Energy customers, including residential and commercial/industrial customers. It is a first-come, first-served process. One significant difference between this program and many other solar rebate programs is that applicants must first submit to a site inspection. This ensures that the installation demonstrates minimal shading from trees, buildings, or other structures and acceptable southern or western orientation. Austin Energy reserves the right to deny rebates based on excessive shading or poor orientation of the solar array.

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<sup>129</sup> *20 by 2020* by Jill K. Cliburn, Public Power Magazine, September 2004 provides details on the overall resource planning process. The valuation study will be similar to those currently called for by the CPUC, though results of such studies differ widely based on the internal and external values that are counted. See also, *DER Benefits Analysis Studies*, by Joe Iannucci, et. al., National Renewable Energy Laboratory, NREL/SR-620-34636, September 2003.

<sup>130</sup> Interviews with Austin Energy Vice-President Roger Duncan March 2, 2004 and with Carlos Cordova, Austin Energy Public Information Office, August 23, 2004.

In practice, this step lengthens the application procedure, but Austin Energy staff is confident that the process will bring better, more cost-effective results.<sup>131</sup>

Residential and commercial customers are targeted. The program has been very popular with customers. Within two months, two-thirds of the year's rebate funding (\$663,000 by July 31, 2004) had been reserved. Applications for preliminary assessments within this time (not all completed to date) included more than 200 homeowners and 18 businesses. Program planners anticipated this high demand, and instituted rebate caps (see below). They also planned to stimulate local solar manufacturing by instituting a higher rebate for locally manufactured equipment. Program staff anticipate seeing more local solar business in subsequent funding cycles. Local stakeholders (solar advocates and environmental or sustainable development groups) have worked for years within the larger city economic development framework to stimulate solar business development. The city has a large high-tech business sector that is reportedly well suited to expand into solar industries.<sup>132</sup>

Complete program guidelines are available from [www.austinenergy.com](http://www.austinenergy.com). The program is limited to solar PV systems.

Technical guidelines include the following:

- ◆ Eligible system components are listed on the Austin Energy Website, including solar modules and system inverters. The Rebate Program does not cover energy storage;
- ◆ All solar systems must carry a five-year warranty form the manufacturer and installer;
- ◆ Licensed electrical contractors must obtain needed permits and perform all electrical interconnections;
- ◆ Solar systems must be interconnected, per Austin Energy interconnection guidelines (available on the Austin Energy Website); and
- ◆ Installations must pass a pre-inspection and a post-installation verification.

### **Incentives Provided**

The rebate amount is calculated as:

*(Number of PV modules) x (STC rating per module in Watts) x (Inverter efficiency) x (Rebate at \$5/Watt or \$6.25/Watt)*

The rebate amount is capped. For residential installations, the rebate is the lesser of 80 percent of the invoiced cost or \$15,000. For commercial installations, the rebate is the lesser of percent of the invoiced cost or \$100,000. For large commercial systems may require City Council review of the rebate application.

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<sup>131</sup> Interview with Cordova.

<sup>132</sup> Interview with Austin Energy Vice-President Roger Duncan March 2, 2004. See also *Silver in the Mine: A Long-Term Comprehensive Energy Plan for the City of Austin* by Michael Osborne, published by Austin Energy, 2003.

Eligible solar customers benefit from Texas statewide tax benefits. These include a property tax exemption for solar and wind power sites and a tax exemption for corporate customers that buy solar.

The Austin program has tapped state energy office funding for some projects, including the recent development of a community-based renewable energy development plan. However, there is no direct connection between the Solar Rebate Program and SEO programs.

As noted, Austin has an active stakeholder community, including a citizens' advisory committee to the City Council on energy resources. The program is largely the outcome of a collaborative energy planning process that culminated in December 2003. There is no limitation on customers' ability to participate in this program while participating in other Austin Energy incentive programs for energy efficiency. Austin Energy Solar Rebate staff also provide general information to customers about applicable state and federal programs.

The Austin program also requires that solar installers be listed as Registered Solar Installers (see Website). Beginning in January 2006, solar installer must be certified by the NABCEP.

Site inspection and verification are planned, but no systems have reached that step in the process to date. Guidelines are under development. The utility hopes to use its own staff to perform inspections.

The Austin media has covered renewable energy topics frequently, simplifying the job of program promotion. The early demand (two-thirds subscribed within two months) suggests a high level of community awareness.

Outreach materials have been circulated to stakeholder groups and trade allies. In addition, utility outreach (newsletter, bill insert, Website, etc.) has reached many potential audiences.

The process is outlined on the [www.austinenergy.com](http://www.austinenergy.com) Website. Interested customers are directed to follow the steps summarized below:

- ◆ Review Solar Candidate Checklist, which summarizes siting requirements and costs;
- ◆ Review the Program guidelines;
- ◆ Submit the Solar Rebate Participation form;
- ◆ In response, the utility will arrange and complete a pre-inspection.

Assuming the pre-inspection is successful, customers are then advised to:

- ◆ Select one or more registered solar installers and initiate the bid process;
- ◆ Submit a rebate application (reservation);

Austin Energy will review the application and if it is approved, the utility will send a Letter of Intent. The reservation period is 120 days. Once the system is installed, the verification is scheduled. Austin Energy staff expect to assist customers in checking documentation. The rebate is expected to be issued within one month of the verification.

With the high demand for rebates, Austin Energy staff expresses some doubt that it can maintain the processing schedule without delays. Also, customers for larger installations may work directly with staff to arrange an appropriate reservation and installation schedule, based on system size and specific needs. Rebates for large systems may require City Council approval.

Ideally, the process would take one month for pre-inspection, four months for installation, four to six weeks for verification, and one month for final processing. As of August 2004, the process had not been thoroughly tested.

The program currently has a temporary manager and one professional assigned. Hiring is underway for a manager. Additional staff may be hired, but more likely will be reassigned as needed from within the utility.

The Austin Energy Solar Rebate Program is generally modeled on solar rebate programs already in place around the United States. Aspects that distinguish it include the following:

- ◆ Focus on spurring local solar industry development through a special incentive;
- ◆ Pre-inspection, aimed at improving actual system performance;
- ◆ Rebates discounted to reflect inverter efficiency; and
- ◆ Quick program rollout with intentions to lower rebates in the future.

Staff report that they are aware of the high rebate level (currently higher than any other major program in the United States), but that they intended to generate initial excitement and to attract international attention from the solar industry. Studies of other solar incentive programs have not indicated strong solar price declines when rebate levels remain high over a period of years.

Austin's anticipated solar cost/benefit study should result in considerable program fine-tuning. The value of solar may in fact be relatively high in Austin because the utility is very reliant on natural gas, and because the utility experiences high summer peak demand.

In addition to the solar rebate program, Austin Energy is supporting city projects to install solar demonstration systems, including a 100 home affordable housing project built in partnership with the Austin Neighborhood Housing and Community Development Office. These will be "ZEH," designed to use energy-efficient design, careful appliance selection, and PV systems so the homes have no net energy use.

### 3.5 New Mexico

Renewable energy development efforts in New Mexico are small compared to those in other states. It is a major oil and gas producer, also rich in solar, wind, and geothermal resources, which is attempting to make a transition to a leading “clean energy state.” The approaches implemented and proposed for the state exemplify a low-investment/high-leverage approach.

Governor Bill Richardson is the former Secretary of Energy under President Bill Clinton. In 2003 and 2004, he was the Chairman of the Western Governor’s Association. In that role, he promoted clean energy development as a priority for the region. In April 2004, Richardson and California Governor Arnold Schwarzenegger jointly led development of a WGA Clean and Diversified Energy Initiative.<sup>133</sup> Two months later, members of the WGA unanimously endorsed the Initiative, including:

- ◆ A goal of developing 30,000 MW of clean energy in the West, from solar, wind, geothermal, biomass, clean coal, and advanced natural gas technologies by 2015
- ◆ A goal of increasing energy efficiency by 20 percent by 2020.

In addition, Richardson encouraged his fellow governors to endorse a 20 percent by 2020 renewable energy portfolio.

Currently, New Mexico is unlikely to meet its governor’s goals. Total renewable energy capacity in New Mexico in 2003 was about 83 MW—less than 1.5 percent of total New Mexico capacity. Under contract to Public Service Company of New Mexico (PNM), FPL Energy completed a 200 MW wind farm in 2004. This will improve statewide renewable energy statistics.

A Renewable Portfolio Standard (RPS), SB 43, passed the New Mexico legislature in 2004. The RPS mandates that investor-owned utilities in the state must provide 6 percent renewable energy in their resource portfolios by 2006 and 10 percent by 2011. This codifies a very similar RPS that was adopted by the New Mexico Public Regulatory Commission (PRC) in 2003. To date, the RPS remains the major tool for promoting renewable energy in New Mexico. The 2006 milestone and 2011 target represent the steepest ramp-up of any RPS in the country.<sup>134</sup> Implementation plans are outlined below.

The original PRC rule (R. 572, 2003) also included provisions requiring utilities to offer voluntary green power programs (independent from the RPS), and that aspect of the rule was implemented without further legislation.

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<sup>133</sup> Western Governors Unanimously Approve Governor’s Clean and Diversified Energy Initiative press release from Western Governor’s Association, June 22, 2004. See [www.wga.org](http://www.wga.org) for details.

<sup>134</sup> *Plugging in Renewable Energy: Grading the States*, Union of Concerned Scientists, May 2003 at [www.ucsusa.org](http://www.ucsusa.org). p. 15.

The public sector is playing a strong role in jump-starting energy efficiency and solar development. The Governor has called for demonstrations of energy efficiency and renewable energy in state buildings, allocating part of a \$6 million discretionary energy project fund to this end.<sup>135</sup> New construction in state facilities and schools must exceed state standards for energy efficiency by 50 percent. The City of Albuquerque has also been active in promoting renewable energy through its partnership with the U.S. DOE Million Solar Roofs program.

A strategy that is evident in New Mexico involves attracting renewable energy business to the state. New Mexico has an energy production tax credit. It provides a gross receipts tax exemption for wind equipment purchased by public agencies. And it allows the use of industrial revenue bonds for new electricity generation projects (e.g., wind).

Specific state-backed projects reflect the economic-development theme. In 2004, the legislature provided \$250,000 in seed money for a fuel cell development partnership, which draws on the technical expertise of Sandia and Los Alamos National Laboratories, New Mexico State University, and business partners. A separate \$500,000 fund supports demonstration grants for energy efficiency and renewable energy projects that are cosponsored by local governments and other public institutions.

The state Department of Economic Development coordinated efforts that resulted in a June 2004 Memorandum of Understanding between the state and the Sharp Corporation. Project areas outlined in the MOU included development of advanced fuel cell technologies, advancement of PV system technologies, and agricultural applications.<sup>136</sup> A separate partnership deal announced in April 2004 will bring PV manufacturer Spire Corporation to the rural community of Taos, New Mexico. With support from New Energy Capital (under the leadership of former DOE Assistant Secretary Dan Reicher), Spire will work with a local solar company and the local electric co-op to supply PV systems for a new regional solar marketing initiative.<sup>137</sup>

New Mexico is also working with public and private partners to develop concentrating solar power (CSP). This utility-scale technology appears promising for New Mexico, due to the availability of both solar resources and land. An initial project-development solicitation, released in late summer 2004, aims for a 50 to 100 MW plant. The state has a long-term goal of 2,000 MW of CSP<sup>138</sup>.

Stakeholders in New Mexico have made innovative proposals to drive renewables development faster and harder, and the Governor's office is often in step with these. New Mexico was one of

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<sup>135</sup> Details on this Governor's discretionary fund were not available. Per communication with state energy officials, a large part of the fund is known to be allocated for development of concentrating solar power.

<sup>136</sup> New Mexico Office of the Governor press release, June 16, 2004.

<sup>137</sup> New Mexico Solar Energy Association, current events report, April 15, 2004. See [www.mnsea.org](http://www.mnsea.org).

<sup>138</sup> Communication with Craig O'Hare, Governor's Special Assistant for Renewable Energy, July 2004. The Western Governor's Association is also supporting a regional goal of 1000 MW of CSP, leading to some collaboration with projects planned Arizona, Nevada, and other states.



the leading states for advocacy participation in the Western Resource Advocates' *Balanced Energy Plan for the Interior West*, which was released in May 2004.<sup>139</sup> The plan proposes a variety of clean energy strategies and a 2020 generation mix that includes 21 percent renewables regionwide.

The Governor has convened seven energy task forces to report by December 2004 on accelerated renewables development and energy efficiency. Renewables task forces include one focused on CSP and one focused on distributed PV. A transmission-access task force also will report on renewables issues.<sup>140</sup> One objective for the task forces is to propose legislation for the 2005 session.

According to the Union of Concerned Scientists, New Mexico ranks ninth in the nation for potential renewable generation as a percentage of its own energy use. By the state's own measure, it ranks second in the nation in solar resources, seventh in geothermal, and twelfth in wind.<sup>141</sup> *The Renewable Energy Atlas of the West* provides an overall picture of potential by resource, as shown in Exhibit 2.5-1.<sup>142</sup> Note that the total 2002 electricity consumption in New Mexico was about 19,200 GWh.

**Exhibit 3.5-1: Potential NM electricity production from renewable sources (GWh/yr)**

Wind	Solar	Geothermal	Biomass	Total
56,000	104,000	3,000	<1000	<b>164,000</b>

The greatest practical barriers to renewable energy development in New Mexico are transmission constraints on centralized resources such as wind, the current cost of solar technology, and environmental sensitivity at some sites. New Mexico is working with other states to resolve transmission issues, and it may be able to market renewable generation to growth centers in Arizona, Nevada, and California.

Another barrier to renewable energy development in the state is the economic and political strength of the oil and gas industries.<sup>143</sup> In natural gas, New Mexico ranks second nationwide in reserves and second in production. In domestic oil it ranks fourth in reserves and sixth in

<sup>139</sup> A *Balanced Energy Plan for the Interior West*, produced by Western Resource Advocates in collaboration with Synapse Energy Economics and the Tellus Institute, May, 2004. Available from [www.westernresourceadvocates.org](http://www.westernresourceadvocates.org).

<sup>140</sup> Communication with Craig O'Hare, Governor's Special Assistant for Renewable Energy, July 2004.

<sup>141</sup> Data from Chris Wentz, Director Energy Conservation and Management Division, NM Energy, Minerals, and Natural Resources Department, presentation to the Southwest Renewable Energy Conference, August 2, 2004.

<sup>142</sup> *Renewable Energy Atlas of the West*, Land and Water Fund of the Rockies (WRA), 2002. See [www.energyatlas.org](http://www.energyatlas.org).

<sup>143</sup> Ibid.

production. In coal, it ranks third in reserves and twelfth in production. Taxes from these industries account for nearly one-quarter of the state budget. The national and international market for these fossil resources should be strong for many years, despite renewable energy development, but industry and some policy makers perceive renewable energy as a threat.

#### INTERCONNECTION AND NET METERING

New Mexico has statewide interconnection regulations for systems over 10 kW that have not been significantly changed since 1988. This rule (NMPRC Rule 570) applies to investor-owned utilities and electric co-ops. Municipal utilities were required to adopt their own rule; most have adopted the state rule. This rule implements the Public Utilities Regulatory Policy Act of 1978, establishing the right of qualifying facilities (independent power producers) to sell power to utilities at avoided cost. Current FERC rulemaking, updating interconnection rules, applies, although the state has not taken formal action.

A simplified interconnection rule for small cogeneration and renewable energy systems under 10 kW has been enacted in 1999. This is NMPRC Rule 571. Systems must comply with all local and national standards (NEC, IEEE, and UL), and must also meet any additional requirements that a utility files and the PRC approves. A manual external disconnect device is required unless the customer and utility agree that the meter can be used to disconnect the system in the case of a power outage. Reportedly, the meter is commonly used for this purpose in PV installations, and the only testing required is a simple shutdown test to ensure that systems recognize when grid power is down.<sup>144</sup>

Net metering is also defined by Rule 571. Basic provisions include:

- ◆ Net metering is limited to non-fossil generation
- ◆ Net metering is limited to 10 kW or less
- ◆ Certification from a professional electrical engineer is *not* required
- ◆ Single-phase PV systems may interconnect without an isolation transformer
- ◆ If the net metered facility uses more power than it produces over a billing period, the utility may bill the customer for the net power used according to the rate structure that would apply if the customer were not net metering.
- ◆ If the facility produces more power than it uses over a billing period, the utility may either reimburse the facility at the avoided cost rate, or apply for a credit at full retail rate to the next billing period. In the latter case, reimbursement at avoided cost only occurs if the facility closes the metered account. This latter case is commonly accepted.

Advocates have proposed changing it to increase the kW limit and to extend the credit over more than one billing period.

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<sup>144</sup> New Mexico Solar Energy Association Website, [www.nmsea.org](http://www.nmsea.org).

## TAX INCENTIVES

### ***Renewable Energy Production Tax Credit***

New Mexico Renewable Energy Production Tax Credit, HB 146 (2003) was enacted in 2002 and implemented July 1, 2002. The credit applies to solar thermal electric, solar PV, wind, and biomass systems of a minimum 10 MW capacity. It provides a tax credit against the corporate income tax of one cent per kWh for companies that generate electricity from these resources. The credit applies only to the first 400,000 MWh of generation in each of 10 consecutive years. Generators must not exceed two million MWh of production annually. The credit may be carried forward for up to five consecutive years. This incentive is aimed primarily at developing the New Mexico wind industry.

### ***Industrial Revenue Bond authority for renewable energy projects/GRT deduction***

HB 143 (2002) specifically defined electricity generation projects as eligible project for the issuance of industrial revenue bonds. Local governments may issue these bonds to support a range of business developments, including electricity generation. The bill was aimed at empowering communities to attract these projects, especially wind developments.

The bill also includes a provision allowing companies a gross receipts tax deduction on wind energy generation equipment sold to the United States or Mexico or any government unit or subdivision, agency, or department, providing the equipment is installed on a supporting structure.<sup>145</sup> The gross receipts tax acts as a sales tax on goods and services in New Mexico.

## RENEWABLE PORTFOLIO STANDARD

The New Mexico RPS is the most aggressive in the nation, in terms of how quickly it seeks to fill utility renewable energy portfolios.<sup>146</sup> The requires IOUs to provide ten percent renewables in their supply mix by 2011, with a 2006 milestone of five percent. The standard was first adopted by the New Mexico Public Regulatory Commission (PRC) in December 2003. The ruling (NMPRC 572) also required utilities to offer a voluntary green power option to their customers. That aspect of the rule was not challenged.

El Paso Electric Company, which serves southeastern New Mexico, challenged the RPS before the State Supreme Court. Public Service Company of New Mexico (PNM) proposed taking the RPS to the legislature. This could resolve questions of authority and resolve details, such as cost-recovery and milestones.

Stakeholders began the legislative process greatly at odds, but with support from the Governor's office, the parties came to an agreement. Four investor-owned utilities, citizens' groups, the solar

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<sup>145</sup> Chapter 37, Laws 2002 from the New Mexico legislative database.

<sup>146</sup> If the California accelerated RPS becomes law, that would be the most aggressive, aiming for 20 percent renewables by 2010.

and biomass industries, large consumers, the Attorney General, and others supported the final bill.<sup>147</sup>

Key features of the RPS include:

1. Sales under voluntary green power programs will not count toward the RPS.
2. Only IOUs must comply with the RPS. Rural electric co-ops and municipal utilities must offer a voluntary green power option, but they are exempt from the RPS.
3. Cost recovery is through the ratemaking process. New Mexico does not have a public benefit fund.
4. The PRC will set a reasonable cost threshold. Utilities that believe they cannot procure renewables for less than the threshold may request a waiver.
5. Large customers with loads at a single service location of more than 10 million kWh will not be charged more than \$100,000 per year in extra costs to pay for renewables, or no more than two percent over their current charges, whichever is lower.
6. Tradable credits will be offered, with values geared to promote emerging (non-wind) renewables.

The PRC is currently engaged in a rulemaking, 04-00211-UT, that will determine a reasonable cost threshold for renewables and the details of certificate trading. It is expected that any owner of a renewable-energy system may hold certificates and sell them to utility companies that need to meet RPS requirements. This would create a *de facto* incentive for distributed renewables, such as PV.<sup>148</sup>

## RENEWABLE ENERGY CERTIFICATES

The RPS allows for tradable RECs, as a procurement option for utilities that have less access to low-cost renewables, such as wind power. The renewable energy intended to satisfy the RPS must be delivered in-state. However, utilities may participate in regional REC trading.

New Mexico expects to participate in the Western Renewable Energy Generation Information System (WREGIS), which is under development by the Western Governor's Association and California partners. WREGIS released draft interim operating rules in April 2004 (see [www.westgov.org/wieb/wregis/documents.htm](http://www.westgov.org/wieb/wregis/documents.htm)), and expects to begin operating in 2005.

In an effort to promote development of emerging renewables, the New Mexico RPS stipulates the following values for certificates:

1. Each kWh generated by wind or hydroelectric shall represent one kWh toward compliance.
2. Each kWh generated by biomass, geothermal, landfill gas or fuel cell technologies shall represent two kWh toward compliance.

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<sup>147</sup> The stakeholder process is documented on the Citizens for Clean and Affordable Energy Website, [www.cfcae.org/Renewable\\_Energy\\_Act.htm](http://www.cfcae.org/Renewable_Energy_Act.htm). Much of this discussion is drawn from CFCAE documentation.

<sup>148</sup> See [www.nmprc.state.nm.us](http://www.nmprc.state.nm.us).

3. Each kWh of electricity generated by solar resources (distributed or central station) shall represent three kWh toward compliance.

In a state the size of New Mexico, a 10 percent RPS will result in only 500 to 600 MW of renewable energy generation. Governor Richardson and stakeholders, including some utilities, envision meeting that goal and surpassing it, as New Mexico becomes a clean-energy export state.

### 3.6 Oregon

Oregon has long been known for its tremendous potential for renewable energy. Oregon's potential for solar energy far exceeds the state's energy requirements. In 2002, the *Renewable Energy Atlas of the West: A Guide to Region's Resource Potential* estimated Oregon's renewable energy electricity generation potential as follows<sup>149</sup>:

#### Exhibit 3.6-1: Electricity Generation Potential

Renewable Energy Source	Electricity Generation Potential
Solar	68 million MWh/year
Wind	70 million MWh/year
Biomass	10 million MWh/year

In stark contrast, renewables account for approximately 1 percent of the production generation mix in Oregon. In recent years production of electricity from wind and biomass sources has increased.

Oregon has excellent solar resources for PV and flat-plate solar thermal collectors, and good solar resources for concentrating collectors.<sup>150</sup>

#### Exhibit 3.6-2: Oregon Solar Resources

Technology	Energy (kWh/m <sup>2</sup> /day)
PV or Flat Plate Thermal	3.5 to 5.5
Concentrating	3.0 to 5.5

Oregon's wind resources are benefited by its exposure to the Pacific Ocean. On-shore resources along the Pacific Coast provide resources with power densities between 300 and 600 W/m<sup>2</sup> measured at 50 meters, comparable to Class 3 to 5 wind resources. The elevations of the Cascade

<sup>149</sup> <http://www.energyatlas.org>

<sup>150</sup> [http://www.eere.doe.gov/state\\_energy](http://www.eere.doe.gov/state_energy)

Mountains west of Portland, Salem and Eugene have sites with excellent wind resources, with pockets Class 5 wind resources with power densities of up to 500 Watts/m<sup>2</sup>. Several significant transmission corridors also cross some of these areas. In addition, much of this region is contained within tribal territories that could offer opportunities for working with federal (e.g. U.S. DOE’s Tribal Energy Program), state, and tribal programs to encourage wind resources and provide high value technical employment. Additional pockets of Class 5 or better wind resources are present in the northeast and southeast parts of the state. Oregon has been the site for significant wind farm speculation. For example, the state’s first utility scale wind farm, located on Vansycle Ridge near the Columbia River valley, became operational in 1998 and has a maximum capacity of 24 MW. Another project, the Combine Hills Turbine Ranch; funded by PacifiCorp and the Oregon Energy Trust, provides 41 MW of capacity. Most of the remaining portion of the state has Class 1 or 2 wind resources with a power density of up to 300 Watts/m<sup>2</sup>, suitable for small wind turbines.<sup>151</sup>

The timber industry has been declining in Oregon for many years due to restrictions and changes in federal policy concerning logging on public lands and other factors. Uncertainty in the timber markets of the Pacific Northwest may reduce the willingness of stakeholders to invest in forest residue and wood products industry waste installations.<sup>152</sup>

As the traditional forest industries decline in Oregon, over 34,000 acres of managed pulpwood crops have been developed in the state helping to secure its paper industries. The forest residue yield from these plantations is predictable and presents an opportunity to collaborate with wood product and paper industries to increase their usage of wood waste as a process or CHP fuel.

Oregon’s dairy industry provides sufficient resources to warrant consideration of anaerobic digesters. In 2003, Oregon had 111 dairy operations that were licensed for 500 head. According to U.S. DOE estimates, there is a potential for approximately 3,400 million cubic feet of biogas from these herds. Exhibit 2.6-2 provides estimates of Oregon’s biomass resources at several price points.

**Exhibit 3.6-3: Oregon Biomass Resources<sup>153</sup>**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	1,299,000	1,928,000	2,515,900
Mill Residues (sawing, milling, and planning of lumber)	10,000	1,738,000	6,834,000

<sup>151</sup> [http://www.eere.energy.gov/windpoweringamerica/wpa/astate\\_template.asp](http://www.eere.energy.gov/windpoweringamerica/wpa/astate_template.asp)

<sup>152</sup> <http://www.energy.state.or.us/biomass/Resource.htm>

<sup>153</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	0	0
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	3,595,636	6,114,270

#### REGULATIONS PERTAINING NET METERING

Legislation enacted in 1999 (H.B. 3219) makes provisions for net metering. Allowable technologies include solar, wind, fuel cells and hydro systems of 25 kW or less. Net metering is available to all customer classes across all utilities.

#### REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTION

The Oregon Buildings Code Division developed the interconnection standards for systems generating up to 25 kW. These systems must comply with NEC Article 690, comply with IEEE codes, and employ UL-listed equipment.

#### STATE TAX INCENTIVES

The *Property Tax Exemption* applies to commercial, industrial and residential customers. Eligible technologies include solar passive space heat, solar thermal electric, solar water heat, solar thermal process heat, PV, landfill gas, wind, hydro, geothermal, and geothermal heat pumps. One hundred percent of the added value is exempt from property taxes. Residential customers may receive up to \$1,500 in personal tax credit for purchasing and installing appliances recognized by the DOE as premium-efficiency such as ENERGY STAR qualified products.

#### ENERGY LOAN PROGRAM

Administered by the Oregon Department of Energy, the Energy Loan Program (SELP) provides financial assistance for energy related projects. Included in these projects are those that seek to implement renewable energy technologies, specifically biomass, cogeneration, methane gas recovery, solar passive and solar active, and wind power. Eligible applicants include the following sectors: residential, schools, state, cities, counties and special districts, commercial, and industrial. To date, this program has received more than 922 applications and approved 606 loans. Of these loans, 10 percent were for Solar/PV systems and 13 percent for geothermal systems. The typical rate for state, counties, cities, special districts, schools and colleges is 4.5 percent for 12 years. For residential and commercial customers, the rates vary depending on the term of the loan.

#### Exhibit 3.6-4: Loan Terms

Rate	Length
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6.0%	15 years
5.5%	10 years
4.75%	5 years

Large industrial customers may receive tax-exempt rates.

**PROGRAM SPECIFIC INFORMATION**

Several utility and state renewable energy programs are available to Oregon residents.

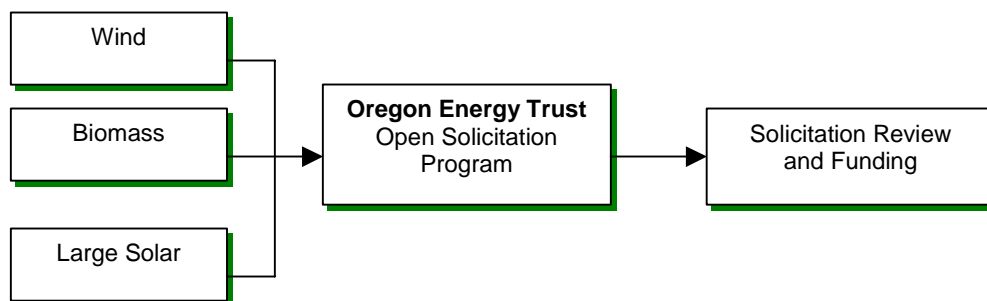
**ENERGY TRUST OF OREGON**

The Energy Trust of Oregon was created in 1999 by the Oregon Public Utilities Commission and is the non-profit organization charged with administering system benefit charges for energy efficiency programs. Included in its portfolio of offerings are renewable energy technologies such as wind, solar, biomass, and fuel cells. For the first quarter of 2004, the Renewable Resources Programs spent \$0.5 million and installed 27 residential projects and 1 commercial project.

*Open Solicitation Program*

This \$1,000,000 per year program provides funding for projects that use renewable energy technologies, including wind, biomass, solar and fuel cells. These unsolicited proposals are reviewed against a number of pre-established criteria including replicability, marketability, educational potential, and implementation potential among others.

**Exhibit 3.6-5: Open Solicitation Process**



*Small Wind Program / Anemometer Loan Program*

This program is administered by Oregon State University's Energy Resource Research Laboratory. The purpose of this program is to help farmers, municipalities, and rural residents identify wind potential for the installation of small systems.

*Solar Electric Program*



The Solar Electric Program launched in 2003. Initial activities included trade ally recruitment and training. The Oregon Trust of Oregon works with a network of trade allies to promote, identify and install PV systems. A list of selected contractors is available through their website. The program is open to residential and commercial customers that receive power from Pacific Power or Portland General Electric. Rebate applications are submitted through installers, who then pass on the savings to the customer. The Web site provides up-to-date information on incentive levels. Residential customer may receive \$3.00 per DC Watt installed up to \$10,000; commercial customers may receive \$2.25 per DC Watt installed up to \$15,000. In addition, contractors provide additional customer support by completing applicable residential or business tax credit applications.

Staff for this program includes a program manager, a director a coordinator, and administrative staff. Five inspectors, under contract to the Energy Trust of Oregon, provide technical support. These inspectors are located throughout the state. Additional technical support to the program is provided through the Department of Energy, and on-call engineers and consultants.

Applications for the program are received through the trade allies. Depending on completeness, the approval process can take as little as a week. Trade allies review the application for completeness, and inspectors review applications against eligibility criteria. The approval is provided to the customer in writing, at which point incentives are reserved for up to one year. Program activities are tracked with a server-based system. This robust system may enable the program to start approving applications on-line.

Through the first year of the program, the incentive levels have been reviewed against participation. Incentives started at \$2.50/ Watt with very little program participation. Subsequently incentives were increased to \$3.50/Watt and an additional bonus of \$0.75. Now that the program has seen some success, the incentive level may be lowered slightly.

Marketing activities for the program include the following:

- ◆ Bill inserts,
- ◆ Magazine ads and articles,
- ◆ Press releases,
- ◆ Presentations,
- ◆ Direct marketing, and
- ◆ Public seminar.

Finally, this program uses Bright Way™ standards and is coordinated with other State initiatives. The program does not allow do-it-yourself installations. All installations must go through a licensed contractor (preferably one that is a program trade ally).

## BONNEVILLE POWER AUTHORITY

In addition to the Energy Trust of Oregon's renewable energy programs, non-investor owned utilities offer other programs. The Bonneville Power Administration (BPA) and Eugene Water and Electric Board (EWEB) offer the joint program The Bright Way™ to Heat Water. Since 1990, this program has promoted solar water heating technologies in the Pacific Northwest. This contractor-driven program was first promoted by EWEB and, in 2002, the BPA purchased the property rights to the program and the rights to distribute it to its utilities. BPA determines the technologies that are eligible for participation based on program specifications. The program does not allow do-it-yourself installations, unless these are certified by a contractor or the utility. In order to participate in the program, contractors are required to attend training and obtain a certification. Participating utilities design their own rules, training, and certification. If desired by the utilities, BPA provides assistance in designing and conducting training sessions, the certification process and contractor eligibility requirements.

Contractors are required to do the following:

- ◆ Obtain a signed, itemized contract with the customer,
- ◆ Complete an analysis and complete a sun chart to determine system location,
- ◆ Warrantee equipment and installation for 2 years,
- ◆ Correct any installation errors,
- ◆ Complete Systems Completion Form, and
- ◆ Provide customer education on the operation and maintenance of the equipment.

The utility then performs the following tasks:

- ◆ Inspects and certifies the equipment installation,
- ◆ Completes a Specification Checklist, and
- ◆ Ensures that specifications are adhered to.

## 3.7 Wisconsin

Wisconsin has good solar resources for PV and flat-plate solar thermal collectors, but poor-to-fair solar resources for concentrating collectors.

### Exhibit 3.7-1: Wisconsin Solar Energy Resources

Technology	Maximum Potential Energy Density (kWh <sub>t</sub> /m <sup>2</sup> /day)
PV or Flat Plate Thermal	3.5 to 4.0
Concentrating	3.0 to 4.5

Wisconsin’s wind resources are benefited by its Great Lake exposure and flat topography. On-shore resources along lake Michigan provide locations with wind power densities of 200 to 400 Watts/m<sup>2</sup>, roughly correlating to Class 3 and 4 wind speeds (wind measurements by Wisconsin Focus on Energy were made at 60 meters instead of the standard 50 meters used throughout this report) suitable for utility scale wind farms or large community energy projects. The wind resources of the western part of the state are comparable, though the pockets of good wind resources are more dispersed. The wind resources in the central part of the state range from 200 and 300 Watts/m<sup>2</sup>, suitable for small turbines.<sup>154</sup> Wisconsin has several successful utility- scale wind projects, including the Montfort Wind Farm, and is a priority market for several wind turbine manufacturers.<sup>1</sup>

The wood products industries form a large portion of Wisconsin’s economy. Wisconsin is rich in forested land, which supports hundreds of independent logging operations and sawmills; in addition, the state has many wood finishing, furniture making, and paper industries. Wisconsin has a strong agricultural community, dominated by its dairy industry. A portion of the state’s agricultural production goes directly to supporting its thriving dairy production. Manure from dairy operations provide a rich energy source that can be used to produce methane using anaerobic digesters; some Wisconsin renewable energy programs are preparing to capitalize on this resource.

Exhibit 3.7-2 provides estimates of Wisconsin’s biomass resources at several price points.

**Exhibit 3.7-2: Wisconsin’s Biomass Resources<sup>155</sup>**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	609,000	886,000	1,138,400
Mill Residues (sawing, milling, and planning of lumber)	42,000	120,200	192,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	5,179,618	5,179,618
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	3,595,636	6,114,270

<sup>154</sup> <http://www.focusonenergy.com/data/common/pageBuilderFiles/winds.pdf>

<sup>155</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

#### REGULATIONS PERTAINING TO NET METERING

In 1992, Public Service Commission of Wisconsin (PSCW) Order 6690-UR-107 authorized net metering for customer-owned systems up to 20 kW. The order applies to all utilities under the jurisdiction of the PSCW and applies to all renewable energy and CHP technologies. There is no cap on the total percentage of a utility's generation portfolio that can be net metered. Renewable energy system excess generation is paid at the retail rate; excess from non-renewable energy systems are paid at the utility's avoided cost.

#### REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTION

The guidelines authorized by Wisconsin Statute 196.0625 (and PSC 119), and signed into law in February, 2004, covers all distributed generation systems up to 15 MW.

#### **Exhibit 3.7-3: Wisconsin Standardized Interconnection Requirements by Category**

<b>Category</b>	<b>System Capacity</b>
1	20 kW
2	20 kW to 200 kW
3	200 kW to 1 MW
4	1 MW to 15 MW

Included in the guidelines are standardized application forms for interconnection: Form 6027 for Category 1 facilities and Form 6028 for Category 2 and above. Category 1 systems up to 20 kW are not considered commercial systems and therefore are not required to have commercial liability insurance; insurance requirements for Categories 2 through 4 vary.

In addition to state activity, the City of Madison's Heating, Ventilating, and Air Conditioning Code, Madison Code of Ordinances' Chapter 30 Section 1 establishes equipment standards for renewable energy systems. The code applies to solar thermal equipment, including collector orientation, shading, anchoring and support; corrosion; sensors; piping; insulation; fluids storage; monitoring; and system documentation.

#### STATE TAX INCENTIVES

Under Wisconsin Statute 70.111, any value added to a property by a solar (PV or solar thermal) or wind energy system is exempted from general property taxes. The tax exemption applies only to the renewable energy systems, not peripheral mechanical or electrical equipment that may be connected to the systems but also would be part of a comparable conventional energy system.

#### RENEWABLE PORTFOLIO STANDARDS

Authorized under Wisconsin Statute 196.378 in 1999, a schedule was developed to transition 2.2 percent of the state's electric energy consumption to renewable energy sources by 2011.

### Exhibit 3.7-4 Wisconsin RPS Requirements by Year

Year	RPS Percentage
2001	0.5%
2003	0.85%
2005	1.2%
2007	1.55%
2009	1.9%
2011	2.2%

Renewable energy that qualifies includes that generated by PV, solar thermal, wind, geothermal, biomass, tidal or wave energy, renewable fuel cells, and hydropower systems less than 60 MW in capacity.

#### RENEWABLE ENERGY ACCESS LAWS

Wisconsin is a prime example of a state using ordinances and regulations to ensure uninterrupted access to renewable energy resources. Under Wisconsin Statute 66.0401 and 66.0403, property owners may apply for permits guaranteeing unobstructed solar and wind access for currently unobstructed views.

Locally, the City of Madison has taken steps to ensure municipal planning permits solar access. Madison's Code of Ordinances' Chapter 16 Section 23 requires streets to be oriented within 20 degrees of an east-west direction to ensure southern solar exposure. Planting of trees also must consider solar access.

#### INSTALLER CERTIFICATION AND LICENSING

The City of Madison's Heating, Ventilating, and Air Conditioning Code, Madison Code of Ordinances' Chapter 30 Section 1 provides an example of a local government issuing rules for contractor licensing for renewable energy systems. To comply with the code, a person desiring to install, repair, or alter a solar heating system must have a Class A-4 professional license.

#### PROGRAM SPECIFIC INFORMATION

##### ***Focus on Energy***

Focus on Energy is a partnership of public and private organizations administered by the Wisconsin Department of Administration (WDA). The program supports a wide variety of renewable energy and energy efficiency measures designed to accomplish the following goals:

- ◆ Save money for businesses and residences,
- ◆ Increase electric reliability,

- ◆ Improve energy efficiency ,
- ◆ Reduce the need for fossil fuels,
- ◆ Improve economic health, and
- ◆ Reduce the negative environmental impacts of energy use.

To encourage renewable energy use and development, Focus on Energy also provides the following:

- ◆ Loans,
- ◆ Grants,
- ◆ Free telephone consultations,
- ◆ Information via its online library,
- ◆ Events and workshops, and
- ◆ Renewable energy yellow pages.

The funding for Focus on Energy’s renewable energy programs is variable, and according to a program representative, has been reduced in recent years. Currently, funding is approximately \$3.5 million.

*Cash Back Reward.* Wisconsin’s Focus on Energy offers cash-back rewards for the installation of or expansion of renewable energy systems on residential and non-residential facilities. The payments are based on an estimate of the amount of electricity or thermal energy produced by installations.

**Exhibit 3.7-5: Wisconsin Focus on Energy Cash Back Rewards**

Technology	Maximum Capacity	Maximum Incentive (% Cost or Project \$)
<b>Residential</b>		
Wind	20 kW	25% or \$35,000
PV	20 kW	25% or \$35,000
Solar Hot Water	5,000 therms	30% or \$3,000
<b>Non-Residential</b>		
Wind	20 kW	25% or \$35,000
PV	20 kW	25% or \$35,000
Solar Hot Water	5,000 therms	25% or \$35,000
Solar Space Heating	5,000 therms	25% or \$35,000

*Grant Programs.* Focus on Energy offers grant programs to support the development of renewable energy within participating Wisconsin utilities. Grants offered under the program are used to specifically support renewable energy-related functions, such as feasibility and

installation studies for customer-sited renewable energy systems and business and marketing grants to provide support for renewable energy service providers.

*Site Assessment Program.* To facilitate the adoption of home and business renewable energy systems, Focus on Energy provides a site assessment program, that includes a visit by a renewable energy expert and a detailed report of the findings. Under the program, a residential site assessment typically costs between \$300 and \$400 and a business site assessment between \$500 and \$600; in both cases, 25 percent of the cost is paid by the site owner.

*Loan Programs.* Focus on Energy offers low-interest loans to finance renewable energy projects on existing owner-occupied single-family and duplex homes within participating utility service territories. PV, wind, and solar water heat are eligible for \$2,500 to \$20,000 in funding at an interest rate of 1.99 percent, with repayment terms set between three and 10 years.

*Scholarships.* In cooperation with the Midwest Renewable Energy Association (MREA), Wisconsin Focus on Energy is offering qualified individuals \$50 in “Renewable Energy Bucks” to attend educational workshops offered by the association. Courses address a variety of renewable energy topics, including PV and wind power generation.

In addition to the “Renewable Energy Bucks” available to the general public, MREA and Focus on Energy offers to pay 50 percent or up to \$300 of the fees for eligible courses, workshops, or certification exams. To be eligible, individuals must either be a renewable energy professional or a employee of a business that is intending to incorporate renewable energy technologies into its operations.<sup>156</sup>

*Feasibility Study Grants.* These grants provide financial support for assessing the feasibility of complex customer-sited renewable energy systems. Feasibility study grants of up to \$10,000 or 50 percent of project cost are awarded to businesses and organizations to help them make appropriate and educated decisions about renewable energy systems.

*Implementation Grants.* These grants provide support for commercial renewable energy projects greater than 20 kW or 5,000 therms per year.

### **Exhibit 3.7-6: Focus on Energy Implementation Grant Values**

<b>Technology</b>	<b>Maximum Percentage of Project Cost</b>	<b>Maximum Grant Value</b>
PV (solar electric)	25%	\$35,000
Solar Thermal	25%	\$35,000
Wind	35%	\$45,000
Biomass Electric	35%	\$45,000

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<sup>156</sup> [http://www.the-mrea.org/course\\_scholarships.php](http://www.the-mrea.org/course_scholarships.php)

Biomass Thermal	35%	\$45,000
Hydroelectric	25%	\$35,000
Renewable fueled CHP	35%	\$90,000

Applications for Implementation Grants are due noon on the last Wednesday of every month.

*Business & Marketing Grants.* These grants provide financial support for improving the strength of businesses that provide renewable energy products and services. Grants can be used for developing business plans, gaining market recognition, market research, developing marketing materials and training or certification of employees. Up to \$10,000 or 50 percent of project costs are eligible for funding.

*Curriculum Development Grants for the Technical College System.* Focus on Energy staff are establishing a program that provides funding to technical colleges, such as Madison Technical College, for the development of renewable energy education, curriculum development, and apprentice programs. The intent of these grants is to further develop the availability of qualified Wisconsin renewable energy system installers.

*Market Provider Program.* Focus on Energy is initiating a provider program in which contractors will market the program in exchange for \$500 of tradeshow/marketing co-funding. To ensure credibility of the provider network, all participants must sign a contract with Focus on Energy that incorporates a statement of ethicality. Mandatory training and Focus on Energy logo use guidelines are provided.

The renewable energy functions of Focus on Energy are administered by two full-time employees supported by eight other employees and two contracting firms. The contractors perform the bulk of the administration. According to the program representative, about half of the funding goes into contractor support and half directly into financial incentives.

When an application is received for a grant or loan, contractors review the application and determine the incentive to be approved. The contractor uses PV Watts minus an additional safety factor of approximately 20 percent to base the incentive level amounts.

The application process for each incentive type is tracked using a specifically designed MS Access database; the budget is tracked separately in a MS Excel spreadsheet. This database allows reports, including geocoding, to be generated at any point in the project pipeline. Reports are also done on a monthly basis for the organization's board. This database also facilitates quarterly data extracts by program evaluators.



As of the program's most recent impact evaluation, dated August, 2003, the program had implemented the following tracked projects:<sup>157</sup>

**Exhibit 3.7-7: Number of renewable energy projects through March 2003**

	With Energy Impact	Without Energy Impact	Total
Cash-Back	103	1	104
Grant	9	50	59
Total	112	51	163

**Exhibit 3.7-8: Number of renewable energy projects through March 2003 by Technology**

	Cash-Back	Grant	Total
PV	47	5	52
Solar Water Heating	32	0	32
Hydro	1	0	1
Wind	12	1	1
Multiple Projects	0	1	1
Geothermal Heatpump	3	0	3
Solar Space Heating	0	2	2
Bioenergy	8	0	8
Total	103	9	112

***Wisconsin Municipal Utility Solar Energy Cash Allowance***

Wisconsin Public Power Inc (WPPI), an organization consisting of 37 of the State's municipal utilities, has promoted an renewable energy incentive program design, the Wisconsin Municipal Utility Solar Energy Cash Allowance, to its members since 1998.

The program is independently adopted and administered from public benefit funds independently collected by each municipal utility. According to a program representative, four of WPPI's members are participating.

Under the program design, participating utilities offer a \$1/Watt incentive for PV installations up to \$1,000 or \$15 ft<sup>2</sup> of solar thermal hot water system up to \$ 1,000. In addition, participating utilities will fund 50 percent of the repair cost of an existing solar thermal hot water system up to \$500.

<sup>157</sup> State of Wisconsin Department of Public Administration, Division of Energy Focus on Energy Statewide Evaluation: Renewable Energy program Spring 2003 Impact Evaluation, Final Report: August 8, 2003

In support of the program, WPPI offers standard application forms, standardized marketing/educational materials, staff expertise. According to the program representative, participation is very low and there have been no applications in the last two years.

WPPI is currently redesigning this program to be broader and to garner higher participation.

#### *WPPI Energy Efficiency and R&D Grants*

WPPI offers a \$20,000 grant annually to its utilities to support renewable and energy efficiency R&D activities. This grant can be used for equipment installation or education.

### 3.8 Illinois

Illinois has good-to-fair solar resources for PV systems and flat-plate solar thermal systems; however, it has poor solar resources for concentrating solar collectors.<sup>158</sup>

#### **Exhibit 3.8-1: Illinois Solar Resources**

<b>Technology</b>	<b>Energy Density (kWh/m<sup>2</sup>/day)</b>
PV or Flat Plate Thermal	3.5 to 4.5
Concentrating	3.0 to 4.5

The wind resources of Illinois range from less than 200 W/m<sup>2</sup> to more than 500 W/m<sup>2</sup> with the majority of the state having a marginal-to-fair wind power density of 200 W/m<sup>2</sup> to 400 W/m<sup>2</sup>. Several pockets of Class 4 resources with energy densities of 400 to 500 W/m<sup>2</sup> exist south of Quincy and northwest of Bloomington that are suitable for utility-scale or large-capacity community wind projects.<sup>159</sup> Illinois Wind Energy LLC is developing the state's first wind farm, the Crescent Ridge project, located in Bureau County.

Illinois is gifted with copious biomass resources; not only does the state have a large agricultural community, but it also has healthy forestry and milling operations. These economic activities provide a wealth of cellulose- and starch-based materials that can provide energy for heating, electricity generation, and transportation fuels.

A 1999 state level analysis conducted by ORNL provided estimates of the available dry tons of a biomass fuel at several price points, as indicated in Exhibit 2.9-2.<sup>160</sup>

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<sup>158</sup> [http://www.eere.energy.gov/state\\_energy/tech\\_solar.cfm?whytwomaps=Why+Two+Maps%3F](http://www.eere.energy.gov/state_energy/tech_solar.cfm?whytwomaps=Why+Two+Maps%3F)

<sup>159</sup> [http://www.eere.energy.gov/windpoweringamerica/images/windmaps/il\\_std800.jpg](http://www.eere.energy.gov/windpoweringamerica/images/windmaps/il_std800.jpg)

<sup>160</sup> Walsh et. Al. "Biomass Feed stocks Availability in the United States: 1999 State Level Analysis" Oak Ridge National Laboratory, January 2000

**Exhibit 3.8-2: Illinois Biomass Resources**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	228,000	330,000	423,300
Mill Residues (sawing, milling, and planning of lumber)	19,000	117,000	282,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	24,270,757	24,270,757
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	1,427,349	7,689,694

Illinois has demonstrated leadership in promoting energy crops for the production of ethanol fuel and gasoline additives (e.g., E85). Ethanol-based fuels and fuel additives present an opportunity for Illinois and other Midwestern “corn belt” states to improve the market conditions for starchy agricultural commodities (such as corn), boosting farm profits, and helping to develop rural economies. In fact, in a 2003 campaign General Motors and the National Ethanol Vehicle Coalition provided \$40 debit cards to owners of GM flexible fuel vehicles, which can use conventional gasoline or high ethanol mixes such as E85.

REGULATIONS PERTAINING TO NET METERING

Net metering is not provided statewide but is offered by the state’s largest utility, ComEd. ComEd’s rules permit small solar and wind systems up to 40 kW to net meter into the grid. The program is available to all customer classes with total enrollment limited to 0.1 percent of the utility’s annual peak demand. This net metering system requires an investment grade dual register meter provided by ComEd. Under the net metering pricing structure, ComEd will pay the customer on a monthly basis the utility’s avoided costs for any net excess generation.

REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTIONS

The state of Illinois does not have statewide interconnection rules in place for distributed generation. The Illinois Commerce Commission has studied the interconnection issue internally but no formal policies have been developed or ratified.

In coordination with its net metering allowances ComED has developed interconnection rules outlined in *The DG Book: Guidelines for Interconnection of Distributed Generation to the ComEd System* (2001). ComEd’s rules segment DG equipment into several categories based on capacity. In general, the system owner is responsible for all interconnection study charges and the system must be a qualifying facility under PURPA to receive payment for power sent to the

utility. Small systems under 40 kW that are net metered are exempted from a number of requirements, but must have a manual, lockable disconnect switch accessible to the utility.

#### STATE TAX INCENTIVES (INCOME, SALES, PROPERTY)

Statute 35 ILCS 200/10-10 allows, but does not mandate, special assessment of residential and commercial energy systems for property tax purposes. Most renewable energy systems qualifies, but under the statute the system cannot have a value more than a conventional energy system.

In addition to incentives for stationary clean energy sources, Governor Blagojevich in 2003 signed Senate Bill 46, which extends tax incentives for ethanol-blended gasoline for a decade. The statute provides a sales tax exemption on ethanol-blended gasoline and completely eliminates sales tax on E85.

#### RENEWABLE ENERGY PORTFOLIO STANDARDS

Under the Illinois Resource Development and Security Act, 20 ILCS 688/5, Illinois adopted a goal of at least 5 percent of total energy consumed in the state and 15 percent by 2010 be derived from renewable resources. However, this does not represent as substantive commitment to renewable energy as an RPS does; it provides no implementation schedule or compliance verification.

In 2002, in a move to support the continued development of green power in Illinois, Governor George Ryan issued Executive Order No. 6 to ensure that buildings owned and operated by the government purchase at least 5 percent of their gross electricity consumption from green sources, not including direct combustion of wood waste, municipal waste, or tires.

Illinois municipal governments have demonstrated green power leadership. In 2001, the City of Chicago signed an agreement with ComEd and the Environmental Resources Trust to purchase 20 percent of the municipal governments electricity resources from clean, renewable resources by January of 2005.

#### GREEN TAG/RENEWABLE ENERGY CERTIFICATE TRADING

Established in 2002, The Chicago Climate Exchange (CCX) is a centerpiece of carbon trading in the United States. The CCX goes beyond the state's commitment to use renewable energy and reduce greenhouse gas (GHG) emissions. It was founded by the City of Chicago and 16 national major companies and utilities. Each voluntary participant of the exchange pledges to commit to a 4 percent reduction in GHG emissions from 2003 to 2006; 1998 to 2001 is the baseline.

Following the model of other successful cap and trade programs, credits will be awarded for emission reductions; members will be free to buy and sell allowances in order to find the most cost-effective way of reducing emissions while remaining under the market cap. The trading activities are overseen by the National Association of Securities Dealers. Currently, the exchange does not include renewable energy projects, but does allow for sequestration of carbon in soils and forest biomass. The CCX will likely serve as a experiment to determine whether voluntary

cap and trade programs can be successful, and if the number of participants grows, renewable energy projects may emerge as an option for carbon offsets.<sup>161</sup>

#### CO-PROMOTION WITH GREEN BUILDING AND SIMILAR PROGRAMS

Illinois and its municipalities have a history of actively supporting green buildings. For example, following a national trend the City of Chicago has declared that all new municipal buildings owned and operated by the city will be certified under the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system.

The Illinois Clean Energy Community Foundation Grants (ICECF) are applicable to projects incorporating green design or pursuing rating through the USGBC LEED. The Energy Efficient Design and Commissioning grant program gives preference to those projects that are actively pursuing a silver rating or better with the USGBC's LEED rating system.

#### PROGRAM-SPECIFIC INFORMATION

##### *Illinois Clean Energy Community Foundation Grants (ICECF)*

Established by the Illinois Legislature under statute 220 ILCS 5/16-111.1, the Illinois Clean Energy Community Foundation (originally the Clean Energy Community Trust) is an independent non-profit foundation. The ICECF invests in clean energy development and land preservation efforts to improve the environmental quality of the state. With respect to renewable energy, ICECF's priorities are to develop the following:

- ◆ Consumer demand for clean renewable energy;
- ◆ Policy instruments supporting the growth of community and utility scale wind or solar power generation; and
- ◆ Demonstrations of the market viability of solar thermal, biomass, fuel cells, and emerging renewable energy technologies.

The ICECF was funded by \$225 million endowment from ComEd and continues to operate from the investment income. For 2004, the ICECF will award a series of grants with no deadline; non-profit organizations and state or local governments may apply for funding for small-scale solar or wind generation. Eligible photovoltaic projects will receive \$2,000 per kW, with a maximum system capacity of 50 kW. Eligible small wind projects will receive \$500 per kW, with a maximum system capacity of 20 kW. Foundation funding for these systems will provide no more than 80 percent of the total project cost.

The grant process begins with the applicant sending in a three-page letter of inquiry, which includes the following:

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<sup>161</sup> Smith, Don C. GHG Reductions in the US, REFOCUS, Sep/Oct 2003

- ◆ Project description;
- ◆ Need and benefits for Illinois; and
- ◆ Project expenses, sources of funding, and requested funds from the Foundation.

After reviewing the letter of inquiry, the Foundation will request a full proposal from selected applicants.

Small scale solar, wind, and green buildings project proposals are accepted through a rolling review process year round. Program staff accept or deny funding proposals with 30 to 60 days. Non-solar/wind projects larger than 50 kW must seek funding in the January or July competitive grant cycles and funding decisions are made by April or October respectively.

Applications are tracked using MicroEdge,Inc.'s GIFTS Web-based platform. The GIFTS platform allows staff, board members, reviewers, and grantees to collaborate to manage the entire lifecycle of the grant.

The ICEF is staffed by eight full-time employees; about 60 hours a week are devoted to renewable programs. The program representative interviewed stated that the staff was sufficient, but would not be with an increase in demand.

To date, the program has funded 23 PV systems resulting in about 600 kW of capacity.

**Exhibit 3.8-3: ICEF Grants from 2001 to 2003**

Year	PV Installations	Wind Installation	Solar Thermal Installations	Transportation Fuels	Feasibility Assessments	Other	Education Marketing and Collaboration
2003	4	1	1	2	3	1	7
2002	7	1	2	0	0	1	0
2001	7	1	0	0	2	2	6
Total	18	3	3	2	5	4	13

*Renewable Energy Resources Program (RERP) Rebates*

The Renewable Energy Resources Program (RERP) promotes the adoption and commercialization of renewable energy within the state of Illinois. Funded by the Renewable Energy Resources Trust Fund (a portion of the state's public benefit funds funded by the Renewable Energy Resources and Coal Technology Development Assistance Charge) and administered by the Illinois Department of Commerce and Economic Opportunity (DECO), RERP distributes funds in the form of grants for large systems and rebates for small systems.

Commercial, industrial, institutional, municipals, and non-profits are eligible for rebate funding. Renewable energy rebate applications for PV and solar thermal energy systems are accepted on an ongoing basis and rebates are awarded the following fiscal year.

**Exhibit 3.8-4: Illinois RERP Grants**

Technology	Maximum Rebate Amount and Percentage of Project Cost
PV	Up to \$5,000 (\$6/Watt) or 60% of project costs
Solar Thermal	Up to \$5,000 or 50% of project costs

*Creative Cow Program*

Administered by the DCEO under the RERP program, the program provided two grants to Stephenson County farms to reduce their environmental impact and help the local economy by installing anaerobic digesters to generate electricity from manure. Each farm received an Opportunity Returns Grant of \$225,000 for their installation.

*Chicago Photovoltaic Incentive Program (PIP)*

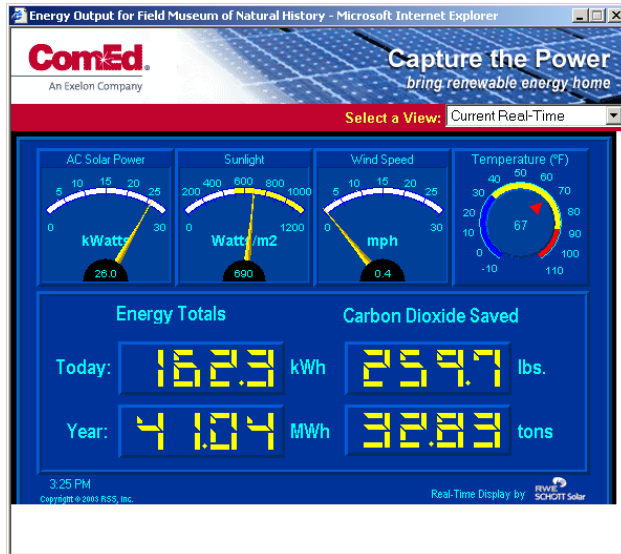
As part of Chicago’s Solar Partnership, the PIP encourages the development of local renewable energy-based economic development. ComEd partnered with Spire Solar, a leading international supplier of PV equipment manufacturing technology, to establish a PV manufacturing facility in Chicago. This facility, operating since 1999, provides both economic development and cutting-edge renewable energy technology to Chicago and the world.

The PIP, administered by ComEd staff, and slated to expire at the end of 2004, provides rebates to anyone who purchases a solar system manufactured and installed by Spire within the Chicago City Limits. Originally, the partnership offered \$1.50/Watt; later, that was reduced to \$1.25/Watt of PV installed in 2003, and then \$1/Watt in 2004. PIP incentives could be used in conjunction with rebates offered by the RERP program to further reduce the cost of installing PV systems, and the program representative interviewed stated that the ComEd incentive was usually used in conjunction with other programs.

On average, applications were accepted or denied within six weeks; installations and inspections take up to a year.

All ComEd installations under this program are coupled with investment-grade remote monitoring meters that provide online tracking of array output and automatically calculate carbon dioxide emissions savings. Many systems are equipped with meteorological metering packages providing solar irradiance, wind speed, and ambient temperature data. The data are displayed via a real-time “dashboard” display ,provided by RWE Schott Solar, and on the ComEd Solar Partnership Website. Exhibit 2.8-5 shows the ComEd Dashboard for the Chicago Field Museum of Natural History.

### Exhibit 3.8-5: ComEd Dashboard for the Chicago Field Museum of Natural History



The core program staff comprises three people part-time and the resources of eight to 10 others when needed.

According to the program representative interviewed, 55 PV installations have been funded by the program resulting in about 958 kW of capacity.

The representative provided the following advice for other programs seeking to start similar programs:

- ◆ Use only investment grade metering to facilitate utility connection;
- ◆ Simplify applications as much as possible;
- ◆ Make hardware and incentive programs friendly to the customer, installer, and utility;
- ◆ Where possible, make forms generic among co-funding programs; and
- ◆ Use only UL approved equipment.

Given the uniqueness and success of the PIP partnership, a Spire Solar representative was interviewed to obtain a greater understanding of the program and to determine if it could be replicated in other communities.

The representative said the attraction of Illinois was that the state had a guarantee to buy a product, the market was engaged, and the electricity rates were high compared to other Midwest locations.

The Spire Solar representative said an agreement to set up a similar model had been signed with a municipality in New Mexico, and there has been discussion of implementing the model in New



Jersey. The representative stated that the ideal consortium is one that includes the utility, public sector, and economic development groups. For the model to be successful, Spire prefers a commitment from the community for 1 MW of installations annually for at least three years.

### 3.9 Pennsylvania

Pennsylvania has a good solar resource for PV and flat plate solar thermal collectors and a poor to fair potential for concentrating collectors.

#### **Exhibit 3.9-1: Pennsylvania Solar Resources**

Technology	Energy Density (kWh/m <sup>2</sup> /day)
PV or Flat Plate Thermal	4.0 to 5.0
Concentrating	2.0 to 4.0

Pennsylvania's wind resources range from poor to good wind power densities (at 50 meters elevation) ranging from less than 200 W/m<sup>2</sup> to more than 500 W/m<sup>2</sup> with most of the state having a poor power density due to predominant ridge and valley topography. Pockets of Class 4 (400 W/m<sup>2</sup> to 500 W/m<sup>2</sup>) or better resources are scattered along the border of the Allegheny Plateau and the Appalachian mountains east of Pittsburgh and offshore in lake Erie. These resources may be suitable for utility scale wind projects. In fact, several utility wind farms have been developed in Fayette and Somerset counties by Exelon-Community Energy.

Pennsylvania has managed forestry programs that produce large amounts of wood and milling waste from local sawing and planing operations. Exhibit 2.9-2 provides estimates of Pennsylvania's available biomass resources.

**Exhibit 3.9-2: Pennsylvania Biomass Resources<sup>162</sup>**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	948,000	1,377,000	1,763,000
Mill Residues (sawing, milling, and planning of lumber)	172,000	591,000	1,628,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	197,689	1,031,195
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	0	2,338,243

Pennsylvania is gifted with a thriving agricultural community and a wide range of agricultural products. A large portion of Pennsylvania’s crop production (corn, hay) goes directly to supporting its thriving dairy production. In the orchard rich southeastern portion of the state woody wastes may be available that would otherwise be open burnt onsite. Wastes from dairy and feedlot operations provide a rich energy source that can be used to produce methane using anaerobic digesters.

REGULATIONS PERTAINING TO NET METERING

The Pennsylvania Public Utility Code 52 Pennsylvania Code 57.34, provides for net metering for qualifying facilities up to 50 kW in capacity. Each utility is required to file its net metering policy with the Public Utilities Commission (PUC). However, despite the codified 50 kW value, some utilities net metering rules apply only to smaller systems. For example the West Penn Power Company’s Net Energy Metering Rider applies to systems that do not exceed 10 kW while PECO offers net metering for systems up to 40 kW.<sup>163</sup>

RENEWABLE ENERGY PORTFOLIO STANDARDS

Pennsylvania does not have a unified RPS, however individual utility restructuring settlements with PECO, PP&L, First Energy, and Allegheny West established portfolio standards for individual utilities. The definition of a renewable energy source is also somewhat flexible among the individual settlements, for example in First Energy’s portfolio requirement municipal solid waste is eligible renewable energy source.

<sup>162</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

<sup>163</sup> Pennsylvania Incentives for Renewable Energy [www.dsireusa.org](http://www.dsireusa.org)

Pennsylvania is currently moving forward to deploy a unified RPS through the introduction of three bills into the Pennsylvania legislature. These bills include:

- ◆ SB 962 Clean Energy Portfolio Standard
- ◆ HB 2250 Renewable Portfolio Standard
- ◆ SB 1030 Renewable and Environmentally Beneficial Portfolio Standard.

SB 962 introduced by Senator Ferlo in 2003, is perhaps the most favorable to renewable, and most discussed of the three bills. SB 962 starts at a requirement for 0.5% of a utility's electricity to be supplied by renewable energy in 2006, increasing to 1% in 2007 and then at 1% per year perpetually until the state chooses to suspend the measure.

Like most RPS's SB 962 establishes a clean energy credit trading scheme allowing utilities to determine which is more advantageous, to buy credits at the market price or to install renewable technology. The penalty for not achieving the RPS standard is \$0.05 per kWh of shortfall.

An interesting aspect of the bill is that it allows only up to ten percent of the standard to be filled by onsite solar thermal installations including solar space and hot water heating where most RPSs only address electricity.

Competing against SB 962, the Rendell administration has advocated an Advanced Energy Portfolio Standard, which outlines rules for electric utilities to supply 10% of their energy implemented over ten years from advanced energy sources. The definition of an advanced energy source includes methane recovery from coal mines, municipal solid waste, coal waste with the traditional renewable resources. Emissions offsets such as carbon sequestration (biomass, hydrates etc.) are also permitted under the proposal

#### GREEN POWER INITIATIVES/GREEN TAG/ AND RENEWABLE ENERGY CERTIFICATE TRADING

In 2001, under the leadership of former Governor Mark Schweiker, Pennsylvania signed a contract with Community Energy Inc. to purchase 100 million kWh of green power over two years. The new Excelon-Community Energy wind farms in Fayette and Somerset counties supplied twenty percent of the green power. The remainder of the purchased green power came from hydroelectric, landfill-gas, and PV.

Elsewhere, the Energy Cooperative (ECAP) a 6,500-member Philadelphia-based competitive energy supplier is offering an EcoChoice 100 green power product that consists of electricity generated entirely from renewable resources. The generation mix of this product is 89.9 percent biomass, 10 percent wind, and 0.1 percent solar. Available to PECO customers the rate for the product is around \$0.072/kWh

## PROGRAM-SPECIFIC INFORMATION

### *Pennsylvania Sustainable Energy Funds*

A number of renewable energy incentive programs are active in Pennsylvania, including five Sustainable Energy Funds established during Pennsylvania's electric restructuring.

In December of 1996 Pennsylvania enacted the Electricity Generation Customer Choice and Competition Act to create competitive market based consumer choice to lower energy rates, enhance energy reliability, and provide a cleaner environment in the Commonwealth. Each utility created its own "Sustainable Energy Fund" with the goals of:

- ◆ Development and use of renewable energy and advanced clean energy technologies
- ◆ Energy conservation and efficiency
- ◆ Sustainable Energy Industries and Businesses

Since the administration, funding, and priorities of each fund vary from utility to utility, each fund is overviewed independently below.

### *First Energy's Sustainable Energy Funds*

Consisting of \$12.1 million collected by First Energy's two Pennsylvania subsidiaries Metropolitan Edison and Pennsylvania Electric (PENELEC) through December 2004. Funding will continue a rate of 0.01 cents per kWh beginning in 2005.

First Energy's contributions were divided into two funds, the Metropolitan Edison Company SEF Fund and the PENELEC sustainable energy fund.

The Metropolitan Edison Company SEF Fund seeded with \$5,700,000 provides both grants and loans to customers of all facility types, within the subsidiaries territory. The majority of the funds will be invested via loans or equity investments in businesses that are pursuing one or more of the fund's purposes. A limited number of grants are available.

The PENELEC Sustainable Energy Fund, administered by the Community Foundation for the Alleghenies, provides incentives for nearly all-renewable technologies for all sectors. Funded by \$8.9 million this fund will provide \$6 million for equity lending in renewable energy and energy efficiency, and approximately \$3 million for an endowment fund to facilitate grants.

Funding can be used for feasibility studies of established or developing technologies. Preference will be given to projects that are likely to be attractive investments. Grants under this program are limited to \$25,000 per applicant and it is anticipated that this funding will be leveraged with other sources. Any organization is eligible for grants under the program, but preference is given to non-profit organizations.

Projects that are eligible for funding under the Fund include those that will generate electricity from renewable energy sources such as wind farms, development of renewable energy technologies and renewable energy business. The application process begins with the applicant writing a two page letter of intent describing their proposed efforts, who would benefit, what results would be achieved, the amount of funding requested, and a list including other sources of funding. The Community Foundation of the Alleghenies' staff evaluates all letters, if the project has potential, the staff will send the proposer application materials and a request for a detailed proposal.

An award is made if a proposal meets the fund's mission. A program representative stated during an interview that this process takes an average of 70 days.

A more preferred use of fund resources is in lending and equity investment. Generally, fund investments will not exceed \$500,000 per project. In this activity the fund intends to receive a return on its investment while stimulating economic development and renewable energy technologies within the state. In this regard the fund seeks to maintain a balanced portfolio of investments, representing a range of risks.

After Foundation staff receives this information, they review the completed application and prepare it for presentation to the Metropolitan Edison/PENELEC Sustainable Energy Advisory Board. The Advisory Board will evaluate the completed application and make recommendations to the foundation's Board of Directors for its final approval. A program representative of the foundation stated that this process usually takes 75 to 90 days.

The program is staffed by two FTEs and the staff taps the foundation's board for technical questions as well as using consultants for financial evaluation and research. The program representative stated that though staffing was adequate, one more capable person with a business background would be helpful. The Foundation retains the services of an accountant to track loans and grants and the fund is independently audited annually as mandated by the Foundation.

In response to the interest from wind developers and individuals seeking funding for onsite wind, the Foundation has begun an anemometer loan program to assist feasibility studies.

The program representative interviewed stated that the program had not yet been formally evaluated but that an evaluation would occur in the future.

#### *West Penn Power's Sustainable Energy Fund*

Since 1999, this \$11.4 million fund promotes the installation of renewable and low impact clean energy technologies by providing grants to no-profit companies and community-based organizations. A seven-member independent board administers this fund. Starting in 2005, funding will continue from per kWh charges applied to electric bills.

Grants are capped at \$25,000 and to are leveraged by funds from other agencies Grants may be provided for projects such as:

- ◆ Demonstrating renewable or energy efficiency technologies,
- ◆ Engaging national programs (e.g., U.S. DOE State Energy Program special projects),
- ◆ Educating consumers on renewable energy and energy efficiency, and
- ◆ Developing policy that open markets for renewable energy related companies.

*Sustainable Development Fund Commercial Financing and Grant Programs (PECO's Sustainable Development Fund)*

Since 1999, this \$32 million initiative has supported renewable energy technologies. Allocations have been as follows: \$12 million for new wind development, \$44 million for PV, and \$2.5 million for public education (added after the PECO/Unicom 2000 merger settlement). This initiative supports two funds: the Sustainable Development Fund, and the Commercial Financing and Grant Programs. Funding will continue based on a per kWh charges applied to electric bills.

*Sustainable Development Fund - Solar PV Grant Program.*

Launched in 2001, offers rebates to commercial, industrial, and residential customers for the installation of PV within PECO's service territory. Systems between 1 kW and 5 kW are eligible, and preference is given to grid-connected systems. Each system is installed by a network of participating contractors and must meet the program's hardware and installation standards, verified by the program administrator. The incentive is arranged around 3 prongs, providing an up front buy-down and a performance incentives for both the installer and owner.

- ◆ Buy-down Incentive: PV system owner via the participating contractor is provided an incentive of \$4/Watt of rated PV system capacity up to \$2,000 for systems approved by the end of 2004. After 2004 this incentive will be reduced to \$3/Watt up to \$15,000.
- ◆ Performance Incentive (Owner): PV system owner is paid \$1 per kWh of gross generation in the first year up to \$5,000.
- ◆ Performance Incentive (Installer): The Participating Installer is paid \$0.10 per kWh of gross generation in the first year up to \$250.

The performance incentives included in the Solar Grant program are advantageous to the utility and the clean energy program as they provide an additional level of quality control to the installation. This encourages:

- ◆ Proper installation of the system, including optimum orientation and tilt; and
- ◆ Self-policing of the PV system by the owner such as ensuring that any system issues that may result in reduced generation are reported to the installer and corrected.

*Sustainable Development Fund - Commercial Financing Program*

Provides assistance to eligible projects in the form of commercial loans, subordinated debt, royalty financing, and equity financing. Types of ventures supported by the fund include:

- ◆ Electricity generation from renewable sources,
- ◆ Manufacturers, distributors and installers of renewable energy, advanced clean energy and energy-efficient technology, and
- ◆ Companies and organizations that are end-users of renewable energy, advanced clean energy and energy efficiency measures.

*Sustainable Development Fund Grant Programs.* Provides grants for renewable technologies in most facility types in the PECO service territory. Grants average approximately \$25,000 each and are available for up to 75% of the work.

*Sustainable Energy Business Planning Grants.* Available to businesses that design, manufacture, sell, install, operate, or service renewable energy technologies or energy efficiency products.

*Sustainable Energy Business Start-Up Grants.* Available to start-up businesses that design, manufacture, sell, install, operate, or service renewable energy or energy efficiency products. These may include prototype development, demonstration, measurement and metering costs, and marketing efforts.<sup>164</sup>

*Green Building Design Grants.* Available to architectural and engineering firms, building developers and building owners who are committed to designing and building green buildings in the PECO energy service territory.

The fund reserves the right to accept other grant proposals for work of compelling interest and value that strongly advances the Fund's mission.

*The Sustainable Energy Fund of Central Eastern Pennsylvania Program (PP&L's Sustainable Development Fund)*

The Sustainable Energy Fund of Central Eastern Pennsylvania (SEF) totals \$20.5 million (January 1999 and December 2004). Funding will continue a rate of \$0.01/kWh beginning in 2005. The mission of the fund "is to promote, research and invest in clean and renewable energy technologies, energy conservation, energy efficiency and sustainable energy enterprises that provide opportunities and benefits for PPL ratepayers"<sup>165</sup> Specifically the fund seeks to make investments that promote:

- ◆ Use of renewable and clean energy technologies to residential, commercial, industrial, and institutional customers in PP&L's territory.
- ◆ Energy efficiency among residential, commercial, industrial, and institutional customers in PP&L's territory.
- ◆ Start-up, attraction, retention and expansion of sustainable energy businesses in PP&L or where it will benefit PP&L ratepayers.

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<sup>164</sup> Pennsylvania Renewable Incentives [www.dsireusa.org](http://www.dsireusa.org)

<sup>165</sup> [www.sustainableenergyfund.org](http://www.sustainableenergyfund.org)

The fund disperses a number of grants and loans to organizations seeking funding within the scope of the Pennsylvania funds missions. Typically 60 percent of the funds are dispersed towards loans, 7 percent towards educational grants and 3 percent towards royalty and equity financing. Between 2002 and 2003 approximately \$330,000 of grants were issued. Grants offered under the fund are earmarked exclusively for non-profit organizations whereas loans and equity investment are applicable to all inquirers.

Equity investment is the preferred method of promoting renewable energy and energy efficiency, where the fund is looking for a distinct payback for their financial support. Applicants submit an online form providing the basic information about their proposed project. Program staff contacts the applicant for more detail. The representative interviewed indicated that they receive hundreds of inquiries but relatively few viable applications. For viable applications the process from inquiry to approval could take anywhere from 60 to 90 days. Applications are tracked via pipeline reports that provide all needed data about the status of the application.

Three and a half people staff the program, and the Fund representative interviewed stated that this was adequate. Consultants provide financial and technical support.

#### *Pennsylvania Energy Harvest Grant Program*

In 2003 the Pennsylvania Department of Environmental Protection and the Pennsylvania Department of Agriculture initiated a \$5 million annually program with the goals of:

- ◆ Improving air-quality,
- ◆ Preserving land and protecting local watersheds,
- ◆ Providing economic opportunities and job creation for agricultural communities, and
- ◆ Meet 10 percent of the state's energy needs with green power.

The initiative encourages the development of nearly all renewable energy technologies except large hydropower along with other technologies such as coal-bed methane, though not renewable, make greater use of the state's indigenous energy resources. The non-renewable energy resources promoted by this program are also those proposed by the Rendell administration.

Nearly all facility types, as well as organizations promoting renewable energy, may apply for the grants but the mission and goals of the initiative imply some preference for agriculture industry stake holders such as farmers and agricultural industries.

In the first year (2003), the Pennsylvania Energy Harvest received 139 applications requesting a total of \$45 million in funding while providing \$96 million in private investment. Grants were awarded to 32 applicants who leveraged \$13 million in private funds.



In February 2004, the governor of Pennsylvania announced plans to increase the initiative's by \$80 million over 4 years. In 2004, the second round of funding (at the \$5 million level) was made available with open solicitation closing on July 23<sup>rd</sup>, 2004.

*The Energy Cooperative – Solar Energy Buy-Back Program*

The Philadelphia-based Energy Cooperative is a 25 year old, 6,500-member, competitive energy supplier. The Energy Cooperative has been paying members who install up to 5 kW photovoltaic solar systems, \$0.20/kWh in support its Green-e certified EcoChoice 100. EcoChoice 100 consists of electricity generated from entirely renewable sources consisting of 89.9 percent biomass, 10 percent wind, and 0.1 percent solar.

To participate in the program, customers must be a member of the Energy Cooperative in PECO's territory and purchase the cooperatives EcoChoice 100 product. The system must have been installed to the specifications of the Pennsylvania Sustainable Development Fund.

The application process is simple, and in almost all cases has been done in coordination with the Pennsylvania Sustainable Development Fund. Applicants fill out a form on the website. It takes less than one day for the Coop to turn around a contract and the first payment is issued within 60 days. Owners of PV arrays report usage once a month, and program staff review the submissions and reserve the right to do manual meter checks.

According to the program representative interviewed, the program is staffed by less than one FTE and has doubled in size since January of 2004 with over 21 participants and has purchased over 53,000 kWh of electricity.

### 3.10 Connecticut

Connecticut has a good solar resource for PV and flat plate solar thermal collectors and poor resources for concentrating collectors.

**Exhibit 3.10-1: Connecticut Solar Resources**

Technology	Energy Density (kWh/m <sup>2</sup> /day)
PV or Flat Plate Thermal	3.0 to 5.8
Concentrating	3.0 to 3.5

Throughout most of the higher elevations of the state there is a potential for utility or large community power developments using wind turbines over 1 MW in size to harness Class 4 wind resources of 400 to 500 W/m<sup>2</sup> measured at 50 meters. The lower elevations consist of Class 1 to 3 wind resources with power densities of 200 W/m<sup>2</sup> to 400 W/m<sup>2</sup>. Offshore resources range from

Class 4 across most of the coast, and pockets of Class 5 (500 to 600 W/m<sup>2</sup>/day) and Class 6 (600 to 800 W/m<sup>2</sup>/day) providing excellent offshore potential.

Despite increased urban sprawl, and the conversion of farm and forest land, Connecticut does have an active agricultural community, the states top agricultural commodities are specialized crops such as nursery stock, tobacco, poultry, and dairy. Wastes from dairy and poultry operations provide a rich energy source that can be used to produce methane using anaerobic digesters. Exhibit 2.10-2 provides estimates of the availability of biomass fuel at several price points.<sup>166</sup>

**Exhibit 3.10-2: Connecticut Biomass Resources**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	109,000	159,000	204,100
Mill Residues (sawing, milling, and planing of lumber)	0	40,000	91,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	0	0
Dedicated Energy Crops ( switchgrass, poplar, willow, soybeans)	0	0	199,646

REGULATIONS PERTAINING TO NET METERING

Connecticut’s Department of Public Utility Control (DPUC) established net metering, in 1990 under Ruling 159. Later, under the authority of the 1998 Electric Restructuring Public Act CGS 16-243h (Public Act 98-28), all IOUs are required to provide net metering to residential customers who own Class I renewable energy systems. Class I renewable systems are defined in Connecticut as solar, wind, landfill gas, fuel cells or sustainable biomass. Public Act 03-135 Section 3, redefined Class I renewable systems to include ocean thermal, tidal, low emissions conversion technologies and small (> 5 MW) run of the river hydroelectric.

The maximum system size for net metering is 100 kW (50 kW is permitted for non-RE fueled systems) and net excess generation is purchased at the spot market energy rate. Customers with systems larger than 10 kW are charged for the competitive transition assessment and the systems benefits charge based on the amount of energy consumed by the customer before subtracting the net-metered onsite generation.

<sup>166</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

## REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTION

As of early 2004, the DPUC was managing the process of finalizing interconnection rules and procedures for all DG technologies up to 25 MW authorized under Docket No. 03-01-15. The rules will be applicable to Connecticut Power and Light (CL&P) and United Illuminating Company (UI), the two utilities responsible for distributing power through most of Connecticut.

Under the proposed rules DG systems will be broken down into categories 10 kW, 100 kW, 1 MW and 5 MW. For each category there are a total of eleven possible steps in the applications process.

1. Generator submits application.
2. Utility conducts applications review.
3. Utility conducts feasibility study.
4. Applicant authorizes impact study.
5. Company performs impact study.
6. Generator authorizes electric power system facility study.
7. Company performs electric power system facility study.
8. Applicant executes interconnection agreement, authorizes work and accepts costs.
9. Project construction.
10. Generator commissions units and pre-parallel.
11. Final acceptance, cost reconciliations, and authorization to connect.

For systems under 10 kW a simplified application and agreement process was proposed where the utility has to complete its review in under 20 days.

## STATE AND LOCAL TAX INCENTIVES

The state of Connecticut allows municipalities the option of offering property tax exemptions for specific renewable energy systems including solar space and water heating, PV, wind systems, fuel cells, and micro hydro.

## RENEWABLE PORTFOLIO STANDARDS

A RPS was created under Connecticut's 1998 electric utility restructuring law Public Act No 03-135, requiring 6 percent of the states total electricity consumption to be supplied by renewable resources beginning July 2000 and increasing to 13 percent by 2009. This was amended by Public Act No. 999-225 allowing electric suppliers to comply with the RPS up to two years later than specified under Public Act No 03-135 if the DPUC determined that the RPS could not be reasonably met.

Originally many of the electricity suppliers, including private power producers, many wholesale generators, non-participating municipal electric utilities, cooperatives, or any other utility

controlled by any unit of local government, were exempt from this standard, handicapping the RPS's potential to promote renewable energy within the state. The RPS was revised requiring all electricity suppliers and distribution companies providing standard offer, transitional standard offer, and standard service or back-up electric generation to comply with the standard. In addition, the revised rule requires 10% of all retail electricity sales come from renewable energy resources by 2010. Purchasing Class I or II renewable resources generated within the jurisdiction of the Regional Independent System Operator or within New York, Pennsylvania, New Jersey, Maryland and Delaware may satisfy RPS requirements. In addition the RPS may be fulfilled by participating in an approved renewable energy-trading program (REC). Electric companies that are found in non-compliance with the RPS in an annual period must pay \$0.055/kWh to the DPUC that will be allocated to a Renewable Energy Investment Fund.

An interesting facet of the Connecticut RPS is that it has separate generation standards for "Class I" and "Class II" renewables. Class I renewable energy sources include solar, wind, sustainable (closed loop) biomass, landfill gas, ocean thermal, wave, or tidal power and low-emission advanced renewable energy conversion technologies, and up to 5 MW run of the river hydro installations. Class II renewables are defined as waste (e.g., municipal) non-sustainable biomass facilities, and certain approved hydro facilities over 5 MW. Electric suppliers must meet the following schedule for renewable energy per year.<sup>167</sup>

**Exhibit 3.10-3: Schedule for Compliance with Connecticut RPS**

Year	% Class I	Percent Class II or Additional Class I	Total
2004	1	3	4
2005	1.5	3	4.5
2006	2	3	5
2007	3.5	3	6.5
2008	5	3	8
2009	6	3	9
2010	7	3	10

**GREEN POWER AND RENEWABLE ENERGY CREDITS**

In spring of 2004, Connecticut's governor signed Executive Order 32 which committed the state government to purchase 20 percent of its electricity needs from generation sources fueled by Class I renewables by 2010, 50 percent by 2020, and 100 percent by 2050.

Connecticut revised its renewable energy certificate (REC) trading program, increasing the scope of entities covered by the RPS. Recent developments include moves by the Connecticut Clean

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<sup>167</sup> Connecticut Incentives for Renewable Energy [www.dsireusa.org](http://www.dsireusa.org)

Energy Fund (CCEF) to trade RECS from its projects. The CCEF is expecting to hold 9,000 Class I RECS by the end of 2004 from its 6,728 MWh of fuel cell, PV, and biomass project energy production. To facilitate marketing and transactions of these credits, the CCEF has issued an open solicitation for a contractor to administer these RECS. Including all metering and geographic information system (GIS) requirements.

#### INSTALLER, CONTRACTOR, AND DISTRIBUTOR CERTIFICATION AND LICENSING

To encourage a qualified pool of solar water heating equipment installers Connecticut Statutes CGS 20-330 and 0-334 include three types of solar licenses a solar contractor's license, a solar journeyman's license, and a solar apprenticeship permit. However there are no state sponsored incentives or training programs. Training is currently delivered through trade schools and labor unions.

Administered by the Connecticut Department of Consumer Protection the required trade experience is as follows.

**Solar (Limited Contractor):** Licensee must pass exam. Entrance to the exam is granted to those who acquired a P-1, P-3, S-1, S-3, S-5, S-7, D-1, or D-3 license prior to July 1. Alternatively, the individual may have served as a solar journeyman for no less than 2 years.

**Solar (Limited Journeyman):** The licensee may perform work on solar hot water systems while in the employment of a Solar Contractor. Entrance to the exam is granted for those who acquired a P-2, P-4, S-2, S-4, S-6, S-8, D-2, or D-4 license, provided the potential licensee participated in a bona fide apprenticeship program in solar work with no less than 2 years experience in solar water heating equipment.

#### PROGRAM SPECIFIC INFORMATION

Connecticut has a number of grant, loan, and rebate programs supporting the development of renewable energy resources, installations, technologies, and businesses within the state.

The Connecticut Clean Energy Fund (CCEF) supports many of these programs. Enacted in 1998 under Connecticut Public Act No 98-28 Section 44 as a public benefit funded by electric rates. The CCEF generates approximately \$100 million over 5 years via a surcharge that increased over time. From 2000 to 2001 the charge was 0.5 mill/kWh but rose to 1.0 mill/kWh from 2004 forward. The fund is managed by Connecticut Innovations, a pseudo governmental investment organization, established in 1989 by the Connecticut Legislature and guided by a Renewable Energy Investment Advisory Committee. Programs supported by the CCEF include the PV Grant Programs and Fuel Cell Initiatives.

The goals of the CCEF include the following:

- ◆ Developing a vibrant market for clean power,
- ◆ Educating consumers about the benefits and availability of green power,
- ◆ Building a base of renewable energy technology and infrastructure.

The CCEF promotes benefits and value to Connecticut ratepayers, such as:

- ◆ Health - A cleaner environment,
- ◆ Security- Energy security and affordability,
- ◆ Prosperity- A stronger economy and innovative clean energy companies,
- ◆ Lifestyle- High quality of life for state residents and their children, and
- ◆ Stature- National stature and leadership.

In 2003 the fund approved over \$15 million in investments across more than 25 initiatives.<sup>168</sup>

- ◆ Over \$11 million for fuel cells,
- ◆ \$430,000 for education and outreach programs,
- ◆ Over \$500,000 for wind energy projects,
- ◆ \$1,650,000 for solar energy initiatives,
- ◆ \$300,000 for Connecticut's climate change action plan, and
- ◆ \$450,000 for biomass gasification technologies.

Funds supported by the CCEF include the PV Grant Programs and Fuel Cell Initiatives.

#### *Commercial, Industrial, and Institutional PV Grant Program*

One of two PV funding programs offered by the CCEF, announced in 2002, this initiative will be open for three annual funding cycles with the first submissions received in February of 2004. Projects will be selected via open solicitation with due dates every four months. \$3 million of funding is provided.

The goal of the program is to award funds to proposals that:

- ◆ Create strong awareness and education of the benefits of PV to communities,
- ◆ Help build networks of knowledgeable PV installers,
- ◆ Demonstrate innovative approaches that are ideally suited for PV and ensure the maximum value from the installation,
- ◆ Demonstrate benefits of PV for areas of electrical transmissions distribution congestion,
- ◆ Result in high probability of successful implementation and operational, and
- ◆ Provide environmental benefits.

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<sup>168</sup> Connecticut Clean Energy Fund 2003 Annual Report

Projects under this grant program are funded at a rate of up to \$5/Watt of PV module output at standard test conditions. Systems that include electrical storage capacity are eligible for an additional \$0.75/Watt. Payments are dispersed in two installments; the first payment of 90 percent of the cost is paid on successful installation and inspection of an approved project. The remaining 10 percent will be paid on the 6-month anniversary of the PV system inspection providing the system has produced a minimum of 70 percent of the projected energy production.<sup>169</sup>

All equipment installed under this grant program must satisfy all applicable interconnection requirements and must display the system energy production in kWh. PV modules and inverters eligible for funding by the program must be those that have been approved by the CEC for the Emerging Renewable Buy-Down Program.

#### *Residential PV Rebate Program*

The Connecticut Clean Energy Funds (CCEF) Residential PV program is funded at \$2 million over 3 years. In July of 2004, published an open solicitation to select participating installers who will administer the program's fund and pass the incentives onto their customers in the form of rebates. In addition to installations and grid interconnection, each selected installer will be responsible for acquiring customers, conducting site evaluations, completing and submitting rebate applications to the CCEF and obtaining all appropriate permits.

The rebate amount to be passed onto the customer will be \$5.00/Watt of PV capacity; capped at \$25,000 per residence for systems up to 5 kW. In addition, any RECs from the system will be the property of the system owner. Projections estimate that anywhere from 80 to 400 installations could result from the program.

Under the CCEF residential PV buy-down program, \$200,000 will be targeted directly at low-income housing.<sup>170</sup>

#### *Connecticut Clean Energy Fund Fuel Cell Initiative*

In its third year, the Connecticut Clean Energy Fund Fuel Cell Initiative has \$4 million in funding to promote fuel cell projects (over 1 kW in capacity) that meet the Fund's goals of:

- ◆ Deployment of fuel cell technology with strong commercialization potential,
- ◆ Involve host facilities that are involved and knowledgeable,
- ◆ Employ innovative and high-value applications and approaches,
- ◆ Demonstrate the benefits of distributed generation technology (fuel cells in particular),
- ◆ Increase public awareness about fuel cells,

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<sup>169</sup> Connecticut Incentives for Renewable Energy [www.dsireusa.org](http://www.dsireusa.org)

<sup>170</sup> Fitzgerald G., Bolinger M., and Wiser R. Low Income Renewable Energy Programs – A Survey of State Clean Energy Funds, Lawrence Berkeley National Laboratory/Clean Energy States Alliance, May 2004

- ◆ Demonstrate how cost barriers can be reduced or mitigated,
- ◆ Promote the environmental and social benefits of fuel cells, and
- ◆ Offer replicability.

The audience for the 2004 solicitation includes fuel cell manufacturers (or integrators) and other project stakeholders.

The Program employ's a two-step process. In Round 1, proposers complete and submit their application providing key information about the project. The CCEF's evaluation team will select projects that can advance to Round 2. In Round 2, proposers complete and submit a more detailed application and may be requested to make oral presentation to the CCEF on the merits of their projects.<sup>171</sup>

#### *Connecticut Innovations*

In addition to CCEF activities, CI sponsors an annual Yankee Ingenuity Technology Competition. In 2004 this competition focused on clean energy technologies and provided two awards of approximately \$300,000 each for promising fuel cell technologies.<sup>172</sup>

#### *Energy Conservation Loan*

Authorized under CGS 32-315-7, the Energy Conservation Loan provides loans for the installation of renewable energy systems and energy efficiency for residential properties including single-family homes and multi-family residences.

Single-family energy conservation loans, funded by the Connecticut Housing Investment Fund (CHIF), provide \$400 to \$15,000 loans for owners of up to four family homes who fall within specified income limits for the family size and location within the state. Loans may be used for conservation improvements, though the major renewable energy systems that would be eligible under this pool of funding are those that provide heating or cooling. Interest rates range between 1 and 6 percent over a ten year period, and are determined by the borrower's family size and income. According to CHIF approximately a dozen loans per year are used for solar or geothermal heating and cooling applications.<sup>28</sup>

The Multi-family Energy Conservation Loan Program provides from \$2,000 to \$60,000 per building to large residential properties (five units or more). Interest rates range between 3 and 6 percent over 10 years in accordance with the average income of the tenants living in the building.<sup>173</sup>

#### *New Energy Technology Program (NET)*

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<sup>171</sup> Connecticut Incentives for Renewable Energy [www.dsireusa.org](http://www.dsireusa.org)

<sup>172</sup> Connecticut Innovations Website <http://www.ctinnovations.com>



For over eleven years the Net has helped invigorate Connecticut's economy and to foster job creation by promoting innovative renewable energy and energy-efficiency technologies. Supported Petroleum Violation Escrow (stripper well), the program provides grants to Connecticut residences and businesses that have 30 or fewer employees and has a renewable energy or energy efficiency technology that has not be commercialized. A program representative that was interviewed stated that the typical application was for businesses with one or two employees.

Funding consists of \$10,000 each for up to five small businesses each year. Recipients may use funds for product development, prototype testing, patent applications, business development, payroll, and marketing. The program representative stated that most applications were for prototyping and product development, but that he believed in most cases that the funds would be better used for business development.

The program representative said that the majority of applications were for energy efficiency technologies. Of the approved projects, approximately nine projects involve a renewable energy technology. These renewable energy projects included fuel cell, tidal, wind, and landfill methane technologies.

On average, the program receives six to eight responses annually with the largest number being twenty-two. A volunteer committee reviews applications and selects grantees. The program is budgeted to provide five grants per year, however if applications in a particular year do not meet program expectations they may award fewer than five and roll the funding to the into the next year. Decisions of awards are made in early May and awarded by July. Awardees have one year to complete the work.

One-quarter to one-third of the award is advanced to the awardees with the rest paid on a reimbursable basis after review of quarterly reports.

The program has undergone some changes over the years. Originally, the grants were capped at \$5,000 for companies with a dozen employees or less. The amount has been increased to \$10,000 and the company size has been increased to 30 employees or less to attract more applicants.

In addition to the award, NET staff attempts to improve the probability of success for applicants by linking them to other sources of funding.

### **3.11 Delaware**

Delaware has good solar resources suitable for PV and flat-plate solar thermal collectors; however, high levels of humidity severely reduce the effectiveness of concentrating solar collectors.

**Exhibit 3.11-1: Delaware Solar Resources**

Technology	Maximum Energy Density (kWh/m <sup>2</sup> /day)
PV or Flat Plate Thermal	3.0 to 5.8
Concentrating	3.5 to 4.0

Delaware’s wind resources are poor compared to those of neighboring states; most of Delaware is of low elevation and is shielded from the strong winds off the North Atlantic. According to the Pacific Northwest National Laboratory’s (PNNL) Wind Energy Resource Atlas, most of Delaware has a wind power density of Class 1 or 2 (< 200 to 300 Watts/m<sup>2</sup> measured at 50 meters). Some Class 3 resources (300 to 400 Watts/m<sup>2</sup>) exist in areas along the Delaware.<sup>174</sup> A recent assessment of wind resources produced for NREL did identify a pocket of Class 4 wind resources that extends approximately 60 miles long and 5 miles wide from Woodland Beach to Fenwick Island; this pocket has a potential for utility-scale offshore wind development. However, environmental and shipping navigation restraints in the region could restrict development capacity.<sup>175</sup> Exhibit 2.11-2 provides estimates of the available dry tons of a biomass fuel at several price points.<sup>176</sup>

**Exhibit 3.11-2: Delaware Biomass Resources**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	26,000	37,000	48,000
Mill Residues (sawing, milling, and planning of lumber)	0	4,000	16,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	88,000	301,000
Dedicated Energy Crops (switch grass, poplar, willow, soybeans)	0	0	31,454

Delaware’s thriving poultry industry produces large quantities of animal waste that in the early 1990s was primarily used as a fertilizer. However, poultry waste is currently under much more stringent control due to concerns about its contribution to eutrophication of watersheds into the

<sup>174</sup> Wind Energy Resource Atlas of the United States, Pacific Northwest National Laboratory, 1986

<sup>175</sup> Study produced by TrueWind Solutions under contract to the National Renewable Energy Laboratory, 2002

<sup>176</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

Delaware River Estuary, and Chesapeake Bay. There is a current shift to use poultry waste to fuel anaerobic digesters.

According to the USDA, Delaware corn and soybean harvests, which are principal crops for the production of biodiesel and ethanol, consisted of more than seven million and five million bushels, respectively. This quantity of production, not including the output from other states, offers some potential for the in-state production of biodiesel and ethanol.<sup>177</sup> Delaware is an active participant in the DOE's Clean Cities Program and promotes biomass based fuels within the state; a number of E85 stations have been established in the state.

Although there are competing demands on Delaware's agricultural resources, the production of biodiesel and ethanol is attractive because of the proximity of the state to major urban areas, such as Philadelphia and Washington, D.C., which may adopt biomass transportation fuels as part of DOE's Clean Cities program and other federal programs.

Delaware has major landfills in Cherry Island, Pigeon Point, Sussex, and Kent that represent potential for the capture and utilization of landfill methane. In fact, since 1995 the methane from Cherry Island has been powering the Conectiv Energy Edge Moor Power Station.

#### REGULATIONS PERTAINING TO NET METERING

The Delaware Electric Utility Restructuring Act, 26 Del. C. 1014 (d) requires that Conectiv Power Delivery and the Delaware Electric Cooperative (DEC) offer net metering for residential and small commercial customers operating PV, wind, small hydro, or other forms of renewable energy up to a capacity of 25 kW. Each utility treats excess generation differently. In the case of Conectiv, new excess at the end of a billing period is credited at the Standard Offer Service energy kWh rate. Customers with a balance greater than \$100 may request payment of the balance. DEC allows customers to credit excess generation to the following month, for up to 12 months. At the end of this period, the customer may sell unused credits to any electric supplier.

#### REGULATIONS PERTAINING TO PRE-APPROVED SYSTEMS AND EQUIPMENT

Conectiv, Delaware's only investor-owned utility, offers standard interconnection rules for many renewable energy systems. Inverter-based systems with a generation capacity of 25 kW or less must comply with IEEE 929 and UL 1741, in addition to Conectiv's Technical Guidelines. These installations are exempt from the pre-interconnection study and are not required to have an external disconnect device. Customers are eligible for net metering and accept full responsibility for any risks involved with disconnecting the system. Larger systems, up to 1 MW, must comply with all sections of the Conectiv Technical Guidelines, must undergo a pre-interconnection study, and must have a manual disconnect device. Inverter based systems must also comply with IEEE 929 and UL 1741.

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<sup>177</sup> U.S. Department of Agriculture Statistics, ([www.nass.usda.gov/de](http://www.nass.usda.gov/de)) based on assumptions from footnote 1.

DEC has rules similar to Conectiv’s for systems less than 25 kW systems and for larger systems. However, customers with systems greater than 25 kW are required to provide proof of insurance, including a minimum of \$1,000,000 liability insurance per occurrence and \$1,000,000 in property loss insurance.

PROGRAM SPECIFIC INFORMATION

*Green Energy Program*

The Green Energy Program, which comprises the bulk of Delaware’s renewable energy incentive activity, was authorized under Delaware SB 145 of 2003, with the preceding Energy Alternatives Program being authorized under the Delaware Electric Utility Restructuring Act of 1999 and funded through the Delaware Public Benefit Fund. The purpose of the Green Energy Program is to develop a Delaware market for renewable energy technologies by reducing production costs through grants. PV, solar water heating, wind turbines, and geothermal heat pump systems are eligible. However, the system purchaser must be Conectiv customer.

The program was designed by a board of stakeholders, including representatives from state agencies, public advocacy groups, and economic development concerns. After development of the draft program design, public review was solicited . Comments from other state programs and from manufacturers and installers were sought. Afterward, public hearings produced additional comments. The program representative interviewed stated that although the program wanted comments from everyone, it would have been preferable to require comments to be submitted in writing before public hearings. The representative believes such a requirement would have aided information collection, ensured clarity of communication, and facilitated more rapid program authorization.

Exhibit 3.11-3 outlines the amount of rebates available for segment. To ensure that both residential and non-residential needs are adequately met, 40 percent of rebate funding is available for residential customers and 60 percent for non-residential customers.

**Exhibit 3.11-3: Delaware Clean Energy Program Rebates**

<b>Application</b>	<b>Maximum Rebate (% of installation costs)</b>	<b>\$ Maximum</b>
Nonresidential	50%	\$250,000
Residential PV	50%	\$22,500
Residential Solar Water Heating Systems	50%	\$1,500
Residential Wind Turbine	50%	\$5,000
Residential Geothermal Heat Pump	Largest of 50% or \$500 per ton of capacity	\$2,500
Nonresidential Geothermal Heat Pump	50%	\$25,000

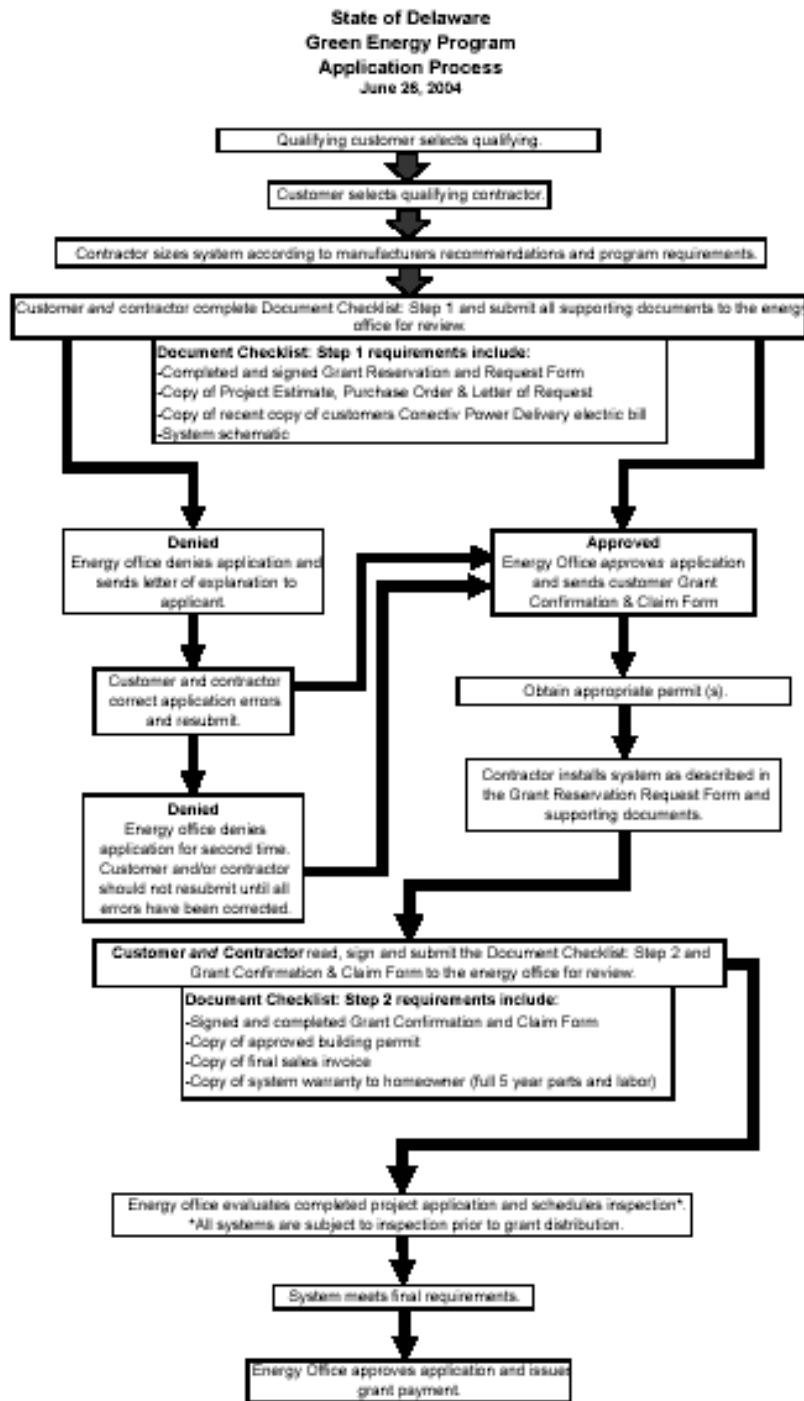
New regulations for the Delaware programs are to be approved in 2004. These changes may affect the incentive amounts, caps, and eligible technologies.

The program is administered on behalf of the Delaware Department of Natural Resources and Environmental Control by Green Plains Energy, Inc., a sustainable energy options consulting firm. Green Plains Energy is staffed by one full-time and one half-time employee. The Green Plains Energy representative interviewed stated that she believed the level of staffing was adequate. The Program's Process flowchart is presented in Exhibit 3.12-4<sup>178</sup>

The Program representative stated that if applicants follow the process correctly, the program can grant approval or denial of a reservation for funding within 30 days. Failure to submit required project documentation may cause the application to be delayed or denied. Omitted documentation, such as schematics for PV system designs and ASHRAE *Manual J* calculations for geothermal heat pump applications, has delayed funding reservations. Most installations are completed within 60 days; 120 days is the worst case. The exceptions are four brownfields rehabilitation projects that are dependent on a range of funding sources; these were expected to be long-term projects from the initial application. Program staff are required to inspect a minimum of 10 percent of the systems, but actually inspect about 90 percent. To maintain the quality of installations, program staff have the authority to deny payment if the final installation does not match the schematic submitted with the reservation application.

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<sup>178</sup> <http://www.greenplainsenergy.com/documents/ProcessFlowChart.pdf>



In support of the program, Green Plains Energy developed a proprietary Web-based system that tracks the application process from inquiry to completed project. The system permits the Delaware Department of Natural Resources and Environmental Control to sign-off on the application and payment online. One staff member, who has additional administrative responsibilities at Green Plains Energy, devotes part of his time maintaining the tracking system. Administrative costs for the program are tracked separately from the incentive applications and payments.

The program has undergone some changes since its inception; most notably was the adjustment from 35 percent to 50 percent of project costs that could be funded by the program. Administrative requirements have been eased somewhat by eliminating, for the most part, of the requirement for permitting costs to be itemized in detail.

The program was originally marketed only by word of mouth; it had no specific marketing or administration budget. As part of the changes in 2003 that increased the percentage of project cost cap, a small marketing budget was created to enhance the program exposure through the Delaware Home Show. The program is also marketed cooperatively through utility (Conectiv) bill inserts, and works with trade allies such as Home Builders Associations.

Since its inception, the program has supported 28 residential installations and nine commercial installations totaling about 500 kW of capacity. The average residential PV system size supported by the program is 4.8 kW. According to the program representative, commercial renewable energy system installations are variable in size but account for about 75 percent of added capacity.

The program representative stated that she had encountered a shortage of installers because of competition from neighboring states, such as New Jersey, that have more lucrative renewable energy incentive programs.

The program representatives stated that important lessons learned include 1) keeping the entire process simple, 2) taking steps to ensure quality control over installations.

In addition to the Green Energy Program Grants, two other incentives were mandated and are being rolled out, these are: The *Technology Demonstration Program* and *Research and Development Program*. The *Technology Demonstration Program* provides cash grants of up to 25 percent of the cost of a renewable energy technology that demonstrates potential for near-term commercialization. The *Research and Development Program* is intended to support qualifying energy efficiency and renewable graduate studies by providing up to 35 percent of project costs up to a maximum of \$250,000. Proposals for these programs will be reviewed twice a year.

### 3.12 Vermont

Vermont has a good solar resource for PV and flat plate solar-thermal collectors, but poor solar resource for concentrating solar collectors.<sup>179</sup>

#### Exhibit 3.12-1: Vermont Solar Resources

Technology	Maximum Potential Energy Density (kWh <sub>t</sub> /m <sup>2</sup> /day)
PV or Flat Plate Thermal	4.0 to 4.5
Concentrating	3.0 to 4.5

Most of Vermont has poor to fair wind resources consisting of power densities of less than 200 W/m<sup>2</sup> (measured at 50 meters height) to 300 W/m<sup>2</sup>. However, the mountains in the central part of the state have exceptionally high wind speeds and a 400 to 600 W/m<sup>2</sup> (Class 4 to 7) power density. These Class 4 or better wind resource capacity makes some areas very attractive from a resource perspective for utility-scale or larger community wind-power projects. However, as encountered by many higher elevation inland wind-power projects, many of these areas of high wind speeds are remote, located on difficult to develop terrain, and may conflict with state land conservation and aesthetic issues. Projects are already underway to develop the Equinox Mountain and other areas.

Vermont's forestry industry is healthy, with well over 70 percent of the state is covered in commercial forest land that supports 800 independent logging operations, 180 saw and veneer mills, and 600 secondary wood-processing firms.<sup>180</sup> The magnitude of these industries and the high proportion of commercial forestland present opportunities for wood-waste based biomass energy projects.

Vermont also has a strong agricultural community, dominated by its dairy industry. A large portion of Vermont's agricultural production goes directly to supporting its thriving dairy production. Wastes from dairy operations provide a rich energy source that can be used to produce methane using anaerobic digesters.

A 1999 state level analysis conducted by ORNL provided estimates of the available dry tons of a biomass fuel at several price points, as indicated in Exhibit 3.12-2.

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<sup>179</sup> [http://www.eere.energy.gov/state\\_energy/tech\\_solar.cfm?state=VT](http://www.eere.energy.gov/state_energy/tech_solar.cfm?state=VT)

<sup>180</sup> <http://www.uvm.edu/extension/publications/nrem/nrfs1.htm>



**Exhibit 3.12-2: Vermont Biomass Resources<sup>181</sup>**

Category	Tons available at < \$30/dry ton	Tons available at < \$40/dry ton	Tons available at < \$50/dry ton
Forest Residues (logging and planned forest thinning activities)	265,000	386,000	497,200
Mill Residues (sawing, milling, and planning of lumber)	0	59,000	124,000
Agricultural Residues (corn stubble, wheat chaff, other wastes produced from activities directly related to agriculture)	0	0	0
Dedicated Energy Crops (switchgrass, poplar, willow, soybeans)	0	0	333,465

REGULATIONS PERTAINING TO NET METERING

Vermont legislation 30 V.S.A. 219a authorizes net metering for any electric utility customer. To take advantage of net metering, utilities must first obtain a Certificate of Public Good from the PSB. Vermont’s net metering has grown by about 75 percent since the beginning of 2003; the PSB granted more than 117 “Certificates of Public Good” by the middle of 2004.

For most non-agriculture renewable energy system owners, the limit on net metering is 15 kW. Excess generation during a billing period will be credited to the next period within a calendar year; at the end of the year, any excess generation will be granted to the utility without compensation to the customer. Electric companies may not charge customers additional standby capacity, but may charge reasonable fees for establishing interconnection and special meter reading.

In 2002, Vermont authorized a subclass of net metering systems in support of the state’s farm community. Farmers who install anaerobic digestion, PV, wind or fuel cells can net meter systems up to 150 kW. In addition, communities of farmers may aggregate capacity and group metering within designated farm systems.

In addition, the PSB may also allow net metering for up to 10 non-farm systems per year over the 15 kW cap, but less than 150 kW. The total generating capacity under net metering for each electric utility company is limited to 1 percent of an individual utility’s peak demand during 1996 or the peak demand during the most recent full calendar year. Farm systems in coordination with their electric company may jointly petition the PSB to exceed the enrollment cap.

<sup>181</sup> Walsh et. Al. “Biomass Feed stocks Availability in the United States: 1999 State Level Analysis” Oak Ridge National Laboratory, January 2000

Regardless of size, each net metering PV system must conform to all relevant requirements established under the NEC, IEEE 949, and UL 1741 standards.

#### REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTION

In coordination with Vermont's "self-generation and net metering" regulations (described above), Vermont has established rules for standardized grid interconnection under VT PSB Docket 6181. Under this rule, all distributed-generation technologies must comply with the NEC, IEEE 949, and UL 1741 codes and standards.

#### STATE TAX INCENTIVES

In 1999, under the Miscellaneous Tax Reduction Act, Vermont passed an exemption for the state's 6 percent sales tax for renewable energy systems. The exemption, after 2002 amendments, now applies to both the initially authorized net-metered systems and home and business renewable energy systems not connected to the grid, and also to solar hot-water heating.

The sales tax exemption closely parallels Vermont's net metering laws and applies to systems within the same size classifications. For example, the sales tax exemption applies to systems no greater than 15 kW capacity, except for farm systems which are permitted up to 150 kW.

All systems up to 15 kW are required to have a utility accessible, lockable, load-break rated, visible disconnect switch. Systems must be tested upon installation and once every two years to ensure that anti-islanding controls function. The system will be covered by a minimum of \$100,000 of general liability insurance for residential installations and \$300,000 for farm and non-residential sites.

#### PROGRAM SPECIFIC INFORMATION

Vermont offers a state rebate program for renewable energy technology, the Solar & Wind Incentive Program. The Solar and Wind Incentive Program, authorized under S. 57 of 2003 and funded by a portion of Vermont's petroleum violation escrow fund, is administered by Vermont Energy Investment Corporation's (VEIC) Renewable Energy Resource Center (RERC); originally funded by about \$581,000. Additional funding has been contributed from Green Mountain Power to total approximately \$960,000 for incentives. Program administrative costs are capped at 10 percent of the total fund value. The program applies to PV, solar water heating and wind turbines under 5 kW; residential, commercial, and local governments facilities are eligible for funding.

The program offers a Tier 1 is for systems installed by a Vermont Solar and Wind Partner, individuals who have agreed to comply with an accepted set of equipment and installation standards, and a second for other providers. Incentives are only paid for the first 5 kW of installed capacity for PV and wind systems and the first 500,000 Btu/day of capacity for solar thermal hot water heaters.

**Exhibit 3.12-3: Vermont Solar and Wind Incentive Program**

Technology	Rebate	Total Cost Cap %	Total Cost Cap \$
Tier 1: Vermont Solar and Wind Partners			
PV and Wind	\$2.50/Watt	40%	\$12,500
Hot Water Heating	\$2.50/100 Btu/day		
Tier 2: Other Installers			
PV and Wind	\$1.50/Watt	40%	\$7,500
Hot Water Heating	\$150/Btu/day		

Grid and off-grid PV and wind systems are eligible for incentives, but they must provide AC power using a UL listed, grid-capable inverter and UL listed system components. PV system incentives are awarded total array rated output under standard test conditions.. Wind systems are rated at turbine output with a hub-height wind speed of 11 meters per second. Solar Thermal hot water systems must be capable of serving domestic hot water loads and have an OG-100 output rating from the Solar Rating Certification Corporation (SRCC) or other recognized body. Incentives are calculated according to the SRCC’s rating for kBtu/day output under clear conditions.

The program, staffed by five people, with two of them dedicating 25 percent of their effort specifically to the program and the remaining three dedicating 10 percent of their effort. The program representative interviewed, stated that the staffing was adequate to keep up with the program, but like many programs additional staffing would be helpful.

The program has received over 200 applications since its initiation, with approximately 95 percent of these applications for residential applications. About 67 systems have been installed; roughly half being grid connected. Applications, approved reservations, and completed projects are tracked using a MS Access database. A single individual coordinates administrative and IT tracking functions.

Applications for incentives are taken continuously when funding is available. The application process consists of two steps.

1. Incentive Reservation Form: The applicant completes the appropriate reservation form (PV, wind, or solar water heating), including customer information, contractor installer information, system specifications.

After an approved project is completed, the applicant then submits a second form:

2. Step 2. The Project Documentation and Final Incentive Request. Fields on this form include incentive reservation information, final incentive calculations, project documentation, signatures and certification.

The applications process takes several weeks; installations are required to be completed in six months, but program staff noted that they were flexible and grant three-month extensions. System inspections are not mandatory, but program staff attempts to inspect as many systems as possible. This effort is hindered by the geographic distribution and remoteness of installations. The program representative interviewed stated that it would be very useful to have GIS functions integrated into the program's tracking database to facilitate system inspections.

The program relies heavily on the program's network of 23 Vermont Solar and Wind Partners who provide upwards of 75 percent of the program's promotion. The program also conducts workshops and forums with builders to encourage participation by new construction. The program does not offer any type of certification to installers currently but is considering adopting NABCEP installer certification.

As of August 10, 2004, incentive reservation forms had been placed for up to \$960,787, making the program funding fully reserved. Program managers expect some reservations be abandoned, and any additional funding will be offered to applicants on an extensive waiting list in the order they applied. Program achievements, measured in installed systems, capacity and cost as of July 28<sup>th</sup>, 2004 are included in table 3.13-4.

Of the more than 60 installations, the majority of them have been residential installations with a large portion of vacation homes and camps. Commercial participation has been many of the installers themselves.

**Exhibit 3.12-4 Systems Installed under Vermont Solar Incentive Program<sup>182</sup>**

Renewable Energy System Type	Installations Total	System Output (AC)	Installed Cost
PV	25	46.8 kW	\$414,360
Wind	3	14.14 kW	\$88,727
Solar Water Heating	11	1168 kBtu	\$91,409
Hybrid	7	not reported	\$166,533
<b>Total</b>	<b>46</b>	<b>not reported</b>	<b>\$669,620</b>

<sup>182</sup> <http://www.nerc-vt.org/incentives/installed.htm>

### 3.13 Washington

Unlike other states with predominantly IOU, Washington offers a fragmented utility landscape encompassing more than 60 utilities. Consumer-owned utilities account for 55 percent of energy sales in the state. Energy policies are negotiated among individual utilities and a cohesive statewide energy policy has been difficult to attain. In early 2004, SHB 2333 promised to change the status quo and create a statewide policy for developing energy efficiency and renewable energy resources.<sup>183</sup>

Washington's generation mix indicates that more than 67 percent of all electricity production comes from hydropower, followed by coal and natural gas. Electricity generation potential for solar, wind, and biomass are summarized below<sup>184</sup>. Wind offers the most potential in Washington State. In addition to their biomass potential, farmlands in Washington offer tremendous possibilities for the installation of wind farms and the creation of locally owned wind cooperatives.

#### Exhibit 3.13-1: Generation Potential

Renewable Energy Source	Electricity Generation Potential
Solar	42 million MWh/year
Wind	62 million MWh/year
Biomass	11 million MWh/year

#### REGULATIONS PERTAINING NET METERING

Net metering has been available in Washington since 1998 (Title 80 RCW House Bill B2773). All utilities and customer classes are eligible for net metering. Allowable technologies include the following: solar, wind, fuel cells, and hydro systems of 25 kW or less.

#### REGULATIONS PERTAINING TO STANDARDIZED GRID INTERCONNECTION

In 2000, interconnection rules were clarified and simplified. Requirements include compliance with all local, state, and national codes, and IEEE standards. Systems must use UL-listed equipment.

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<sup>183</sup> <http://www.altrue.net/site/renewwa/section.php?id=7807>

<sup>184</sup> <http://www.energyatlas.org>

## STATE TAX INCENTIVES

Through legislation HB1856, Washington residents can apply for state tax exemptions for systems as small as 200 Watts. Eligible technologies include PV, wind, land field gas, and, most recently, fuel cells.

## RENEWABLE ENERGY PORTFOLIO STANDARD

The recently enacted SHB2333 provides a statewide policy for utilities to increase the amount of renewable energy in their generation mix. The following generation scale will apply to both IOUs and publicly owned utilities:

### **Exhibit 3-13.2: Renewable Energy Portfolio Requirements**

<b>Year</b>	<b>Percentage</b>
2010	5%
2015	10%
2023	15%

Through this legislation, Washington state residents benefit from increased energy efficiency and reduced pollution. In addition, it fosters job creation and research and development of renewable energy technologies. Rural communities will reap benefits in terms of additional income from farm resources (biomass and wind) that may be used in the generation of renewable energy.

## PROGRAM SPECIFIC INFORMATION

### PUGET SOUND ENERGY (PSE)

*PSE* offers rebates for residential PV systems installed in the PSE service territory. Depending on the location, projects may receive from \$525/kW to \$600/kW. Rebates are paid after post-installation inspections.

In addition, PSE has partnered with the Bonneville Efficiency Foundation (BEF) to solicit, screen, and implement renewable energy projects. For these projects, the BEF application guidelines apply.

*Orcas Power and Light – Production Incentive Program.* This program provides a one-time, maximum incentive of \$4,500 for PV installations and \$1.5/kW for wind (up to half of the estimated generating capacity). To date there are 14 solar members and one wind member participating in this program.

## PUBLIC UTILITY DISTRICT PROGRAMS

Several Public Utility District (PUDs) in Washington state provide incentives for the installation of renewable energy technologies.

The *Chelan PUD* offers the *Sustainable Natural Alternative Power (SNAP) Producers Program*. This program provides incentives to customers who install and connect to the grid systems sized at 25 kW or less. Eligible sectors include residential, commercial, industrial, government (state and local), schools. This program received an award in 2003 from the Interstate Renewable Energy Council (IREC). Rebates are paid in \$/kWh to a maximum of \$1.5/kWh.

*Clallam County's PUD* offers \$450 in incentives for 1 kW PV systems and \$750 for 40 ft<sup>2</sup> minimum solar water systems.

*Franklin PUD – Loan Program*. This program offers low-interest loans for PV and solar water heat installations in single or multi-family residences. For single family residences, the loans vary between \$400 to a maximum of \$10,000. For multi-family residences, the loans vary from \$400 to \$15,000.

*Gray Harbors PUD* offers a loan program similar to the Franklin PUD's. When they install solar water heating systems, residential, commercial, and industrial customers may choose between a one-time rebate of \$600 or a low-interest loan of up to \$4,000.

*Pacific County PUD* offers a \$500 rebate for the installation of solar water heating systems. Eligible customers include commercial, industrial, and residential.

The PUD programs describe above follow BPA guidelines. See Oregon's description for information on BPA.

## BONNEVILLE EFFICIENCY FOUNDATION

BEF offers private grants for renewable energy technologies. This foundation works with several states in the northwest, including Washington and Oregon.

The *Solar 4R Schools Program* is an innovative program that works in partnership with school officials, utility representatives, and local businesses to foster PV system installations in schools, curriculum development, and green tag trading. To date, five schools in the state are participating in this program.

The *Renewable Energy Grant Program* provides loans, grants, and investment options for renewable energy projects in several northwest states. BEF shares 33 percent of the capital cost of the project. This grant programs is aimed at large systems installed by non-profit organizations and for local and tribal governments. For smaller residential systems, BEF provides support through the Northwest Solar Cooperative or Our Wind Co-op. The Solar Starter

Program (Northwest Solar Cooperative) is a production incentive program for systems sized at 5 kW. For systems over 5 kW, incentives may be negotiated.

## 4 Federal Programs and Initiatives

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The role of the federal government is the following:

- ◆ Spearhead renewable energy research, development and deployment; and
- ◆ Provide a policy (e.g., regulatory and tax) environment that does not hinder, or contradict the goal of continued development of the nation's renewable resources.

Traditionally, the DOE has taken a leadership role in technology development, market commercialization, and promotion of renewable energy technologies. These R,D&D programs have contributed to the continued evolution of solar, wind, biomass, geothermal, and other energy sources. However, recognition of the value of renewable energy as a resource for reducing the emission of climate-change gases, stimulating local economies, providing jobs, and developing new commodity markets, has led to renewable energy program development by other agencies, including the EPA and the U.S. Department of Agriculture (USDA).

This section will first overview the presentation of federal tax incentives, and will describe the programs of the DOE and other agencies that increase market penetration of existing technologies, commercialize near-term technologies, or fund the development of energy resources such as biomass energy. Given breadth of federal energy-development activities, this section does not address every federal program. Rather, it endeavors to provide descriptions of those programs that do the following:

- ◆ Support direct installation of renewable energy technology,
- ◆ Support the establishment of a market for renewable energy technology translating from near-term to commercial, and
- ◆ Provide technical support or other resources that compliment state, local, and utility programs.

### 4.1 Federal Programs

Taxation – or more accurately a lessening of – is an important factor in the sustainability of renewable energy markets, especially for large commercial and industrial customers.

#### *Modified Accelerated Cost Recovery System*

Under this system, businesses can more quickly recover investments in solar, wind, and geothermal property through depreciation deductions. The MACRS established a set of classes



for the lives of various properties over which the property may be depreciated. For renewable energy technologies that were placed in service after 1986, the current MACRS property Class is five years.

*Job Creation and Tax Relief Reconciliation of 2003, Section 201 (HR 201)*

In addition to the MACRS depreciation, Section 201 of the Job Creation and Tax Relief Reconciliation of 2003 provides for an additional 50 percent depreciation on renewable energy property in the first year of operation. To qualify for the 50 percent first-year bonus, the property must have been acquired by the taxpayer between May 5th, 2003, and January 1st, 2005. Interestingly, many states have not adopted the federal bonus depreciation, or have explicitly separated their state tax depreciation schedules from the new federal rules.

*Renewable Energy Production Credit (REPC)*

Enacted as part of the Energy Policy Act of 1992 and authorized under Tax Code Citation 26 USC 45, the REPC is a per-kWh tax credit for electricity generated by qualified renewable energy sources including wind, closed-loop biomass, and poultry waste for the first 10 years of operation. The REPC provided 1.5 cents per kWh credit, adjusted annually for inflation. And extended as part of the Job Creation and Worker Assistance Act of 2002. New projects cannot enroll as of 12/31/2003.

*Solar and Geothermal Business Energy Tax Credit*

This incentive is a 10 percent tax credit available to commercial businesses that invest in or purchase solar-energy equipment to heat, cool or generate electricity. For geothermal, it is applicable only to heating or cooling, or up to the electricity-transmission stage of a project. Credit may not be taken if the project is subsidized by tax-exempt private activity bonds, and the credit is limited to \$25,000 per year and may be carried forward for 15 years. This may limit its applicability to certain state or local incentive that finance through tax-exempt bonds. The credit is ongoing and has no expiration date.

## 4.2 U.S. Department of Energy

*State Energy Program (SEP)*

SEP's (Originally the State Energy Conservation Program, circa 1970) objective is to promote energy conservation and efficiency and to reduce energy demand by developing and implementing comprehensive state energy conservation plans supported by federal financial and technical assistance.

SEP is supported directly by congressional appropriations as well as funds from the Petroleum Violation Escrow, state funds, and program income. SEP funds are distributed through grants given to the individual state energy offices. These grants are used at the states' discretion (subject to a few conditions) and may support state level renewable energy projects or support demonstrations of commercially available energy efficiency and renewable energy technologies.

These funds are often dispersed by the individual states to support other renewable energy related activities.

Special project funds are awarded to projects, via open solicitation, to support specific state energy program priorities, and are often tied to a specific program area (e.g., Clean Cities, Solar Technologies Program, etc.). For FY 2004, funding opportunities totaled approximately \$16 million.

#### *Distributed Energy Subprogram*

The Distributed Energy Technologies Subprogram supports research and development on a variety of small, modular energy generation devices, including both renewable and non-renewable electrical and thermal power generators. Some of the goals of the subprogram are to reduce the cost of energy, increase energy system reliability, and improve national security. Most of the program's activities are largely non-renewable in focus. To achieve its goals, the distributed energy subprogram funds collaborations through competitive solicitations that support research, development, and deployment.

#### *Million Solar Roofs (MSRI)*

Announced in June 1997, the MSRI is tasked with facilitating the installation of solar energy systems on 1 million U.S. buildings across all sectors, by 2010. Key goals of the million solar roofs program are the following:

- ◆ Building voluntary partnerships with states, communities, and other organizations (e.g., builders, manufacturers, utilities and non-profit organizations);
- ◆ Expanding the federal pool of financing ;
- ◆ Leveraging financial support for solar technologies from states, utilities, and other stakeholders; and
- ◆ Promoting the use of solar energy systems on Federal buildings.

MSRI does not provide any direct funding or incentives for solar energy system installations. But in 2003 it did provide approximately 30 grants to its partnerships. The initiative strives to accomplish its goals by providing technical outreach and promotional assistance to its partnerships.

The MSRI Website indicates that it has been involved in the installation of 200 MW of solar-energy resources, with about 40 MW being PV.<sup>185</sup>

#### *Solar Energy Technologies Program*

The Solar Energy Technologies Program leads the DOE's efforts to develop and deploy cost-effective solar technologies. The mission of the Solar Energy Technologies Program is to

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<sup>185</sup> <http://www.millionsolar.roofs.com>

“improve America's security, environmental quality, and economic prosperity through public-private partnerships that bring reliable and affordable solar energy technologies to the marketplace.” The near-term technical goals are as follows:

- ◆ Electricity from photovoltaic systems reduced to \$0.18/kilowatt-hour (kWh);
- ◆ Polymer solar water heater reduced to \$0.04/kWh (the thermal equivalent of \$4 per million Btu); and
- ◆ Electricity from concentrating-solar-power systems reduced to \$0.10/kWh.

The DOE's Solar Energy Technologies Program does not provide funding to support commercialization or market development. However, it works closely with the MSRI to provide technical support and public awareness of solar energy.

### ***Geothermal Technologies Program***

The Geothermal Technology Program works with industry to further the exploration and utilization of the nation's geothermal energy resources. The program mission statement is, “To work in partnership with the U.S. Industry to establish geothermal energy as an economically competitive contributor to the U.S. Energy Supply” and its goal is to reduce the cost of geothermal power generation (on a utility scale) to \$0.03 to \$0.05 per kWh by 2010. In addition to technical support and information provided by DOE programs, the Geothermal Technology Program provides direct funding via competitive solicitations. Most recently the program has provided more than \$ 5.3 million in Enhanced Geothermal Systems grants to 12 organizations with an average cost share of 27 percent.<sup>186</sup>

## **4.3 U.S. Environmental Protection Agency**

The EPA offers a variety of programs related to clean energy; examples of these programs include the Green Power Partnership, Combined Heat and Power Partnership, AgSTAR, and the Landfill Methane Outreach Program (LMOP). All these programs are partnership-based and offer virtually no direct financial incentives to participants. All of these programs offer a mix of technical support (e.g., tools, access to experts), recognition, and cooperative opportunities. Although the program's lack direct funding, they offer a wealth of technical resources and are an excellent opportunity to connect to other federal, state, local, and non-profit programs that can provide financial resources. In addition, like most other EPA partnership programs, these programs endeavor to work with clean energy industry stakeholders to help commercialize and promote technologies.

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<sup>186</sup> <http://www.eere.energy.gov/geothermal>

### *Green Power Partnership*

The Green Power Partnership is a voluntary program that seeks to facilitate the growth of the green power market by increasing demand by partnering with the nation's largest energy users. The partnership offers high quality information on green power options.

Over 500 organizations have partnered with the program including U.S. Air Force, General Services Administration, City of Chicago, New Jersey Consolidated Energy Savings Program, Fedex, and the Pennsylvania State University. Combined the participants have made annual green power commitments that exceed 2 million MWH.

### *Combined Heat and Power Partnership*

The CHP Partnership is a voluntary program that seeks to reduce the environmental impact of power generation by promoting the use of CHP. The Partnership works closely with the CHP industry, state, and local governments, and other stakeholders to develop tools and services to support the development of new projects and promote their energy. The CHP partnership promotes activities within two core groups: industry partners, and state and local partners.

State and local partners agree to host a CHP workshop to promote the benefits of CHP and support development of new projects within their state or local jurisdiction. These partners also agree to review EPA-produced state or local data and analysis, including a document that outlines state and local regulations that may affect CHP project development. Finally, state and local partners serve as key EPA liaisons as they provide project-specific assistance in their state or city.

Industry partners work with EPA to assess the potential for CHP development at their facilities. Partners also agree to work with EPA to publicize the energy, environmental, and economic benefits of their projects, and to provide EPA with minimal operational data to enable EPA to evaluate the Partnership's success at increasing the use of CHP in the United States. Industry partners are the "customers" of the program, providing the basis for implemented and operating CHP installations.

The CHP partnership offers a variety of resources to perspective participants including a variety of technical documents, a tech support-email, and resources from ally organizations, such as the Association of Energy Engineers

Compared to other partnership programs operated by federal agencies, the CHP partnership has only about 140 partners. Industry partners include Dow Chemical, Exxon Mobile, and International Paper, who collectively operate hundreds of facilities. In addition, partners include dozens of CHP industry stakeholders such as Capstone Turbine Corporation, Caterpillar Energy Products, and Fuel Cell Energy.

The CHP partnership promotes the success stories of many CHP installations in a variety of states.

It should be noted that most of the success stories in EPA’s CHP partnership are reliant on fossil fuels, and the increased efficiency of CHP installations is what yields the environmental benefits.

**AgSTAR**

The AgSTAR Program is a voluntary effort led by the EPA and jointly sponsored by the U.S. Department of Agriculture, and the DOE. The primary goal of the AgStar program is to reduce the release of methane, a leading contributor to global warming, from the nation’s agricultural enterprises. AgSTAR focuses on manure and animal waste management through a variety of methods, including collection and digestion. The digesters promoted by the program produce a methane-rich fuel known as “biogas”.<sup>187 188</sup> AgSTAR promotes harnessing this fuel in combination with CHP technologies such as reciprocating engines and microturbines. These CHP produce electricity that can be used to support farm activities and heat that can be re-circulated into the digester or used to heat farm facilities.

AgSTAR offers technical support to the livestock industry. This support includes the following:

- ◆ The AgSTAR Handbook, a manual developed to provide guidance on developing biogas operations at commercial farms;
- ◆ FarmWare, an expert decision-support software package that can be used to conduct biogass recovery system assessments;
- ◆ The AgSTAR Industry Directory, a directory to connect commercial farm operators to digester, biogas, and energy industry stakeholders;
- ◆ The AgSTAR Website, where other resources can be downloaded along with case studies and articles; and
- ◆ Technical support, provided by AgSTAR hotline representatives at 1-800-952-4782.

According to AgSTAR, it has been very effective at promoting digester technology, and the number of operating digester systems nationwide has doubled since 1994, resulting in the reduction of more than 124,000 metric tons of carbon equivalent gas releases, and annual energy generation equivalent to 30 million kWh. AgSTAR tracks the number of operational digesters in each state and reports this as a performance metric, although some of these digesters were installed before the initiation of the AgSTAR program in 1994.

**Exhibit 4-1: Digesters per State Before and After AgSTAR program**

State	Number of Digester Installations After 1994	Number of Digester Sites Before 1994
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<sup>187</sup> Managing Manure with Biogas Recovery Systems – Improved Performance at Competitive Costs, The AgSTAR Program, EPA-430-F-02-004, U.S. Environmental Protection Agency, Winter 2002

<sup>188</sup> U.S. Environmental Protection Agency AgSTAR Website <http://www.epa.gov/agstar/>

CA	5	2
CO	1	0
CT	2	0
FL	1	0
IL	3	0
IA	5	0
MD	1	1 (flare only)
MI	0	1
MN	1	0
MS	1	0
NY	4	1
NC	1	0
PA	0	5
VT	0	1
VA	0	1
WI	5	1

*Landfill Methane Outreach Program*

The EPA’s Landfill Methane Outreach Program (LMOP) is a voluntary assistance and partnership program that promotes the use of landfill gas as a renewable, Green-energy source. (Ref 3.) Landfill gas is an inevitable by-product of landfills and has a high concentration of methane. Traditionally, landfill gas has been flared to reduce odor and to convert methane to less potent climate-change agents like carbon dioxide. By preventing emissions of methane through the development of landfill-gas to energy projects, the U.S. EPA helps to prevent climate change while providing communities and power generators, and consumers of process heat (kilns etc.), with a cost-effective source of fuel.

According to the EPA, there are more than 360 landfill-gas to energy projects in the United States, plus another 600 candidates. LMOP has accumulated more than 355 partners who have agreed to work with the program to promote the development of landfill-gas projects and the program has been a direct participant in more than 250 landfill gas programs including the 26 projects that went online in 2003. LMOP has profiled more than 1,300 candidate landfill sites. The LMOP program, reports in its performance metrics that it prevented the emission more than 4.1 million metric tons of carbon equivalent. (Note: 1.22 million tons of this was flared with no energy recovery.)

LMOP support includes the following:

- ◆ Technical Assistance, including a detailed toolkit highlighting opportunities for funding from other EPA programs (e.g., acid rain), foundations and states. Technical documents include handbooks for landfill gas system operators;
- ◆ Partnerships, fostering mutual exchanges between partnership groups including industry, energy partners, state partners, community partners, and endorsers; and

- ◆ Support assessing candidate landfills.

## 4.4 U.S. Department of Agriculture

The USDA has initiated a number of renewable energy projects, invigorated by funding from recent legislative action such as the Farm Bill 2002. The development of renewable resources, particularly biomass resources, interlocks with many of the USDA's key objectives. USDA programs attempt the following:

- ◆ Improve rural and agrarian economies;
- ◆ Stimulate markets for new agricultural commodities (such as biomass crops, and agricultural waste);
- ◆ Develop and commercialize new farm, agricultural, and forest technologies; and
- ◆ Encourage the development of biobased products.

The USDA is in a unique position to act locally through the networks of Universities and rural extension services to the end goal of promoting renewable energy technology and biomass crops in the same way that hybrid corn was promoted in the early part of the century.

### *Renewable Energy System and Energy Efficiency Improvement Program*

One of several renewable energy focused programs launched under Title IX of the 2002 Farm Security and Rural Investment Act of 2002 "Farm Bill." The Renewable Energy Systems and Energy Efficiency Improvements Program provides \$22.8 million of funding available for Fiscal Year 2004 for eligible agricultural producers and rural small businesses to purchase renewable energy systems and implement energy-efficiency improvements. The solicitation for 2004 has closed, but grants were available for a minimum of \$2,500 to \$500,000 as long as they did not exceed 25 percent of the total project cost. Eligible RE technologies included wind, solar, biomass, geothermal, and hydrogen produced from a renewable energy source.

### *National Wood Energy Demo Project*

The USDA's Forest Service project demonstrates innovative uses for forest projects. In the case of the National Wood Energy Demo Project, the Forest Service selected seven sites to demonstrate the BioMax 15, a modular biopower system, which converts small-diameter forest thinning removed in efforts to curb forest fires into up to 15 kW of electricity and 50 kW of heat.

The demo sites include White Spruce Enterprises (Salcha, Alaska), Indigenous Community Enterprises (Flagstaff, Arizona), The Shasta Energy Group (Mt. Shasta California), the North Park School District (Walden, Colorado), Mount Wachusett Community College (Gardiner, Massachusetts), SBS Wood Shavings (Glencoa, New Mexico) and American Medal Products, (Cuba, New Mexico).<sup>189</sup>

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<sup>189</sup> National Wood Energy Demo Project Announces Site Locations, Press Release, U.S. Department of Agriculture Forest Service Forest Products Laboratory Press Release

*Rural Business Cooperative Service Special Initiative – Biobased Products and Bio Energy*

The goal of the Rural Business Cooperative Service (RBS) Biobased Products and Bio Energy Program is to finance technologies that process the nations agricultural and forest-based resources into usable biobased products and energy.

Business and facilities that install biomass energy equipment are eligible under the RBS's Business and Industry Guaranteed Loans up to \$25 million dollars.

B&I loan guarantees can be extended to loans made by recognized commercial or other authorized lenders in rural areas which includes all areas other than cities of more than 50,000 people and the contiguous and urbanized area of such cities or towns. Generally, authorized lenders include federal or state chartered banks, credit unions, insurance companies, savings and loan associations, Farm Credit Banks or other Farm Credit System institutions with direct lending authority, a mortgage company that is part of a bank holding company, and the National Rural Utilities Finance Corporation. Other loan sources include eligible Rural Utilities Service electric and telecommunications borrowers and other lenders approved by RBS who have met the designated criteria. Assistance under the B&I Guaranteed Loan Program is available to virtually any organization, including a cooperative, corporation, partnership, trust or other profit or nonprofit entity.<sup>190</sup>

This program provides guarantees up to 80 percent of a loan made by a commercial lender. Loan proceeds may be used for working capital, machinery and equipment, buildings and real estate, and certain types of debt refinancing.

## **5 International**

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There is a growing awareness and an increase in renewable energy use in industrialized countries as well as in developing and emerging countries. In addition, organizations such as the United Nations, U.S. DOE National Renewable Energy Laboratory, U.S. AID, and the World Bank, promote renewable energy as a resource for sustainable development.

Renewable energy policies and programs abroad have many lessons that can be incorporated into domestic efforts. Similar to program goals and missions in the U.S., the motivations for the growth of renewable energy in the international community has been driven by forces such as environmental improvement, economic growth, national security, and developing the industries of the future.

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<sup>190</sup> Rural Business Cooperative Service Special Initiative – Biobased Products and Bio Energy Website  
<http://www.rurdev.usda.gov/rbs/biomass/biomass.htm>



Policy forces such as the Kyoto Protocol and the realization of the potential effects of global warming has driven Europe, Canada others to lead in efforts to fully implement or exceed the provisions of the Kyoto Protocol. This has led to a European Union wide effort to implement energy efficiency technologies, renewable technologies, and find ways of utilizing carbon sinks. To facilitate the implementation of the protocol and to avoid regulatory initiatives the members of the European Union have rolled out numerous incentive programs, policy instruments, and market channels to facilitate the use of renewable energy technology. Under the provisions of the Kyoto Protocol, European nations have instituted the first world scale carbon trading schemes to provide further market incentives to reduce emissions.

- ◆ The European countries, Canada, and other signers of the Kyoto Protocol have instated the world's largest carbon trading scheme.
- ◆ Policy instruments have operated concurrently with other national objectives to develop healthy and innovative renewable energy incentive programs resulting in a large quantity of installed capacity in nations like Germany.

Many countries, realizing that renewable energy is likely to be one of the world's largest industries in the coming decades have taken steps to encourage the development of domestic renewable energy industries. Realizing that to become a global leader that the technology must be supported domestically these countries have coordinated with their environmental and policy objectives to provide strong domestic markets that has resulted in large native installed capacity as well as healthy equipment.

- ◆ Denmark has one of the world's largest wind generation capacity with over 3,110 MW<sup>191</sup> with Danish firms supplying over half of the world's wind turbines in 2001.
- ◆ Denmark generates approximately 18% of its energy from wind.
- ◆ Japan, a Nation that has one of the largest installed PV capacities, amounts of installed PV systems, hosted firms that manufacture red over 363 MW of PV modules and cells.  
<sup>192</sup>

The U.S. is fortunate to have the economy of scale, markets, and transportation channels to facilitate the importation of vast amounts of energy, much in the form of petroleum, from Western Europe, Venezuela, Mexico, Canada, and the Middle East. Many other countries, particularly rapidly developing economies in China and the Pacific Rim, do not have the luxury of substantial indigenous fossil based energy resources or the ability to compete on a large scale with the U.S. and Europe in international fossil fuel markets. To provide fuel for their growing economies, improving national security, providing modern amenities such as the Internet and

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<sup>191</sup> Wind Energy Industry Grows at a Steady Pace, Adds over 8,000 MW in 2003, American Wind Energy Association, 2004

<sup>192</sup> [http://www.jxj.com/magsandj/rew/2004\\_04/pv\\_market\\_update.html](http://www.jxj.com/magsandj/rew/2004_04/pv_market_update.html)

automobiles to their citizens many of these nations have taken great steps to harness the power of indigenous energy resources. Examples include:

- ◆ India Asia's largest and oldest windpower market, with over 2,100 MW of capacity, provides an open IPP market with accelerated depreciation of assets, low interest loans and tax incentives.
- ◆ Thailand and other southeast Asian nations are developing infrastructure to produce and distribute biofuels taking advantage of thriving sugar and cassava production.
- ◆ Philippines has developed a geothermal electrical capacity of over 1,930 MW, second only to the United States.
- ◆ China has developed the massive "Three Gorges" hydropower scheme and is promoting a variety of other renewable energy resources to support economic growth and improve public health by displacing traditional low-grade coal powered generation.

With this in mind, we provide in this section a summary of activities taking place in other countries that may serve as examples for continued U.S. renewable energy efforts and programs. As part of our benchmarking effort, we have reviewed renewable energy activities in the following countries: Canada, Mexico, Brazil, Denmark, Germany, Spain, Japan, China, South Africa, and Australia.

## 5.1 Canada

Canada, one of the world's largest exporters of energy and energy resources, is endowed with copious amounts of hydropower from powerful rivers and with extensive fields of coal, oil, and natural gas. Canada's largest energy customer is, in fact, the United States, with massive powerlines delivering an annual average of over 39,000 GWH to the Pacific Northwest, New England, and California.

Despite this wealth of energy resources, the Canadian government has continued to promote renewable energy as well as energy efficiency through a variety of programs. Collectively for low impact renewable energy Canada generates over 7,000 GWH and 315,000 GWH from massive hydropower installations.<sup>193</sup>

Canadian efforts to promote renewable energy are driven by a variety of policy issues: First, Canada takes its commitments under the Kyoto protocol seriously and is developing mechanisms to reduce greenhouse gas emissions, including promoting renewable energy, despite its wealth of fossil fuels. Other environmental pressures, such as a drive to stop development, or reduce hydroelectric development due to its impacts on fisheries and indigenous populations are both culturally and commercially valuable.

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<sup>193</sup> [www.eia.doe.gov](http://www.eia.doe.gov)

### ***Green Municipal Enabling Fund (GMEF)***

The first of two funds established in 2000 as part of the Federation of Canadian Municipalities Green Municipal Funds. The GMEF consists of \$50 million of support to municipalities and their public and private partners for feasibility studies and field tests of new renewable energy projects. Studies of technical, environmental, and/or economic feasibility of proposed projects are eligible for grants up to 50 percent of cost to a maximum of \$350,000. Eligible projects include onsite generation, landfill energy, building integrated renewable energy (including passive solar), microhydro, wind, solar thermal, photovoltaic, biomass, and community energy planning (including greenhouse gas reduction and brownfields redevelopment). The GMEF is expected to support 65 feasibility studies in 2004, resulting in a total of 273 studies. Of these, 55 studies have been for renewable energy supply. The GMEF is slated to expire in March of 2007.<sup>108</sup>

### ***Green Municipal Investment Fund (GMIF)***

Sister fund to the GMEF the GMIF provides \$200 million in interest-bearing loans, loan guarantees, and grants toward the implementation of projects similar to those funded by the GMEF. Eligible projects in almost all cases must have a return of investment in 10 years. Select pilot projects may have returns in excess of 10 years. Eligible projects may apply for loans covering up to 15 percent of project costs (occasionally increased to 25 percent). For pilot projects, the GMIF may provide a grant or long-term loan up to 50 percent of the capital cost. As of June 2004, the GMIF has provided support for 47 projects, including 12 renewable energy projects.<sup>7</sup>

### ***Climate Change Action Fund (CCAF)***

The CCAF was established in 1998, and operated from a \$150 million endowment, to help Canada meet its commitments under the Kyoto Protocol. The CCAF has supported renewable energy projects including a public green power awareness campaign, and the demonstration of building integrated PV. The CCAF is in its final year of operation and has no plans for future solicitations, except for its Technology Early Action Measure (TEAM) component which offers development and deployment support for new technologies. TEAM was originally launched with \$60 annually million from CCAF in 1998, received an additional \$35 million and is extended through 2008. Roughly 30 of the 82 projects supported by TEAM have involved renewable energy.<sup>7</sup>

### ***Sustainable Development Technology Canada (SDTC)***

A \$350 million fund for the development demonstration, and pre-commercialization of sustainable development technologies that address climate-change and clean-air issues in Canada. SDTC was initiated in 2002 as a non-profit corporation with an initial \$100 million endowment from the Canadian government. The commitment was renewed with additional contributions of \$250 million in 2003. Eligible projects include energy exploration, production, transmission, and distribution as well as waste management, transportation, emissions controls and other enabling technologies (e.g., software). SDTC may provide up to 50 percent of eligible

costs for a particular project, though the fund's target is approximately 33 percent of the project costs. A caveat is that total federal and provincial support cannot exceed 75 percent of total project costs. As of June 2004, 38 projects totaling \$72 million in investment from SDTC had been approved, and an additional \$206 million had been leveraged from project consortia members.

***Wind Power Production Incentive (WPPI)***

The fund offers support to electric utilities and independent power producers for the construction of new wind projects in Canada. The WPPI established with \$260 million in 2001 aims to provide support for the installation of 1,000 MW of new wind capacity by 2008. The incentives paid by the fund decline from 1.2 cents/kWh to 0.8 cents/kWh by 2007, and are available for the first ten years of a project's operating life on a first-constructed, first-served basis. Payments are designed to offset about half the premium associated with new wind projects over conventional electricity sources.

***Market Incentive Program (MIP) for Distributors of Emerging Renewable Electricity Sources***

Funded with \$25 million through 2006 and managed by Natural Resources Canada, the MIP is designed to encourage electricity distributors to explore new ways of stimulating sales of electricity generated from renewable sources by offsetting up to 40 percent of a distributor's costs associated with the delivery of green power to residential and small-commercial customers.

***Renewable Energy Technologies Program (RETP)***

Natural Resources Canada's RETEP Program offers support for the development and commercialization of advanced renewable energy technologies.

***Community Energy Technology Centre (CETC)***

Managed by Natural Resources Canada, the CETC is a revolving fund that supports project feasibility studies. Project developers must repay the cost of the feasibility study if the project moves forward.

***Renewable Energy Deployment Initiative (REDI)***

Initiated in 1998 REDI is a six year \$24 million program offering incentives toward the installation of renewable energy systems to satisfy building thermal needs. Businesses are eligible for a rebate of up to 25 percent (40 percent in remote communities) of the purchase and installation of qualifying systems, up to \$80,000 per project. In 2000, nine businesses received a total of \$119,910 through REDI.

***Technology Partnership Canada (TPC)***

Is a program of Industry Canada, a federal economic development agency. The TPC's R&D program provides support for small to medium sized projects, and the hydrogen program early adopters program to help build a hydrogen economy.

In addition to the large federally supported funds, there are a large number of provincial and municipal funds available.

**Exhibit 5-1: Provincial and Municipal Funds**

Fund	Value	Goal	Achievements
Alberta Climate Change Central (CCC)	Approximately \$4 million	Provides private analysis, engagement, and policy advice	Leveraged its funding nearly 5 to 1
British Columbia Renewable Energy Technology Program	Approximately \$850,000 over 3 years	To support a variety of RE projects.	Support to R&D and early demonstration projects.
Manitoba Climate Change Action Fund	\$1 million over 4 years	To encourage technological innovation in alternative or green energy projects.	Funded 37 projects totaling \$732,300 in the first three years of the program
Yukon Green Power Initiative *YG	\$3 million	To foster research, development, training, and awareness of green power.	Unknown

## 5.2 Mexico

Since the 1990s, Mexico has promoted the use of energy-efficient technologies and renewable energy as a means to reduced electricity demand and power plant development.

Traditional sources of renewable energy in Mexico are hydro-electric and geothermal, generating over 5,000 GWH from low impact renewables and another 24,000 GWH from hydroelectric.<sup>194</sup> However, through the efforts of the DOE and U.S. AID, wind power mapping activities are taking place in Mexico. These activities include the assessment of wind power potential in several areas of the country, project development, followed by possible project implementation. Concurrent with wind power mapping, solar resource assessment is also taking place in Southern Mexico. As stated on the NREL site, “NREL has been requested to develop high-resolution satellite-derived solar resource data and maps for the states of Chiapas, Veracruz and Oaxaca. The database will include time and spatial information as well as hourly data at every grid cell, which will allow for detailed and defined site and technology assessments. NREL, together with a subcontractor will develop the maps, and work with local partners to evaluate the results of the satellite-derived calculations and to incorporate the information into their GIS framework.”<sup>109</sup>

The Mexico Renewable Energy Program (MREP), managed by Sandia National Laboratory, in collaboration with U.S. AID has promoted the use of renewable energy through several pilot projects. Achievements of this collaboration includes:

- ◆ Cost sharing of project implementation,

<sup>194</sup> [www.eia.doe.gov](http://www.eia.doe.gov)

- ◆ Local training and capacity building for local professionals,
- ◆ Commercial replication of projects in the private sector.

Further, the rural electrification program, directed by the Secretaría de Energía, has mandated that renewable energy options be included as part of this countrywide effort.

Regulatory efforts to increase the use of renewable energy in Mexico are led by Secretaria de Energía (SENER), Secretaria de hacienda y credito publico (SHCP), Comision Reguladora de Energía (CRE) and Comision Nacional para el Ahorro de Energía (CONAE), which includes CONAFE (Consejo Consultivo para el Fomento de las Energías Renovables en Mexico).<sup>195</sup>

In addition to the efforts discussed above, it is important to note that, FIDE has been instrumental in developing programs and projects aimed at reducing energy consumption, increasing energy efficiency in the commercial, industrial and residential sector and developing a viable ESCO industry. In addition, FIDE has developed energy-efficient standards for appliances, lighting fixtures and bulbs, chillers, and other equipment. The SELLO FIDE is a similar program to the ENERGY STAR label program. All these efforts set the stage for a solid renewable energy future.

### 5.3 Brazil

Since 1992 Brazil has been active in promoting the viability and use of renewable energy, and is generating approximately 14,000 GWH of electricity from low impact renewable energy sources and another 282,000 GWH from hydropower.<sup>196</sup> With the joint efforts of NREL and local Brazilian universities, rural energy projects have been implemented, including the “LUZ PARA TODOS”, or “lights for all.” This program takes advantage of local resources to provide energy to communities in the Amazon, including the use of the rich biomass byproducts of sugar cane and wood processing available in many regions of the country. Brazil has been a leader in the substitution of ethanol produced from sugarcane, for gasoline.

In addition, the Sun Wind Energy Resource Assessment states the following:

“The Laboratory of Solar Energy (LABSOLAR), part of the Federal University of Santa Catarina, and the Brazilian Wind Energy Center (CBEE), part of the Federal University of Pernambuco, are cooperating with the NREL in the production of solar and wind assessments for Brazil.”

Five assessment products are under development:

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<sup>195</sup> [http://www.energia.gob.mx/work/secciones/154/imagenes/e\\_renovables\\_mexico.pdf](http://www.energia.gob.mx/work/secciones/154/imagenes/e_renovables_mexico.pdf)

<sup>196</sup> [www.eia.doe.gov](http://www.eia.doe.gov)

- ◆ A high resolution (10 km) solar map by LABSOLAR,
- ◆ A medium resolution (40 km) solar map in cooperation with NREL,
- ◆ A medium resolution (40 km) solar map by LABSOLAR,
- ◆ A MM5 wind map by CBEE, and
- ◆ A 1 km wind map produced in cooperation with NREL.

A geospatial toolkit will integrate the solar and wind data with GIS data to support an overall solar and wind energy resource assessment.<sup>197</sup>

## 5.4 Denmark

Denmark long been praised as a shining example of renewable energy with the tiny country generating over 7,000 GWH from low impact renewable sources. Denmark, a land of windmills, has historically been one of Europe's most renewable energy-dominated nations. Danish success with implementing renewable energy has not been due to technological or grant and rebate success alone. The economic, cultural, utility, resource, and policy situation of the country have all contributed to improving the penetration of renewable energy principally from wind farms into the generation mix. Denmark produces 18% of its electricity from wind.

## 5.5 Germany

Germany is perhaps Europe's leading country with respect to renewable energy, collectively Germany generates over 26,000 GWH of energy from low impact renewable sources.<sup>198</sup> In May and June of 2004, the German government hosted the Second World Renewable Energy Forum: Renewing Civilization by Renewable Energy (World Council on Renewable Energy-WCRE). This event reflects the worldwide consensus of the importance renewable energy options in the face of diminishing fossil fuel reserves and climate change. As a result of the conference, "government delegates from 154 countries adopted the [Political Declaration](#) of renewables 2004. The declaration contains definitions of common political objectives for promoting the role of renewable energies."<sup>199</sup>

In Germany, new laws have gone into effect to promote the use of PV technology and a generous 100 percent tax exemption has been introduced to promote the use of biofuels. One of the government's goal is to increase the market share of renewable energy as a primary source from 2.1 percent in 2000 to 4.2 percent by 2010. In addition, there are favorable financing options for

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<sup>197</sup> <http://swera.unep.net/swera/indes.php>

<sup>198</sup> [www.eia.doe.gov](http://www.eia.doe.gov)

<sup>199</sup> <http://www.renewables2004.de>

renewable energy projects, incentives for solar roof program participation, and buy-back of PV-produced energy.

Germany has created the world's second largest commercial market for PV. A major driver for the establishment of this market has been the country's establishment of a "feed law", or production incentive, which provides a per kWh performance incentive for renewable power generation. As of 2004, the current incentive is \$0.487 per kWh base, and \$0.72 per kWh for building integrated PV systems under 30 kW. This program has been the principal driver for the growth of the German PV market from under 6 MW in 1992 to 260 MW in 2002.<sup>200</sup>

## 5.6 Spain

According to the Clean Edge report of 2004, Spain is third in the world for installed wind capacity. IDAE, the Spanish Institute for the Diversification and Saving of Energy, promotes the use of renewable energy resources and energy efficiency. IDAE in conjunction with the Instituto de Credito Oficial (ICO), provide financing for renewable energy projects. For instance, the 2004 guidelines show that solar energy may obtain up to 100 percent for thermal projects and 90 percent for PV related projects. Other renewable energy sources such as wind, biomass and biogas and energy efficiency projects may obtain up to 70 percent. In 1998, approximately 6.5 percent of the energy consumption was attributed to renewable energy,<sup>201</sup> biomass and hydro being the most common sources.

## 5.7 Japan

Japan's use of renewable energy resources continues to increase. For instance the use of PV has increased from 133 MW in 1998 to 673 MW in 2002<sup>202</sup> and Japan's total electric generation from low impact renewable energy sources is over 21 billion kWh. In addition, many of Japan's main industrial corporations continue to research, develop, and commercialize renewable energy technologies. According to a study by Janet Sawin, "Sharp produces 27 percent of the world's solar cells,<sup>203</sup>" and Japan continues to lead the market as the largest producer of PV in the world. Japan's METI solar roof program takes advantage of this in-country resource, and has assisted in the installation of PV systems in over 25,000 homes in 2000 and in over 29,000 homes in 2001.

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<sup>200</sup> Starrs, T.J., Designing A Performance-Based Incentive for Photovoltaic Markets, ASES Solar 2004 Conference, July 2004.

<sup>201</sup> <http://www.idea.es/documentacion/planfomento/Capitulo3.pdf>

<sup>202</sup> Clean Energy Trends 2004. Clean Edge March 2004. Makover, J., Pernick, R., and Wilder, C.

<sup>203</sup> <http://www.worldwatch.org/press/news/2004/05/12/>



Through government policies and subsidies (such as incentives and excess-energy production buy-backs), Japan has achieved a tremendous increase in the use of renewable energy use. Japan has a track record of leadership and setting ambitious goals. For example, the Japanese government has set a goal of producing 3 percent of its power from renewable sources (excluding hydroelectric and geothermal) by 2010<sup>204</sup>. Japan is also a leader in the development of fuel cell technology

## **5.8 China**

The major drivers for China's interest in renewable energy is economic security, promoting the countries exploding economy, and health. In urban areas, China's dependence on indigenous low grade coal for power generation has helped make 7 of China's cities some of the most polluted in the world.. In the rural areas, byproducts from indoor wood stoves for cooking and heating are identified as a major health hazard.

China has made enormous strides to supplement its energy portfolio, perhaps the most controversial project is the massive Three Gorges Dam project, by far the worlds largest hydroelectric scheme that will provide over 18 GW of capacity. Unfortunately, most hydropower schemes come at a substantial environmental and cultural cost, in particular the Three Gorges project has displaced 100,000s of thousands of people, flooded many of China's most significant archeological sites, and may result in environmental impacts that will not be fully understood for decades.

Since the mid 1990s, China has made efforts in promoting the use of low impact renewable energy. Through partnerships with the United Nations Development Program, NREL, the World Bank, and US AID, the Chinese government is working on developing laws and policies to foster the use of these technologies. The main purpose is to promote the use of commercially available technology such as wind farms, heat pumps, and PV cells.

At the request of the Chinese government, NREL is working closely with the Center for Renewable Energy Development to develop portions of a new renewable energy law in China, develop incentive options to foster the use of these technologies, and finally, to analyze their viability.

## **5.9 South Africa**

In South Africa, renewable energy sources such as wind have already been identified as important resources for economic development, especially in the rural areas. Wind energy maps for South Africa have been in place since 1995. In 1998, the government published a White

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<sup>204</sup> Asian Renewables – Developing Countries, RE Focus January/February 2004

Paper integrating wind energy to the national energy policy. In addition it recognizes the role renewable energy plays in a country's security.

South Africa has also abundant resources to produce energy as a byproduct of biomass waste. Sugar cane and forest have already been identified and used as such. However, the right economic incentives need to be put in place to further this initiative.

The potential for developing viable solar energy projects is also available in South Africa, especially in remote villages where grid power is not available, or too expensive an option.

The 2002 Summit in this country also helped shape some of the policies, legislature and national commitment to advance renewable energy technologies.

In 2003, the South African cabinet approved another White Paper targeting 10,000 GWh from renewable energy sources (wind, bio mass, solar and small hydro).

## 5.10 Australia

The Australian Greenhouse Office (AGO) is the agency in charge of promoting renewable energy programs in the country. Through laws and regulations, Australia has committed to achieve 9,500 GWh of renewable energy by the year 2010. To accomplish this goal, The AGO works with the private sector and the international community to promote the use of renewable technologies such as wind, solar, and fuel cells, among others. The Renewable Energy Act of 2000 serves as the cornerstone for achieving the AGO's goals.

The AGO supports the following programs:

### ***Photovoltaic Rebate Program (PRP)***

This program offers substantial rebates to residential customers and property developers to install PV technologies. The program's Website offers information on the program, and a program manager contact name.

### ***Renewable Remote Power Generation Program (RRPGP)***

This program is aimed at areas not serviced by the main power grid. Diesel-fuel replacement projects are eligible for funding. The Website provides detailed information on rebates, funding levels, eligibility and regions of the country that qualify. Each territory may have unique qualification criteria.

### ***Renewable Energy Equity Fund (REEF)***

This program provides seed money/venture capital to small firms for research and installation of innovative renewable energy technologies.

***Mandatory Renewable Energy Target (MRET)***

Through this initiative, Australia's government will make sure the legislation, policies and programs are in place to achieve the renewable energy target. The latest press release and white paper, dated June 2004, provides detailed information regarding this initiative.

In summary, this initiative outlines Australia's responsibility to secure an environmentally sustainable energy industry, provides funding of over \$500 million in private industry investments in renewable technologies and low-emission technologies, \$134 million for the commercialization of renewable technologies, and a commitment of \$75 million for Solar Cities, among others.

***Alternative Fuels Program (AFP)***

This program is targeted to reducing vehicular emissions through the use of alternative fuels such as natural gas and liquefied petroleum gas.