RENEWABLE ENERGY PROGRAM

CALIFORNIA ENERGY COMMISSION

# EMERGING RENEWABLES PROGRAM

# Committee Decisions On Pilot Performance-Based Incentive Program

FINAL DRAFT COMMITTEE REPORT

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STATE OF CALIFORNIA
ENERGY COMMISSION

Arnold Schwarzenegger, *Governor*

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# Committee Decisions on the~~Decision Document~~

# Pilot Performance-Based Incentive Program

## Introduction

Public Resources Code section 25744 authorizes the California Energy Commission to develop a program that provides incentives based on the performance of eligible distributed emerging renewable technology systems. Pursuant to this authority, the Energy Commission has allocated ten million dollars for a Pilot Performance-Based Incentive (PBI) Program for photovoltaic (PV) systems. The pilot program will run concurrent with both the California Energy Commission's Emerging Renewables Program (ERP) and the California Public Utilities Commission's Self-Generation Incentive Program (SGIP).

The elements of the Pilot PBI Program are summarized as follows:

- There will be a single incentive level of $0.~~35~~50 per kilowatt-hour (kWh) for all participants to be paid ~~monthly~~ quarterly for three successive years of uninterrupted performance.
- All customer classes are eligible.
- Funding is capped at $400,000 for any single installation, with a $1,000,000 cap for any corporate or government parent; no minimum or maximum system size limit.
- The reservation period for system installation is 12 months.
- A revenue-grade meter is required for all participating systems.
- The participant must coordinate with a third party provider to report performance data using a web-based reporting system or a utility reading and reporting system.
- The Pilot PBI Program will not include a loan or financing element.
- Applicants must participate in activities to evaluate the Pilot PBI program.

## Program Development Process

At the Energy Commission's *Integrated Energy Policy Report* (IEPR) workshop on August 27, 2004, public comment was solicited on the Accelerated Renewable Energy Development Draft Staff White Paper. One of the topics in the White Paper was the future of the Emerging Renewables Program and performance-based incentives.

The Energy Commission staff considered the comments from the IEPR workshop and reviewed several documents[1] prior to developing a Staff Draft Pilot PBI Program Proposal.[2] On September 27, 2004, the staff conducted a workshop to present the Staff Draft Proposal and to solicit input from interested parties. Workshop attendees

recommended other approaches for implementation of the performance-based incentive pilot program. These included the idea of allowing the industry to determine the incentive level by bidding what the level should be. Several participants also favored a hybrid approach where a portion of the incentive is paid upfront as a rebate, and a portion on the performance of the PV system.

Written comments on the Staff Draft Proposal were received from the following parties:

- Cal SEIA
- Bonneville Environmental Foundation
- Golden Sierra Power
- Fronius USA, LLC
- Bergey Windpower Co.
- PowerL~~l~~ight
- Pacific Gas and Electric Company

On December 1, 2004, the Energy Commission's Renewables Committee (Committee) conducted a public workshop to hear comments on a proposed pilot Performance-Based Incentive program and other changes to the *Committee Draft*~~-~~ *Fourth Edition Emerging Renewables Program Guidebook (Guidebook)*. The Committee considered oral comments received during the workshop and those submitted in writing prior to the final draft of the *Guidebook*. Written comments on the *Guidebook* were received from the following parties:

- San Diego Gas and Electric
- Cooperative Community Energy
- Southern California Edison Company
- Pacific Gas and Electric Company
- PowerLight
- Golden Sierra Power
- GenSelf
- Plan It Solar
- Village Power

This Decision Document outlines the decisions and rationale for the design of the proposed Pilot PBI Program as recommended by the ~~Energy Commission's Renewables Committee (~~Committee~~)~~. The proposed guidelines for the Pilot PBI Program are contained in the ~~*Draft Fourth Edition of the Emerging Renewables Program*~~ *Guidebook*. ~~On December 1, 2004, the Committee will conduct a public workshop to hear comments on the Pilot PBI Program and the proposed updates to the *Guidebook*.~~

~~The Committee will consider oral comments received during the workshop as well as those submitted in writing, and revise the *Guidebook* as appropriate. It is expected that~~ The ~~a~~ *Final Draft Guidebook* and this Decision Document will ~~then~~ be considered for adoption at the Energy Commission's Business Meeting on January 19~~5~~, 2005.

## Problem Statement

There are two main issues driving the proposal to implement a Pilot PBI Program. First, historical PV system monitoring and anecdotal evidence indicate that the quality of the PV systems and their actual performance ~~frequently~~ often fall short of expectations.

The Energy Commission monitored 19 residential PV systems ranging from 1 to 12 kilowatts and analyzed data collected from mid-February, 2000 through December, 2001. The study found that hardware and software problems ~~tended to~~sometimes jeopardized system performance, and noted that the performance of several monitored systems changed over the duration of the study. The analysis concluded that if distributed generation were to play a crucial energy role in California, its overall reliability improvements will need to be monitored closely.[3] In a related study, the Energy Commission found that not much information was available for customers to establish realistic system performance expectations. Additionally, customers often did not know when or how well their systems are working, or under what conditions they should call their installer for service. The report noted that inverter reliability and performance have considerable room for improvement.[4]

The SGIP made similar findings among the larger PV systems it monitored in 2003. Although average overall system performance was better, some systems ~~often~~ performed below expectations, with technical difficulties or weather variations causing erratic performance or even causing systems to go off-line.[5]

Second, the ERP and the SGIP are oversubscribed and cannot sustain incentives for California's dramatic PV market growth. As discussed in the 2004 Integrated Energy Policy Report, there may be more effective ways, beyond the current rebate approach, to maximize the funds allocated for these incentives.

To ensure that these ratepayer funds are used judiciously, PV systems must be properly designed, placed, installed, and maintained to achieve their maximum energy production potential and provide the most benefits for California. The Committee has directed the staff to develop a pilot PBI program and to test this approach as a possible long-term option for building the PV market in California.

## Pilot Performance Based Incentive Program Objectives

The Pilot PBI Program will help verify whether electricity production from PV systems can be maximized by offering incentives based on actual system performance. The Committee expects a PBI program to attract participants with systems and installation optimized for performance, such as those with the highest technical quality, the best orientation, and the most diligent maintenance. The pilot will also test the expectation that the program will attract only commercial customers, and will be helpful in learning

whether web-based or utility-based monitoring systems provide viable monitoring mechanisms.

According to the PV industry, long-term funding is the key to adding stability and certainty to build the market. By carefully setting the incentive level, a PBI Program can extend ratepayer funds while supporting higher performance than standard up-front rebates.

The Pilot PBI Program will test the incentive level and the overall program strategy to help the Energy Commission determine if a PBI Program attracts the most optimal systems and should be implemented in the future. The Committee provides the following discussions and rationale for each decision made in developing the proposed Pilot PBI Program.

# Renewables Committee Decisions and Rationale

## Program Design

Decision
The Energy Commission will conduct a single pilot program to test performance-based incentives.

Discussion and Rationale
Several approaches have been suggested for the Pilot PBI Program. Cal SEIA[6] and Fronius[7] proposed that the Energy Commission conduct several pilot programs to test the various approaches for a performance-based program. A hybrid approach, combining a capacity-based incentive with a performance-based incentive, was recommended by Powerlight[8] and Sharp Solar.[9] Pacific Gas and Electric Company (PG&E) believes that a hybrid approach will cause confusion in the marketplace and that a single pure performance-based incentive should be offered. Additionally, PG&E recommends that an auction be used to set the incentive level and that periodic auctions be conducted as part of the $10 million set aside for the pilot program.[10] Kyocera suggested that the Energy Commission should use a bidding approach and let the market decide what the performance incentive payment should be.[11]

The Committee has determined that a single program focused on providing incentives based on actual system performance is the appropriate approach for the Pilot PBI Program. The multiple-pilot approach would cause confusion with possible participants and others in the industry and would be complex to administer. Determination on which projects would receive performance incentives is also unclear, and the $10 million for the pilot is insufficient to support multiple pilot programs. Finally, the Energy Commission lacks adequate resources to develop, implement and evaluate multiple pilot programs, while also managing the standard ERP.

The Committee recognizes the value in a hybrid approach as a method to overcome the barrier of the high initial cost of a PV system. The hybrid approach~~,~~is similar to the current rebate programs except that a portion of the payment would be tied to actual system performance.~~, is weighted heavily on a capacity-based incentive and is weak on the performance component.~~ A hybrid approach may be promising, but because it is based in part on system capacity, it limits the degree to which a performance incentive is factored into customers' purchase decisions. A hybrid program would be difficult to evaluate ~~and~~ since it would not provide a true picture of a performance approach. For these reasons, the Committee does not support using this method for the pilot PBI Program. By conducting and evaluating a true performance-based incentive pilot program, the Energy Commission will gain information to help determine the best incentive approach to build a sustainable market for PV.

## Incentives

### Single vs. Multiple Incentive Levels

Decision
A single incentive level will be offered to all customer classes.

Discussion and Rationale
Economic factors and the attractiveness of performance-based incentives differ among various customer classes. Setting performance incentive levels for each possible participant would be quite problematic and would depend on whether the incentive is taxable, how tax credits and depreciation are calculated, and whether the purchase is made with cash or a loan. As shown in the table below, for a residential customer, the performance-based incentive ranges from $0.67 per kWh to $0.87 per kWh, depending on economic factors affecting the customer. For a commercial customer, the performance-based incentive ranges from $0.32 per kWh to $0.73 per kWh depending on taxability and how the incentive impacts the cost basis on which tax credits and depreciation are calculated.

Multiple incentive levels for the performance-based program will add complexity to the pilot program. For example, it may be difficult to identify and verify the proper customer class type and incentive level for each applicant, and payment calculations would be more complicated. Evaluation of the pilot program will also be difficult with multiple incentive levels and obtaining meaningful results may be problematic. There are other incentives available to customers who, based on their situation, do not find the economics of this pilot program attractive.

A single incentive level for the performance pilot is the simplest approach. Evaluation of the program will allow comparison of the customers that participate in the performance-based pilot relative to the existing capacity-based incentive programs.

PG&E asked that assumptions be made clear for how renewable energy credits (RECs) would be treated in the Pilot PBI Program.[12] When the issues concerning RECs are settled, the Energy Commission will make any necessary adjustments to the program.

**Incentive Level**

Decision

The performance incentive payment will be $0.~~35~~50 per kWh.

Discussion and Rationale

In the Draft Pilot PBI Program, the staff proposed that the incentive payment be set at $0.25 per kWh paid annually over a 5 year period. Cal SEIA[13] and Bonneville Environmental Foundation[14] believe that this incentive payment would not equal the $2.80 per watt rebate level scheduled for the January – July 2005 period, but would amount to a $1.80 per watt rebate. For a performance incentive to be equal to $2.80 per watt, the performance payment should be $0.35 per kWh. Other parties that provided comments, including Powerlight,[15] Spectrum Energy,[16] and Sun Power,[17] said that the incentive payment in the staff draft proposal would be too low. Clean Power Research, using a policy analysis tool, found that the performance incentive equal to the $2.80 per watt rebate ranged from $0.38 per kWh to $0.12 per kWh[18].

At the December 1, 2004 workshop, the Committee heard from stakeholders that the proposed incentive level of $0.35 per kWh over three years was not adequate and that the incentive level should be raised or the payments made over a longer period of time.[19] Based on oral and written stakeholder comments, the Committee raised the performance payment for the pilot program to $0.50 per kWh while leaving the three-year payment period in place.

The performance-based incentive needed to match the rebate level varies by the type of customer and whether the incentive is taxed, as well as tax credits and depreciation. The following tables show the different performance-based incentives along with the cost to the state by case and scenario. The analysis was performed for both a residential and commercial customer purchasing the PV system with both cash and a loan. The two scenarios examined for each case include:

- **Scenario A:** as in the original staff analysis, assumes tax credits and depreciation are paid on the full cost of the system and that the performance-based incentive is taxed separately.

- **Scenario B:** assumes tax credits and depreciation are taken after the net present value (NPV) of performance-based incentives has been deducted, and that the performance-based incentive is not taxed.

**Commercial Customer 10 kW PV System**[20]
$2.80 Rebate = $28,000

| | Commercial Loan A | Commercial Loan B | Commercial Cash A | Commercial Cash B |
|---|---|---|---|---|
| **PBI 3 yr** | 32 ¢/kWh | 41 ¢/kWh | 58 ¢/kWh | 73 ¢/kWh |
| **Total Payments 3 yr** | $18,000 | $20,000 | $24,000 | $37,000 |

**Residential Customer 3 kW PV System**[21]
$2.80 Rebate = $8,400

| | Residential Loan A | Residential Loan B | Residential Cash A | Residential Cash B |
|---|---|---|---|---|
| **PBI 3 yr** | 71 ¢/kWh | 54 ¢/kWh | 87 ¢/kWh | 67 ¢/kWh |
| **Total Payments 3 yr** | $10,000 | $8,000 | $11,000 | $10,000 |

Performance based incentives for both residential and commercial customers under the loan scenario are always lower than what is required under the cash scenario. The most cost-effective incentive is the Commercial Loan Scenario A option. Under this option, a performance payment of $0.32 per kWh would be needed to equal a $2.80/watt rebate and would result in total incentive payments of $18,000. Under Commercial Loan Scenario B, a performance payment of $0.41 per kWh would be needed to equal a $2.80/watt rebate and would result in incentive payments totaling $20,000. The cash scenarios for the commercial customer result in performance incentives of $0.58 per kWh to $0.73 per kWh for parity with a $2.80/watt rebate.

A rebate is the most cost effective policy option for a residential customer purchasing a PV system in cash. The total payments range from $10,000 to $11,000 with performance incentives, relative to a rebate totaling $8,400. This is due to lower discount rates for residential customers and the lack of a federal tax deduction or depreciation. For Residential Loan Scenario A and Scenario B, performance payments of $0.71 per kWh and $0.54 per kWh, respectively, are required to equal a $2.80/watt rebate.

To be effective and cost efficient, the pilot PBI Program should be designed to pay the minimum level of performance incentive while still achieving active program participation. The performance incentive level has been established to maximize the effectiveness of ratepayer funds. A performance incentive of $0.50~~35~~ per kWh for the pilot program is higher than the incentive required to equal $2.80/watt for both commercial loan scenarios.

The Energy Commission has the ability to raise the performance payment to a higher level if it determines that adequate participation in the pilot program does not occur, because the incentive level is set too low. The Energy Commission will monitor participation in the pilot program and make a determination on the adequacy of the performance payment within six months of initiating the pilot program.

### Corporate Parent Incentive Limit

Decision
The maximum level of funding available to any corporate or government parent is capped at $1,000,000 over the duration of the pilot program.

Discussion and Rationale
To avoid a situation where only a handful of customers with similar system configurations would exhaust the limited funds, PG&E recommended that customer participation limits be placed on the pilot program.[22] Similarly, the SGIP placed a 1-megawatt (MW) parent cap in one calendar year and a 4-MW parent cap over the four-year duration of its program. The Committee believes it is reasonable to place limits on the funding available for corporate and government parents in order to encourage the installation of a variety of system configurations, and thereby expand the sample size of data available for evaluation under the pilot program.

## Eligibility

### Technology

Decision
The Pilot PBI Program is open only to PV technology that meets the eligibility requirements specified in the Emerging Renewables Program Guidebook.

Discussion and Rationale
Bergey Windpower Company requested that small wind systems be included in the Pilot PBI Program.[23] In keeping with the simplest design, the Committee has limited the pilot program to PV systems only. Over 95 percent of the projects receiving funding from the Emerging Renewables Program are PV systems. The intent of the pilot program is to test the performance approach and help inform the design of future incentive programs for emerging technologies. Should the performance approach prove to be the best method for future long-term incentive programs, it is possible that small wind will be an eligible technology.

### System Size

Decision
No minimum or maximum system size limits will be established; however, funding will be capped at $400,000 per project (see “Reserved Funds” for a discussion of the funding cap).

Discussion and Rationale
In the September 16, 2004, draft Pilot PBI Program Proposal, the staff recommended that a 200 kW maximum size limit be established. Fronius, USA, suggested reducing the maximum project size from 200 kW to 75 kW to allow three times more installations

and a larger sample size for the pilot.[24] PG&E commented that the upper limit of 200 kW is reasonable, but questioned how the data acquisition system might impact customers of small systems.[25] The Committee decided that the best approach to test the market is not to limit system size.

### Customer Class

Decision
The Pilot PBI Program is open to all customer classes.

Discussion and Rationale
The economics of performance-based incentives differ by customer type and these factors make a PBI Program an attractive option for only those customers who can take advantage of tax benefits. Although the pilot PBI Program is available to residential customers, the Committee does not anticipate their participation while up-front rebates are available.

The commercial sector is expected to benefit most with a performance-based incentive because of the tax credits and accelerated depreciation that is available to this customer class. Unlike the commercial sector, the residential customer requires a higher performance incentive to purchase a PV system – due to lower discount rates and the lack of a federal tax deduction or depreciation.

As shown in the tables in the Incentives section above, costs differ by customer class, economic and tax factors. By comparing the NPV costs across the scenarios, cost effectiveness can be determined. Typically, performance-based incentives are more cost-effective for commercial customers purchasing a PV system. For residential customers, generally rebates are more cost-effective than a performance incentive.

## Reservations

### Reserved Funds

Decision
The Energy Commission will use a methodology based on the rated capacity of the PV array using a 25 percent capacity factor to determine the amount of funds it reserves for each applicant (see calculation below). However, the maximum amount of funding reserved for any project will be $400,000.

**Reserved Funds = (PV Array kW)$_{PTC}$[26] x (8760 hrs/year x .25 kWh/kW) x $0.~~35~~50/kWh x 3 years**

Discussion and Rationale
The Committee agrees with the comment made by PG&E that limits be placed on customer participation so that the majority of funds are not taken up by a small number of customers. Since the pilot PBI program focuses on generation, the Committee

decided to place a cap on funds rather than system capacity. A funding limit allows the applicant more flexibility in system size.

The 25 percent capacity factor is intentionally high to ensure that sufficient funds are reserved for each applicant. It is unlikely that a system can produce more energy than is estimated based on the above calculation. However, even if a system is shown to produce more energy, it will not be provided additional funds.

**Reservation Period**

Decision:
The reservation period under the pilot program is in two parts – a 12-month Preliminary Reservation period, during which the system is purchased and installed, and a three-year Final Reservation period, during which the applicant may submit quarterly invoices for payment.~~to purchase and install a PV system is 12 months, with three years for payments.~~

Discussion and Rationale:
The Emerging Renewables Program's standard reservation period is six months. The Committee set the Pilot PBI Program reservation period at 12 months to allow larger projects to be installed and to remove a variable to allow comparison with the SGIP, which also provides for a 12 month reservation period.

## Payments

**Payment Period**

Decision
Performance payments will be paid over a three-year period.

Discussion and Rationale
The preferred payment period for a long-term performance-based incentive program is generally 10 years or more. A longer payment period provides more assurance that other ratepayers benefit from the incentives. In Germany, for example, incentive payments are made over a 20-year period. However, a 20-year or even a 10-year payment period is too lengthy for a pilot program. A shorter payment period still provides value in learning about issues related to a performance program, while reducing the risk to customers by making payments in a relatively short period of time.

The Committee considered making performance payments over a one-, three- or five-year period. The simplest approach is to make a single performance payment after one full year of system operation. However, this option may result in underpayment due to unusual weather conditions or problems with the PV or metering system in the first year, and provides little difference from up-front rebates. Either a three- or five-year payment period appears to be appropriate for the pilot program. A five-year payment period was

suggested in the Staff Draft Proposal and the September 27, 2004, staff workshop. Comments on a hybrid approach which combines a capacity-based incentive along with a performance-based incentive also suggested that the performance payment period should be one year.

The shorter three-year performance period for incentives results in a small reduction in policy and administrative costs to the state, relative to a five-year performance period. In the interest of simplifying and shortening the time for the pilot program, a three-year payment period is appropriate.

**Frequency of Payments**

Decision
Performance payments will be made quarterly for 12 uninterrupted and consecutive quarters.

Discussion and Rationale
The Committee examined options for making performance payments monthly, quarterly or annually. In the Committee's opinion, annual payments will be too infrequent, while monthly payments will be too administratively burdensome. Ideally, payments should be made on actual energy performance on a quarterly basis, with actual energy usage reported by month to coincide with the utilities' regular process of billing for actual energy usage on a monthly basis. Actual energy production may be reported to the Energy Commission either monthly or quarterly, but the Energy Commission will only issue payments on a quarterly basis.

**Payment Process**

Decision:
The Energy Commission ~~will~~ has created a new Payment Request Form (CEC 1038 R9~~8~~) that an applicant must submit, along with the standard required supporting documentation, to initiate the payment process after the PV system becomes fully operational. Thereafter, payments will be initiated by the Energy Commission on a ~~monthly~~ quarterly basis, four to eight weeks after each data ~~collection~~ reporting period, and after the energy produced by the system is verified.

Discussion and Rationale
The R~~8~~9 form documents that the system was installed within the PBI reservation period, identifies system specifications, and provides information to verify the first meter read and start date. The form also provides information needed for collecting energy production data and making incentive payments.

~~If data is collected by utilities, a monthly payment period aligns with the utilities' data collection process already in place, which would streamline the payment process.~~

**Loans/Financing**

Decision
The Energy Commission will not offer financing in support of the PBI program, but will instead rely on the market to provide financing options.

Discussion and Rationale
Several parties who commented on the PBI proposal claimed that difficulty securing financing would be a barrier to a performance-based approach to incentives. For example, Sun Power commented that the PBI proposal was at odds with the financing markets.[27] Other parties recommended that the Energy Commission work to reduce this perceived barrier by providing a low-interest loan program, as suggested by Cal SEIA[28], or by guaranteeing inexpensive and long-term financing, as suggested by Powerlight[29]

The Committee explored whether it would be difficult or more costly for customers to borrow additional money to cover the larger up-front costs for a PBI program as compared to the up-front rebate program. In addition, it considered whether there would be a higher risk for lenders if customers received smaller payments over several years, even if the net present value was the same as for the up-front rebate.

In discussions with financial experts, the Committee has learned that there is a general misconception in the PV industry that lenders consider the value of the PV system, the customer's tax credit status, the future PBI payments, potential energy savings, and other income streams. This is perceived as a barrier, because parties who provided comments believe that many lenders are unfamiliar with the technology, the tax benefits, and other savings that could affect a customer's ability to repay a loan. On the contrary, most lenders look only at customers' current financial status, including their equity or down payment, when considering the feasibility of a loan. The Committee believes that customers should seek traditional loans on PV systems as they would any other purchase or investment. Furthermore, the Energy Commission continues to provide information to consumers about lenders familiar with offering loans for PV systems. (Please visit [consumerenergycenter.org] for these and other consumer education fact sheets.)

There are a few state loan programs that consider a customer's ability to repay a loan based on potential energy savings; however, these loan types represent a small segment of loan options. Such programs include the State Assistance Fund For Enterprise, Business And Industrial Development Corporation (Safe-Bidco) and the Energy Commission's Energy Efficiency Financing programs, as they determine the value of the loan or loan guarantee. However, most of the entities eligible for those loan programs (schools, hospitals, local governments) are not expected to participate in the PBI program for economic reasons, because they cannot take advantage of tax credits. Along with non-profit entities, some California small businesses may qualify for loans from the Safe Bidco program.

With the standard up-front rebate, retailers often 'finance' systems in effect by reducing the system purchase price to the customer, and taking receipt of the rebate after the

system is installed and operational. Likewise, some manufacturers 'finance' their contractors by allowing them to pay for the systems after the rebates are issued. The Committee expects the industry to continue offering similar financing to their customers who are participating in the PBI program. Because financing opportunities do exist to reduce the up-front costs for customers participating in the PBI program, the Committee expects the market to identify existing financing options and create new schemes that will be most advantageous for PBI program participants.

The concept of a performance guarantee often arises when discussing a performance-based incentive. Two ways that a PBI program differs from an up-front rebate program include: 1) payments are made over time, and 2) the system may under-perform, which would affect payments. The Committee expects the industry to offer some types of performance guarantees, perhaps assured by an escrow account or some other measure for the customer and the manufacturer/retailer to share the inherent risks of payment for performance. The Committee expects these risks to put pressure on optimizing system performance both from the industry's perspective based on technology and installation, and the customer's perspective based on operation and maintenance.

## Performance Verification and Reporting

### Metering

Decision
A revenue-quality meter is required for participation in the Performance-Based Incentive Pilot Program.

Discussion and Rationale
According to the Massachusetts Technology Collaborative (MTC), revenue quality meters are the standard for accuracy and timely reporting of energy production.[30] Other programs, including the Pennsylvania Sustainable Development Fund, and the San Diego Regional Energy Office, require a revenue-quality meter for program participation. Several entities including PowerLight, and SunPower, incorporate a revenue quality meter as part of their PV system installation. Furthermore, the SGIP found that a significant portion of energy production data was not captured when the PV systems it monitored used an interval-meter.

The cost for a dedicated revenue-quality meter measuring electricity production (kWh) from a PV system is not major – even for a residential customer. The cost for a new revenue-quality digital meter ranges from $500 to $1,000, and a refurbished digital meter is priced around $50.

**Data Acquisition and Reporting**

Decision

Performance data collection and reporting by a third party is the responsibility of the customer participating in the pilot program. The participant may choose to report PV system performance in one of two ways:

- Web-based reporting of system performance.
- Electric utilities read and report system performance data to the Energy Commission.

Discussion and Rationale

Bonneville Environmental Foundation supports a remote meter reading method for data collection and reporting.[31] They believe that it provides a cost-effective approach for data collection and reporting for commercial customers, however are too costly for small-scale PV systems. Clean Power Markets recommends that a web-based data acquisition system be used to track system performance.[32] Typically, web-based systems are accurate to ± 5 percent. Web-based systems provide the customer with real-time electricity production and usage information, which can result in energy conservation and peak shaving potential.

Web-based metering is a centralized data management tool often provided by a third-party, which provides independent, real-time monitoring of energy generation from a customer's PV system. Information from a data logger or digital meter is transmitted through a phone line system modem, wireless modem or internet connection to a data collection and management system. Access to data is provided to both the customer and others using a website or other vehicle, and access can be accomplished remotely. The Committee notes that at least three such web-based management tools are currently available to customers.

Electric utilities collect metered data and bill their customers on a monthly basis. Several electricity providers may be amenable to reading and reporting performance data output to the Energy Commission.

The applicant must submit an invoice form (R10) to the Energy Commission along with supporting documentation from the applicant's electric utility or third party monitoring system administrator verifying the monthly and quarterly generation. ~~Energy Commission will establish a communication protocol and format for data reporting for both the web-based reporting system and the utility reporting option. In both cases, t~~The pilot program participant is responsible for ensuring that system performance data is communicated to the Energy Commission.

## Program Evaluation

Decision:
As previously noted, the Energy Commission will monitor participation in the pilot program and make a determination on the adequacy of the program design and incentive level. After one year, the Energy Commission will evaluate the pilot program to determine if the objectives outlined for the performance-based pilot have been met.

Discussion and Rationale
At the September 27, 2004, staff workshop and in its written comments, PowerLight suggested that success metrics be established for the pilot program. Additionally, Powerlight commented that the evaluation criteria and process for evaluation be presented to the public prior to implementation of the pilot program.[33]

To evaluate the Pilot PBI Program, the Energy Commission will determine if the program met its objectives by asking the following questions:

- What customer classes participated in the program and why did they choose a PBI over a standard up-front rebate?
- How does the actual performance of PV systems participating in the Pilot PBI Program compare with PV systems installed with an up-front rebate? Did the Pilot PBI Program attract high-quality systems that are ideally installed and optimally maintained?
- Did the Pilot PBI Program extend ratepayer funds and deliver more benefits for California ratepayers by supporting more PV generation than standard rebates?

As a condition of receiving incentive payments, applicants must agree to participate in an evaluation process whereby the Energy Commission or its representative may conduct telephone interviews and/or on-site visits, and analyze data collected from installed system monitoring equipment.

# Endnotes

[1] Cal SEIA / Bonneville Environmental Foundation, "Performance-Based Incentives: The Principle," Presentation made to the California Energy Commission, Spring, 2004.
Thomas Hoff / Robert Margolis, Clean Power Research, LLC. Draft "Economic Benefits of Performance-based Incentives," June 9, 2004.
Thomas Starrs, Bonneville Environmental Foundation. "Designing a Performance-Based Incentive for Photovoltaic Markets," Presented at the American Solar Energy Society's Solar 2004 Conference.
[2] Staff Draft Pilot PBI Program Proposal, dated September 16, 2004.
[3] Measured Performance of California Buydown Program, Residential PV Systems, Regional Economic Research, Inc., August 2002.
[4] Onsite Verification Report, Regional Economic Research, June 2002.
[5] CPUC Self-Generation Incentive Program, Third-Year Impacts Assessment Report, Prepared by Itron, October 2004.
[6] Comments made at September 27, 2004 Staff workshop and submitted to Docket No. 02-REN-1038 on September 27, 2004 from Jan McFarland, Cal SEIA.
[7] Comments submitted to Tony Brasil via e-mail on September 28, 2004 from Brian Farhi, Fronius USA, LLC.
[8] Comments made at September 27, 2004 Staff Workshop and submitted to Docket No. 02-REN-1038 from Kari Smith, Powerlight.
[9] Comments made at September 27, 2004 Staff Workshop by Arthur Ruden, Sharp Solar.
[10] Comments submitted to Docket No. 02-REN-1038 on October 1, 2004.
[11] Comments made at September 27, 2004 Staff Workshop by Tom Dyer, Kyocera.
[12] Comments submitted to Docket No. 02-REN-1038 on September 27, 2004 from Pacific Gas and Electric Co.
[13] Comments made at September 27, 2004 Staff workshop and submitted to Docket No. 02-REN-1038 on September 27, 2004 from Jan McFarland, CalSEIA.
[14] Comments submitted to Docket No. 02-REN-1038 on September 27, 2004 from Tom Starrs, Bonneville Environmental Foundation.
[15] Comments made at September 27, 2004 Staff Workshop and submitted to Docket No. 02-REN-1038 from Kari Smith, Powerlight.
[16] Comments made at September 27, 2004 Staff Workshop by Don Osborn, Spectrum Energy. Commented that the PBI rate of $0.25 does not take into account the loan cost.
[17] Comments made at September 27, 2004 Staff Workshop by Todd Lindstrom, Sun Power. Commented that staff's proposed program will not work with financial markets.
[18] Comments made at the September 27, 2004 Staff Workshop by Tom Hoff, Clean Power Research, LLC.
[19] Comments made at December 1, 2004, Committee Workshop by PowerLight stated that the proposed incentive results in a negative NPV and that $1.00 per kWh is needed to entice commercial customers to the PBI pilot.
Comments made at December 1, 2004, Committee Workshop by Tom Starrs stated that the proposed incentive is only 44 percent of the current rebate and that payments should be made over a longer time frame if the payment remains at $0.35 per kWh.
Comments made at December 1, 2004, Committee Workshop by Sun Power Geothermal stated that for parity with the $2.80 per watt rebate, the performance payment needs to be $0.40 per kWh for five years.
Comments made at December 1, 2004, Committee Workshop by Golden Sierra Power stated that a $0.55 to $0.60 per kWh is needed to equal a $2.80 per watt rebate.
Comments submitted by VillagePower to Docket No. 02-REN-1038 on December 2, 2004, suggested that the incentive be $0.60 per kWh for three years or $0.45 per kWh for five years.
[20] Assumptions for Commercial Customer – PV cost at $8.00/watt, projects useful life of 25 years, annual production of 1500 kWh/kW with no degradation over time, electricity valued at $0.20/kWh, federal tax rate of 34%, state tax rate of 6.6%, depreciation based on MACRS accelerated depreciation. (MACRS

are modified ACRS, which are depreciation methods applied to limited partnership assets placed in service in 1986 or before.) For loan purchases – 15 year loan term at 7% interest. For NPV calculations, discount rate of 10% and state taxes deducted from federal taxes. Analysis assumes a for-profit company that can benefit from all tax credits.

[21] Assumptions for Residential Customer - PV cost at $8.00/watt, projects useful life of 25 years, annual production of 1500 kWh/kW with no degradation over time, electricity valued at $0.20/kWh, federal tax rate of 28%, state tax rate of 6.5%. No depreciation for tax purposes, state tax credit available but no federal ITC. For loan purchases- a 30 year loan at 7% interest rate. For NPV calculations, discount rate of 7% and state taxes deductible from federal taxes.

[22] Comments submitted to Docket No. 02-REN-1038 on September 27, 2004 from Pacific Gas and Electric Co.

[23] Comments submitted to Docket No. 02-REN-1038 on September 28, 2004 from Michael Bergey, Bergey Windpower Co.

[24] Comments submitted to Tony Brasil via e-mail on September 28, 2004 from Brian Farhi, Fronius USA, LLC.

[25] Comments submitted to Docket No. 02-REN-1038 on September 27, 2004 from Pacific Gas and Electric Co.

[26] The PTC rating is based on PV USA test conditions and includes the efficiency rating of both the PV modules and system inverter (represents 1,000 watts/meter$^2$ solar irradiance, 1.5 Air Mass, and 20 degrees C. ambient temperature at 10 meters above ground level and wind speed of 1 meter/second).

[27] Comments made at September 27, 2004 staff workshop by Todd Lindstrom, Sun Power.

[28] Comments made at September 27, 2004 Staff workshop and submitted to Docket No. 02-REN-1038 on September 27, 2004 from Jan McFarland, CalSEIA.

[29] Comments made at September 27, 2004 Staff Workshop and submitted to Docket No. 02-REN-1038 from Kari Smith, Powerlight.

[30] Metering Requirement for the MTC Production Tracking System (PTS): Version 3, March 24, 2004, p.4.

[31] Comments submitted to Docket No. 02-REN-1038 on September 27, 2004 from Tom Starrs, Bonneville Environmental Foundation.

[32] Comments submitted to Docket No. 02-REN-1038 on October 1, 2004 from Jan Pepper, Clean Power Markets, Inc.

[33] Comments made at September 27, 2004 Staff Workshop and submitted to Docket No. 02-REN-1038 from Kari Smith, Powerlight.