STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

Implementation of Restructuring Legislation (Chapter 854, Statutes of 1996, AB 1890): Renewables	)))	Docket No. 96-REN-1890

Transition to Sustainable Markets:
A Consensus Proposal to Allocate AB 1890 Funds for Emerging Renewable Photovoltaic Technology

Respectfully Submitted by

California Photovoltaics for Utilities Collaborative (CAL PV4U)
California Solar Energy Industries Association (CAL SEIA)
Solar Energy Industries Association (SEIA)
Sacramento Municipal Utility District (SMUD)

To
Renewables Program Committee

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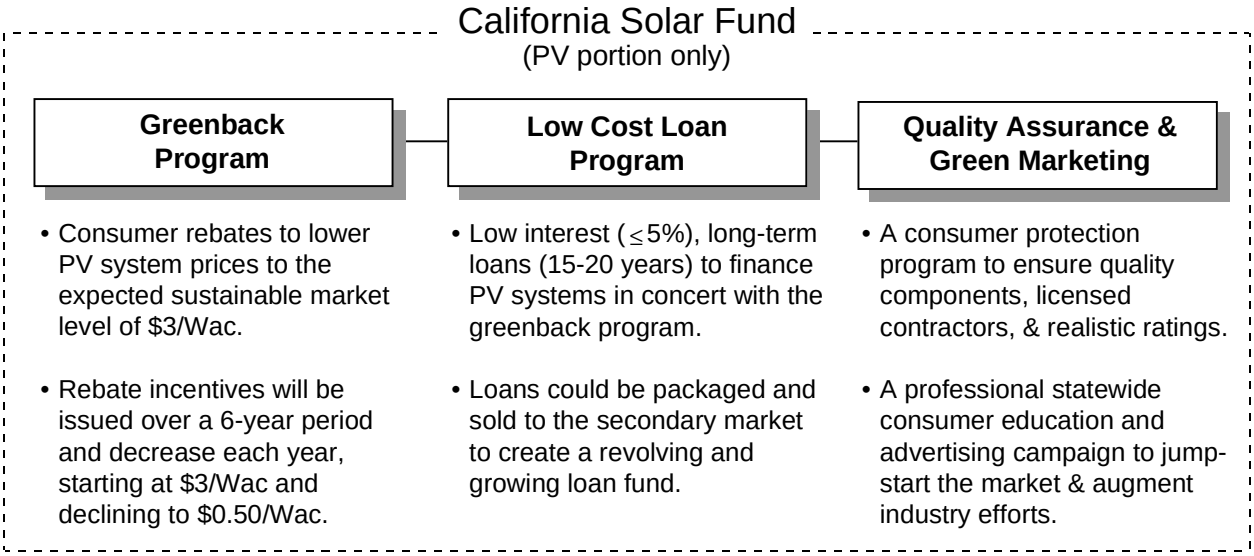
Introduction

This proposal reflects the intent of Article 7 of California Assembly Bill 1890 to foster the development and commercialization of emerging renewable photovoltaic (PV) technology by utilizing allocated funds to transition grid-connected PV to self-sustaining markets without further subsidy. We respectfully submit a cohesive set of recommendations for consideration by the Renewables Program Committee. The recommendations herein reflect a consensus agreement by members of the California PhotoVoltaics for Utilities Collaborative, California Solar Energy Industries Association, the Solar Energy Industries Association, and the Sacramento Municipal Utility District.

We believe that each emerging renewable technology has a different set of requirements to make a successful transition to sustainable markets. This is driven in part by their respective place on the technology development curve as well as the technology application (e.g., large central station versus small rooftop). It is therefore proposed that a "California Solar Fund" be created to manage and implement a portfolio of market-based incentives and financing mechanisms designed specifically for grid-connected PV, emphasizing distributed customer-sited applications.

We believe the Solar Fund could include incentives and mechanisms for other solar technologies with a different pool of funding, however, our proposal provides specific information for PV technology only. Further, we encourage other emerging renewable technologies to similarly develop and propose a commercialization strategy that will stimulate the in-state market for that technology in ways that lower system cost, increase in-state manufacturing levels, and establish a self-sustaining market at the end of the AB 1890 Renewables Public Goods Program period.

We propose that $96 million of the minimum 40% allocation for new and emerging renewables funds be allocated for PV development over the 4-year collection period and expended over a 6-year base program period to establish a 50-MW PV commercialization program. It is recommended the funds be expended under the following major components of that program.



Rationale for Funding Emerging Grid-Connected Photovoltaics

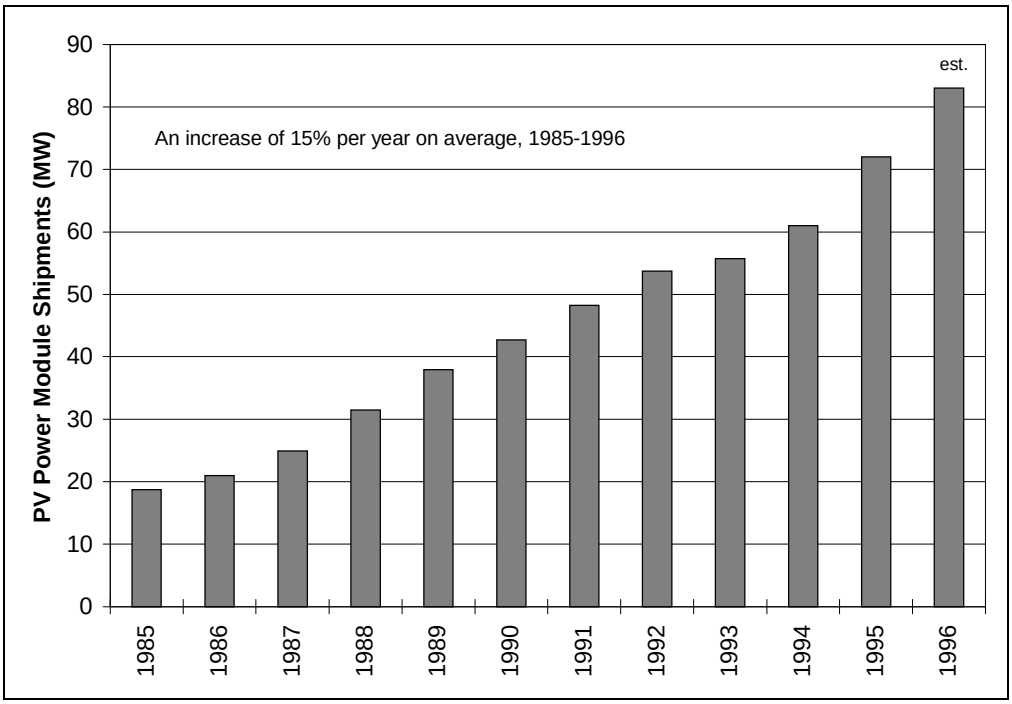
PV is a mature emerging technology and enjoys:

- Diverse cost-effective international and domestic markets. These markets are worth over $1.3 billion annually (as of 1996), primarily in off-grid and consumer products. Figure 1 presents total annual PV module shipments over the last 12 years.[1] Sales have grown steadily at an average annual rate of 15%. Commensurate with the steady demand for PV modules, PV cell production and module assembly capacity has expanded at roughly the same rate and assembly capacity currently stands at about 125 MW.[2]

- A strong industry infrastructure, particularly in California. California is the world PV leader with a 25% share of worldwide manufacturing and distribution capacity from companies like BP, Kyocera, Siemens, Solec, United Solar, and dozens of other California PV-related companies of all sizes (see Figure 2). The point is that the existing California PV industry infrastructure can rapidly respond to the AB1890 market opportunity;

- Proven technical readiness. While the primary U.S. market has been off-grid and consumer products, there are hundreds of grid-connected PV systems in operation today. Most of the existing U.S. grid-connected capacity is in California and has established a track record of reliable operation; and

- Status as one of the highest value renewable technologies. The many benefits of PV are well-documented, including 100% emissions-free power, access to the largest California renewable resource measured in GW of potential, power output that coincides with peak demand, the ability to capture distributed benefits, and proven public support.



[1] R. Johnson, Strategies Unlimited, *PV Industry Overview, Domestic & International*, UPVG Utility PV Experience Conference, Lakewood, CO, October 1996
[2] Ibid.

Figure 1. PV power module shipments, 1985-1996.

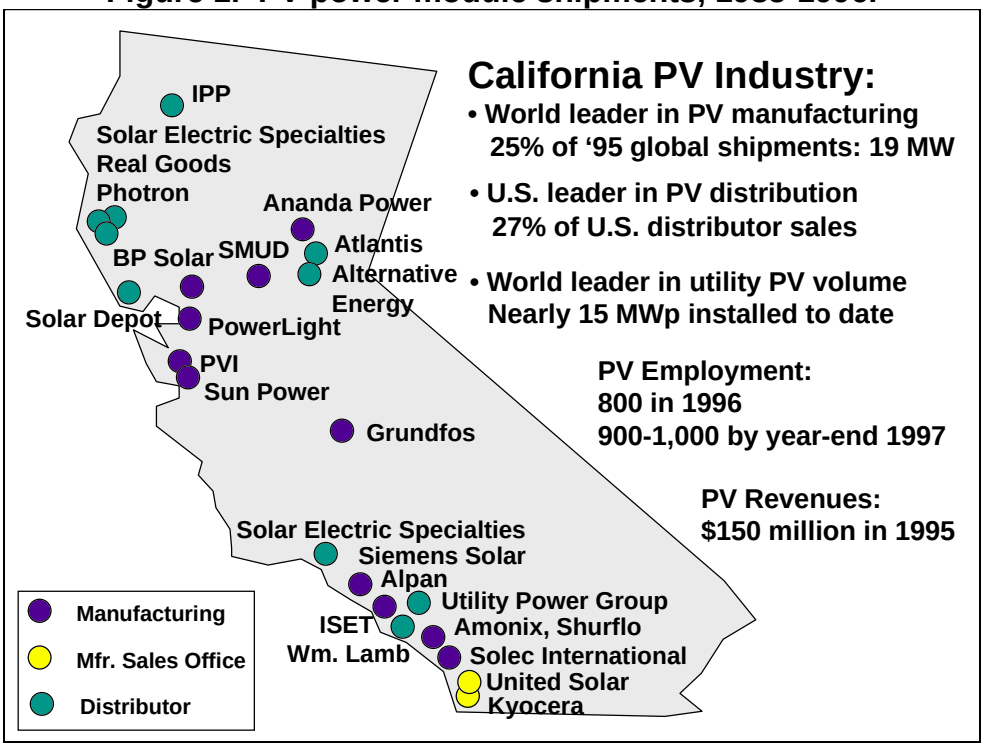


Figure 2. California PV industry overview & selected companies.[3]

There are two fundamental barriers, however, to the widespread introduction of PV in grid-connected markets. *High capital cost and lack of low-cost, long-term financing*. Although PV has marched down the cost curve, PV costs in 1996 need to be cut in half to enter high volume grid-connected applications.

Figure 3 shows historical (actual) price and projected grid-connected PV system prices, in real 1996$. PV prices have declined at a real exponential rate of 9%/year. Today, PV is only one-third the price it was 12 years ago. And prices continue to fall with ever-increasing market demand, technological and manufacturing advances, and production expansion. The Sacramento Municipal Utility District has almost single-handedly demonstrated that, with their Sustained Orderly Development commercialization strategy, the PV industry can and will respond with a succession of declining prices. In fact their actions have accelerated the decline in pricing.

Even with this dramatic progress, the present price of grid-connected PV, about $6/Wac, is twice the target market price of $3/Wac. Several studies indicate that significant and sustainable markets exist at installed price levels approaching $3/Wac.[4,5,6] A study by the Utility

[3] T. Jensen, Strategies Unlimited, November, 1996.
[4] Utility PhotoVoltaic Group, Summary Report. Photovoltaics: On the Verge of Commercialization, Report of the UPVG's Phase 1 Efforts, Washington, D.C., 1994.
[5] H. Wenger, C. Herig, R. Taylor, P. Eiffert, and R. Perez, *Niche Markets for Grid-Connected Photovoltaics*, presented at the IEEE Photovoltaic Specialists Conference, Washington, D.C., May, 1996.
[6] H. Wenger, T. Hoff, and J. Pepper, Photovoltaic Economics and Markets: A Case Study of the Sacramento Municipal Utility District, Final Report, sponsored by the California Energy Commission, Sacramento Municipal Utility District, and the U.S. Department of Energy, Sacramento, CA, October, 1996.

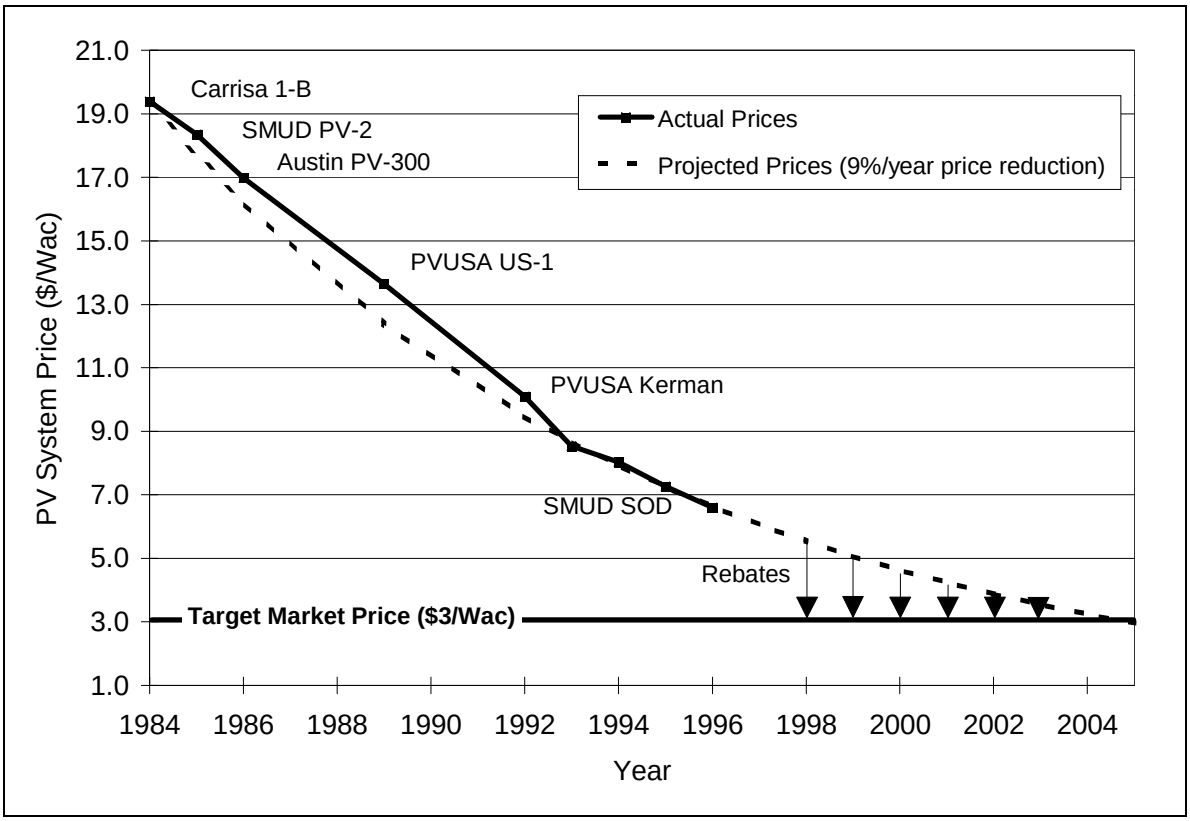


Figure 3. PV price trajectory: Rebates will accelerate reaching the target market price (1996$).

PhotoVoltaic Group, an organization of over 75 utilities, concluded that there is a potential market of over 3,000 MW of distributed and customer-sited PV applications at prices between $2.50/Wac and $4.50/Wac.[7]

This is not to say the "magic number" of PV commercialization is $3/Wac, but there is evidence that suggests significant California markets exist in this target price range. Figure 4 shows an upper bound market demand curve for residential systems in Sacramento.[8] The top curve is the market upper bound based solely on achieving the economic break-even point. It assumes that every homeowner with a roof that can accommodate a PV system (taking into account siting factors such as proper roof orientation, shading from trees, and roofing material) will purchase a system and break-even on their investment. Consideration of other factors such as green pricing premiums, early adopter purchases, or payback criteria were not considered. The lower curve assumes that of this upper bound market, about 1% of the population will purchase PV.

The result is a market potential of about 30 MW of residential rooftop PV systems at prices between $2.25-$3.75/Wac. Based on this 1% penetration estimate, the potential California residential market – which is about 25 times as large as Sacramento – is around 750 MW in the $2.25-$3.75/Wac range. The California market potential is in the multi-GW range when other distributed PV markets such as commercial customer applications are included.

[7] Utility PhotoVoltaic Group, op.cit.
[8] H. Wenger, T. Hoff and J. Pepper, op.cit.

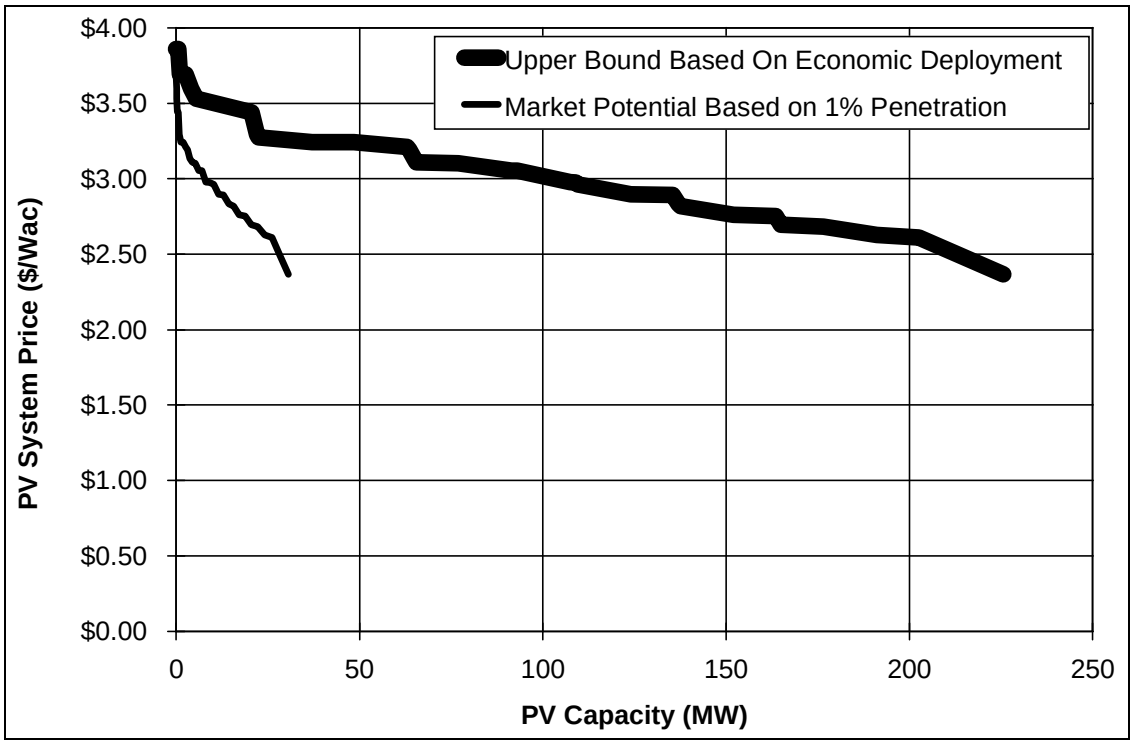


Figure 4. Residential PV market potential in Sacramento.

Recent experience has shown that consumer-based incentives can jump-start and lead to substantial grid-connected markets. In Japan, a declining subsidy coupled with low-interest financing and market education, such as we propose here, has resulted in 2, 4, and 7 MW of customer-sited grid-connected PV capacity in the past three years respectively. The Japanese government is committed to the continued subsidization of their rooftop PV program with 10,000 4-kW grid-connected rooftop systems proposed in FY 1997 (40 MW). There is a reported backlog of 20,000 homeowner applications to purchase these systems.[9]

AB 1890 Funding Allocation Via Consumer-Direct Incentives

Two primary funding mechanisms are recommended based on the rationale and experience described in the previous section. Consumer rebates administered through a "Greenback Program" and low-cost financing administered through a Loan Program. We believe that implementation of these two mechanisms at the recommended funding levels will meet the intent and spirit of AB 1890 to develop and sustain photovoltaic technology for Californians.

[9] R. Johnson, op.cit.

Greenback Program

The Greenback Program is a multi-year program of cash rebates (called "greenbacks") designed to reduce the cost of PV systems to California consumers. Current end-of-1996 volume purchases of complete rooftop PV systems are at about the $6.50/Wac level including added costs such as interconnection, metering, overhead, tax, and bonding.[10] A reasonable, turn-key project cost for PV purchases beginning in 1998, the first year of the program, is around $6.00/Wac.

Table 1 provides a recommended allocation of the greenback rebate portion of the PV Commercialization Program. It is based on taking the difference between the projected PV system price curve at each future year as delineated in Figure 3 and the target market price of $3/Wac. An initial $3/Wac rebate should permit the marketing of systems at the $3/Wac range. If the greenback rebates are established on a known, declining basis, experience in California and elsewhere has shown that the industry will respond with the necessary investment in new, lower-cost manufacturing facilities as well as streamlined and reduced installation and transaction costs so that a viable, self-sustaining market could be established.

The Greenback Program is designed to result in 50-MW of PV systems with an approximate $3/Wac end-point. Actual sales price to the customer will be determined by market conditions and competition, but the program provides the opportunity to establish what is considered a viable sustainable market. It is envisioned this program would result in over 20,000 California PV systems over approximately a 6-year period. We recommend that $66 million be allocated for the Greenback Program.

Table 1. Greenback Rebate Incentive Schedule

Total PV Eligible for Rebate (MWac)	Estimated Year of Rebate	Number of PV Systems	PV System Price without Rebate ($/Wac)	Consumer Rebate ($/Wac)	Target Market PV Price with Rebate ($/Wac)	Rebate Incentives Paid by Solar Fund ($million)
3	1998	1,226	$6.00	$3.00	$3.00	$9.00
5	1999	2,043	$5.50	$2.50	$3.00	$12.50
6	2000	2,451	$5.00	$2.00	$3.00	$12.00
8	2001	3,268	$4.50	$1.50	$3.00	$12.00
13	2002	5,311	$4.00	$1.00	$3.00	$13.00
15	2003	6,128	$3.50	$0.50	$3.00	$7.50
50		**20,425**				**$66.00**

[10] D. Osborn, D. and D. Collier, *Utility Grid-Connected Photovoltaic Distributed Power Systems*, UPVG Utility PV Experience Conference, Lakewood, CO, October 1996

Additional details of the Greenback Program need to be determined. An initial framework has been discussed, including the following points:

- The end user directly receives the benefit of the greenback rebate. The Greenback Program will be structured to ensure the customer receives the full effect of the greenback credit. Reducing the upfront PV system cost contributes to greater financing availability from lenders and lowers the customer's monthly payments.
- The greenback rebate will be processed only after the PV system is installed. Proof of installation must be established, such as a signed utility interconnect agreement and system check-off.
- The greenback dollar level is set for a predetermined number of MW. For example, a rebate of $2/Wac for 6 MWac of PV systems as shown in Table 1. The greenback dollar amount will be lowered to the next level when the total number of MW has been fully subscribed. Thus if demand is more or less than expected, the mechanism is self-adjusting. The timing schedule in Table 1 is therefore approximate.
- The Greenback Program may build in the flexibility of adjusting subsequent greenback dollar levels and MW caps. It may be determined there is a need to adjust the greenback dollar level, for example, as a function of average PV system price and the demand for greenbacks. The potential impact of allowing this flexibility requires further study.
- Greenbacks enable the CEC, or governing body such as the California Solar Fund, to monitor program activity. Information on PV prices, system location, and PV system size will be provided as part of the greenback certificate. The greenback certificate may also be a means to supply consumer protection information.
- Safeguards must be incorporated into the greenback program to prevent "gaming". Safeguards are needed to prevent allotting a disproportionate share of greenbacks to a few customers/PV suppliers and over rating of PV systems to maximize greenback rebates. PV systems will have to pass certification standards to be eligible for greenback payment, including installation by a licensed contractor, and system installation and components that meet applicable codes and standards such as the National Electric Code (NEC), certified testing agencies (such as Underwriters Laboratory), and the Institute for Electrical and Electronics Engineers (IEEE).
- Mechanisms are needed to assure the greenbacks are used in a timely manner. Greenbacks will have limited "shelf lifes", and will expire after a certain predetermined time period – such as 3 months. Therefore, allocated but unused greenback funds can be reallocated to other users promptly to maintain the overall goals of stimulating specific numbers of MW sales at specified rebate amounts.

One of the major lessons learned from the solar tax credit days of the early 1980s is the need to design the greenback program in a way that will not result in the inflation of PV system prices, but foster competition and lead to lower prices and systems that work reliably over time. Solar hot water system prices inflated to the maximum level eligible under the 1980s tax credit program since the credits were applied as a percentage of total system price. The greenback program prevents this effect in two major ways: Greenbacks are independent of the amount paid for the system, but rather are based on the system capacity; and greenback dollar levels will be

declining over the span of the PV Commercialization Program to exert downward pressure on system pricing. Other safeguards will be studied and incorporated, in cooperation with the CEC, into the Consumer Quality Assurance Program.

Low Cost Loan Program

Low-interest long-term loans for financing the direct consumer purchase of PV systems are needed to overcome capital cost barriers and lower monthly expenses to a level that is more in line with the electric bill savings the PV system will provide. The availability of up to 100% debt low-interest financing also provides purchase opportunities to a wide-range of consumers and income levels.

It is proposed that financing mechanisms be targeted for consumers of small PV systems such as homeowners and small businesses. The need and type of mechanisms for larger systems, however, should be investigated further. The bottom line is that low cost financing is key to the economic viability of capital-intensive PV installations.

Figure 5 shows, for example, the levelized cost of PV-generated electricity as a function of the loan interest rate at an installed PV system price of $3/Wac. Key assumptions are a 20% PV capacity factor (1,750 kWh/kW-year production), O&M cost of $0.01/kWh, loan term of 20 years, inflation at 3.5%, and a 30-year PV system life. A 5% interest loan yields a levelized cost of electricity of about $0.08/kWh (real$) at the target market PV system price of $3/Wac. This is competitive with anticipated retail electricity prices in the residential and commercial sectors. The importance of low-cost financing is self-evident from the results shown in Figure 5.

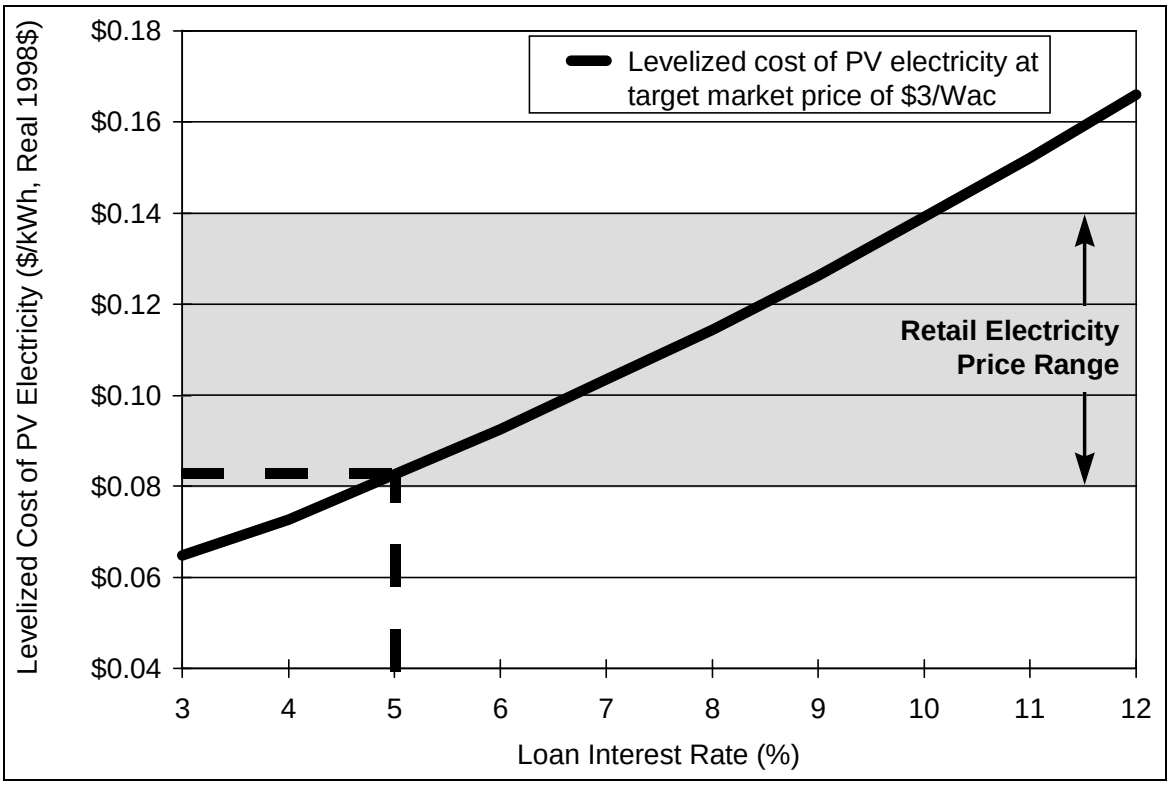


Figure 5. Rebates and low-interest loans allow PV to compete with retail rates.

We recommend that $24 million of AB 1890 funds be allocated to the Low Cost Loan Program. There are several financing mechanisms that will be pursued and require further study, including:

- Utilize new and existing finance programs to cover the cost of a PV system. For example, funds from the Loan Program could be used to pay down the interest rate on conventional and energy efficient mortgage loans such as the Edison Electric Institute's new E Seal program which includes provisions to finance PV.

  Paying down loan interest rates and the lender's risk premium will jump-start financing programs that include PV and will build a competitive financing infrastructure that will be in place at the conclusion of the Greenback Program. In this way, the seed funding from AB 1890 will used to create a lending structure that can finance *more* than the 50-MW of PV systems proposed.

- Create a secondary market for the relatively small loans made to homeowners and other small system purchasers. Multi-million dollar loans for large-scale installations can likely be accommodated presently through existing state financing agencies who can make loans in the 5%-6% range to renewable energy projects. These agencies have not been able to deal in the past, however, with small loans such as those for individual homeowners.

  When an adequate amount of such loans are made, for example $5-$10 million, the loans would be "bundled" and sold to large purchasers of bonds by having a state agency package these loans and sell them to the secondary market at low rates. If successful, this approach would result in getting the $5-$10 million back into the program quickly to be re-loaned again. This "recycling" of cash is what banks typically do when they resell their mortgages on the secondary market. This approach could potentially be recycled several times during the 6-year program resulting in a 3:1 leveraging effect and creating a revolving loan fund. For every dollar of seed funding, three dollars of new loans could be issued during the first six years.

Consumer Quality Assurance Program

We recommend that funding be allocated for an on-going consumer education and quality assurance program. This program will ensure that PV systems are built with quality components that meet applicable codes and standards, that licensed contractors are utilized, and that PV systems have accurate power ratings. Safeguards to ensure reliable and safe system operation will be implemented and are tantamount to preserving a sustainable market. We recommend that consumer education and quality assurance funds be on the order of 2% of the total funding allocation for emerging PV technology, or about $2 million.

Green Marketing

To get the word out about the advantages of PV, the available greenback rebate program, and low interest loans, it is recommended that a statewide advertising and public education campaign be funded with approximately $2 million of the AB 1890 funds. This marketing effort would serve to jump-start the PV program and augment industry efforts.

What is the California Solar Fund?

The California Solar Fund would be the organization, with full-time staff, responsible for administering and distributing the allocated funds from AB 1890 and other contributions such as from voluntary sources and municipal utilities. Issues pertaining to certification, product quality assurance, customer satisfaction, and marketing would also fall under the Solar Fund's purview.

We recommend that $2 million (not to exceed 2% of the total funds for the PV program) be allocated for the purposes of administering the Solar Fund and the consumer education and quality assurance program described above. A board or an advisory council should be established to set policy and govern the Solar Fund. We also recommend that the Solar Fund be implemented as a public-private partnership, perhaps with the California Energy Commission.

Summary

We recommend that $96 million of the minimum 40% allocation for new and emerging renewables AB 1890 funds be allocated for PV development over the 4-year collection period and expended over a 6-year base program period to establish a 50-MW grid-connected PV commercialization program. It is recommended the funds be allocated under the following major components per Table 2, with flexibility to shift funds between the major components if needed to better meet the goals of the program.

Table 2. Distributed PV Funding Allocation Summary

	Total AB 1890 Funds ($M)	Greenback Consumer Rebate Program ($M)	Low Cost Loan Program ($M)	Green Marketing ($M)	Consumer Quality Assurance & Admin. Overhead ($M)	Total Program ($M)
1998	24.00	9.00	6.0	0.75	1.00	16.75
1999	24.00	12.50	6.0	0.50	0.75	19.75
2000	24.00	12.00	6.0	0.50	0.75	19.25
2001	24.00	12.00	6.0	0.25	0.50	18.75
2002		13.00			0.50	13.5
2003		7.50			0.50	8.0
Total	**96.00**	**66.00**	**24.00**	**2.00**	**4.00**	**96.00**

APPENDIX A:
Answers to Commission Questions on Funding Allocation

1. **Define the terms used in your proposal, including but not limited to: renewable resource technology, renewable resource provider, existing, new, and emerging technologies?**

   Only emerging renewable resource technologies are referred to our proposal. We recommend adoption of the CEC staff's proposed definition of emerging technology: *"Emerging renewable (resource) technology" means photovoltaic and other renewable (resource) technologies, as periodically designated by the California Energy Resources Conservation and Development Commission (CEC) or its successor, and which has been determined by the CEC to have reached the status of an early stage of commercial readiness.*

   Photovoltaics are specifically defined in AB 1890 as an emerging renewable technology.

2. **What technologies are considered emerging? Is your designation flexible to allow on-going changes for future market and technology developments?**

   Photovoltaics (PV) is considered an emerging renewable technology.

   Yes, the definition in Question 1 allows any technology to move into, and out of, the emerging designation, as long as certain operation and reliability aspects have been addressed.

3. **Does your proposal allocate between existing, new and emerging technologies? How?**

   This proposal advocates the allocation of $96 million to PV commercialization activities, within the recommended emerging technology allocation of 25% set forth in the SEIA/CAL SEIA “umbrella” proposal.

4. **Does your proposal direct funds to consumers, suppliers, or both? If both, then how should the split between the two be determined? Does your proposal deal with CTC rebates? How?**

   The proposal directs 69% of the funds to consumers through a cash rebate program, 25% of the funds to consumers through loan financing programs, and 6% of the funds for consumer protection, green marketing, and program administration. The cash rebates are used to buy down the upfront capital cost of the consumer's PV system, and in this way the rebate benefits the consumer and the supplier. The supplier can handle the administration of the rebates in order to reduce transaction costs and administrative burden.

   The focus of this proposal is on customer-sited "self-generation" PV systems. We believe that all renewable self-generation should be exempt from CTC charges, therefore such generation is not eligible for CTC rebates. For non-customer-sited PV systems, we

recommend that CTC rebates be examined as a potential mechanism, but this is not explored in our proposal.

5. **Is money allocated by fuel resource type or technology? How? Which technologies/resources are included in your proposal? Which are not included?**

   The proposal outlines a strategy for achieving significant decreases in PV technology costs over time, leading to a sustainable market for PV technology at the end of the program period. Money is allocated by both fuel resource type (solar energy) and technology (photovoltaics), with specific programs crafted to address commercialization needs. Money should be allocated in amounts which can yield significant positive impacts in the accelerated commercialization of a technology, as compared with the progress of commercialization with no additional resource allocation.

   Our proposal recommends specific amounts of money needed to have a significant positive impact in the accelerated commercialization of a technology.

   This proposal addresses grid-connected PV technology, emphasizing distributed customer-sited applications. This proposal does not specifically address any other technology since we believe that most renewable technologies have different needs and mechanisms according to their respective position on the technology development curve and type of application, e.g., large central station vs. small customer-sited. This difference in needs is particularly true of emerging and pre-emerging renewable technologies.

6. **Are allocations fixed now, or made according to a flexible formula?**

   The allocations have been fixed up front according to major program categories. A declining consumer rebate incentive mechanism has been built-in which will exert downward pressure on prices over time. We recommend that flexibility to shift funds between programs be allowed to maximize the impact of the overall development strategy. A specific schedule is provided in our proposal.

7. **What entity (or entities) is responsible for evaluating projects and distributing funds? What entity (or entities) is responsible for distributing CTC rebate funds.**

   It is proposed that a "California Solar Fund" be created to manage and implement a portfolio of market-based incentives and financing mechanisms designed specifically for grid-connected PV, emphasizing distributed customer-sited applications.

   The California Solar Fund would be the organization, with full-time staff, responsible for administering and distributing the allocated funds from AB 1890 and other contributions such as from voluntary sources and municipal utilities. Issues pertaining to certification, product quality assurance, customer satisfaction, and marketing would also fall under the Solar Fund's purview.

A board or an advisory council should be established to set policy and govern the Solar Fund. We also recommend that the Solar Fund be implemented as a public-private partnership, perhaps with the California Energy Commission.

We believe the Solar Fund could include incentives and mechanisms for other solar technologies provided they have a different pool of funding, however, our proposal provides specific information for PV technology only.

We believe that CTC rebate funds are not applicable for customer-sited PV systems since these systems should be exempt from CTC charges. For non-customer-sited PV systems, we recommend that CTC rebates be examined as a potential mechanism, but this is not explored in our proposal.

8. **How frequently are funds awarded, distributed? What is the total time duration of distribution?**

   Funds should be awarded on an up-front, system cost buy-down basis, should be forwarded/credited to the customer as soon as possible after certification of equipment installation, and should flow through the customer to the supplier and/or manufacturer(s), if appropriate.

   It is proposed that rebates be made available over a 6-year period, ending in 2003. Loan financing programs should be in place without further input of AB 1890 funds in 2002. A funding schedule for all programs is provided in the proposal.

9. **Does your proposal include weighting factors for externalities (both positive and negative)? For economic performance of technologies/projects? If so, what weights are you proposing, and what data, calculations, and formula are you using to determine those weights? If your proposal does not include weighting factors for externalities or economic performance, why not?**

   The proposal contains no weighting factors for externalities, however significant transmission & distribution (T&D) benefits will accrue as a result of the distributed, locational attributes of each individual PV system. The economics of these attributes will be quantified when the market and/or regulation places a value on T&D, system reliability, and locational peaking power assets. These values are currently the subject of intense, ongoing debate.

   The economic performance of the PV equipment is considered and established during the process of setting the up-front rebate or buy-down value. Historical PV manufacturing and pricing data are used to establish declining up-front rebate amounts from 1998 through 2003. Establishing a declining rebate schedule has the effect of exerting downward pressure on PV equipment prices.

10. **What criteria does your proposal use to ultimately award funds to specific projects, if applicable? What are the weights for these criteria? What is the basis for your weights and criteria? Do the criteria vary for existing, new and emerging technology**

categories?

Rebate awards are based on the PV system power rating at predetermined ambient test conditions. A simple, standard methodology will be developed to determine PV system ratings. The Photovoltaics for Utility Scale Applications (PVUSA) project located in Davis, CA, which the California Energy Commission sponsors, would be a logical place to provide guidance and determine appropriate rating methods.

See the answer to question 14 regarding loan fund mechanisms.

11. How does your proposal take into account the funds collected through voluntary contributions when determining allocations? How could the two fund sources be coordinated to complement one another?

This proposal does not take into consideration any funds collected through voluntary contributions, however these funds could be used to supplement the entire AB 1890 fund pool, unless specifically earmarked for a particular technology by the contributor.

12. How does your proposal take into account the funds collected from municipal utilities? How could the two fund sources be coordinated to complement each other?

Municipal utilities will be encouraged to invest collected funds in programs similar to that outlined in this proposal, either within their own geographic area if interest is sufficient, or in other areas where local infrastructure and interest exist if so desired. Alternatively, these utilities could be encouraged to pool their resources with the larger state program. Nevertheless, customers of municipal utilities should be eligible for participation in the state program regardless of the status of participation of their municipal electricity provider.

13. How does your proposal maximize the effectiveness of the funds? (For example, does it only provide funds to projects that are not competitive now but are likely to become competitive if funding is provided over the next four years? Or, does it provide funds to projects that are already competitive? To those that are unlikely to become competitive even if funding is provided?) How do you quantify effective utilization of funds in your proposal?

This proposal maximizes the effectiveness of these funds by structuring a program designed to result in permanent prices (no subsidies) for PV products which have been reduced to, or close to, the market price for electricity by January 1, 2004. As such, it provides funds for purchasing programs to a technology which cannot compete with market priced power today, but is intended to be competitive after the six-year program is complete. (Note that these programs may employ extended financing mechanisms which serve to lengthen the effective program completion time).

Effective utilization of funds may be gauged by ascertaining the market price of PV equipment sold through the program at any point during its existence and comparing it to the

prevailing market price of electricity plus a customer preference premium for green power.

14. **How does your proposal use financing instruments to maximize the effectiveness of available funds?**

An umbrella low-cost loan program designed for end users is proposed. Several different loan mechanisms will be pursued, including:

Utilize new and existing finance programs to cover the cost of a PV system by paying down loan interest rates and the lender's risk premium. This will jump-start financing programs that include PV and will build a competitive financing infrastructure that will be in place at the conclusion of the PV Program. In this way, the seed funding from AB 1890 will used to create a lending structure that will be in place and operate autonomously at the conclusion of the program.

Create a secondary market for the relatively small loans made to homeowners and other small system purchasers. Multi-million dollar loans for large-scale installations can likely be accommodated presently through existing state financing agencies who can make loans in the 5%-6% range to renewable energy projects. These agencies have not been able to deal in the past, however, with small loans such as those for individual homeowners.

When an adequate amount of such loans are made, for example $5-$10 million, the loans would be "bundled" and sold to large purchasers of bonds by having a state agency package these loans and sell them to the secondary market at low rates. If successful, this approach would result in getting the $5-$10 million back into the program quickly to be re-loaned again. This "recycling" of cash is what banks typically do when they resell their mortgages on the secondary market. This approach could potentially be recycled several times during the 6-year program resulting in a 3:1 leveraging effect and creating a revolving loan fund. For every dollar of seed funding, three dollars of new loans could be issued during the first six years.

15. **If your proposal utilizes CTC rebates, what criteria is used to identify CTC rebate recipients? Is the CTC rebate restricted to certain customer classes?**

We believe that CTC rebate funds are not applicable for customer-sited PV systems since these systems should be exempt from CTC charges. For non-customer-sited PV systems, we recommend that CTC rebates or customer credits be examined as a potential mechanism, but this is not explored in our proposal.

16. **Identify and account for government incentives (e.g., federal tax credits) in your proposal.**

The 10% Federal Income Tax Credit (ITC) and 5-year MACRS depreciation incentives apply to commercial projects utilizing PV technology, and have no expiration date. No programs recommended in the proposal would reduce access to these tax incentives and thus they enhance the proposed programs as opposed to offsetting them. (Tax incentives could be reduced by the proportion of a project financed with tax exempt debt. The proposed financing programs utilizing the California Alternative Energy and Advanced Transportation

Financing Authority anticipate that the Authority would issue or authorize fully taxable debt, since recent changes in the tax code preclude it from issuing tax exempt debt for new electricity projects).

17. Explain how your proposal meets each one of the statutory purposes in Section 381 (a) and (b).

This proposal meets the statutory purposes of Section 381(b)(3) , Section 381(h), Section 383(a)(1), and Section 383(b).

APPENDIX B:
Answers to Commission Questions on Certification Criteria

1. **What qualifies a project/provider as a renewable? What is an "eligible renewable resource provider"?**

   A renewable energy project is one that meets the renewables definition proposed by CEC staff with the additional provision provided by the "umbrella" SEIA/CAL SEIA proposal regarding hybrid power plants.

   Distributed PV systems obviously qualify as renewable, however we are unclear in regards to the designation of system retailers/suppliers as "providers." The most obvious course of action would be to designate the system owner as the provider, however designating the retailer as such may provide further incentives for PV system sales activities by allowing for accumulation of renewable credits by the retailer, while the individual system owner would likely have little use for such small quantities of credits. An "eligible renewable resource provider" could simply be a retail electricity supplier that provides information regarding the content of the renewable energy source to consumers.

   The SEIA and CAL SEIA umbrella proposal supports the Union of Concerned Scientist position that AB 1890 language be changed to read: Article 7, Section 381(b)(3): "In state operation and development of existing renewable resource technologies defined as electricity produced from other than a conventional power source within the meaning of section 2805, provided that a power source utilizing more than 25 percent fossil fuel may not be included, and in-state operation and development of new and emerging renewable resource technologies defined as electricity produced from other than a conventional power source within the meaning of section 2805 provided that the fossil fuel portion of a power source may not be included."

2. **Should certification be for generation plants only, or for both generation plants and electricity marketers or aggregators? Who/what should be certified? The generation facility, the energy itself, or the power provider?**

   Both generation plants and electricity marketers or aggregators should be certified. Disclosure and proof of renewable energy production must be made at all levels. It is recommended this be done on a measured kWh basis for power generators and for marketers and providers of renewable energy from central station and larger power facilities as a means of reconciling the renewable content produced and sold.

   The generation facility and the power provider should be certified, and the energy itself should be subject to some form of "labeling" requirement so as to disclose to the end user the "content" or source of the electricity.

In regards to distributed customer-sited PV systems, the facility should be self-certified on a nameplate rating basis as discussed in the following responses.

3. **Should there be different certification requirements to receive funding (Section 385) than to have direct access (Section 365)?**

   For most cases the answer is no, since the energy production measured in kWh is ultimately what is certified, there does not appear to be a need for separate certification mechanisms for funding versus direct access. This depends, however, on the types of projects and applications. Certification for smaller customer-sited PV power systems that may be owned by consumers who wish to obtain direct access requires a simpler mechanism than tracking kWh production and consumption on a project by project basis. A self-certification process is recommended for customer-sited PV systems that would be accomplished by the completion of a rebate certificate that contains details of power system type and rating. This could be enough for receipt of funding and for obtaining direct access during the transition period.

4. **Are performance criteria appropriate for certification?**

   For most cases the answer is yes, the "content" of electricity measured in kWh. We recommend, however, that the certification process for the purposes of receiving immediate direct access consider waiver of measured renewable energy production for those consumers with customer-sited PV systems. This is to minimize administrative burden. A simple methodology based on a prediction of annual PV energy production based on the PV system power rating can be combined with historical annual consumer demand to estimate the percentage of total consumption that will be met by the PV system.

5. **What is your certification process?**

   For customer-sited PV systems, a self-certification process is recommended with oversight from the CEC or other administrative body. This process is implied in our proposal and is accomplished by the completion of a rebate certificate that contains the details of power system components and power system rating.

   There are several elements for certification and these are discussed in our proposal: (1) Ascertain that PV system components meet appropriate codes and standards; (2) Ascertain the system has been installed by qualified personnel; (3) Ascertain the system has been interconnected to the electric grid; and (4) Ascertain the power system rating. This process triggers payment of a rebate for the PV power system and also can be used as the basis for determining eligibility of direct access during the transition period (where customers can choose their generation supplier when 50% or more of the customer's energy demand is met with renewable energy). A simple methodology based on the prediction of annual PV energy production based on the PV system power rating can be combined with historical annual consumer demand to estimate the percentage of total consumption that will be met by the PV system.

6. **Who should make the certification? Should projects/providers/aggregators be allowed to self-certify? If so, what type of information should be reported for the self-certification process? What should the penalties be for falsely self-certifying?**

   For customer-sited PV systems, a self-certification process is recommended with oversight from a public-private partnership that could include the CEC. We have referred to this public-private oversight partnership in our proposal as the "California Solar Fund". Issues pertaining to certification, product quality assurance, customer satisfaction, and marketing would fall under the Solar Fund's purview.

   Self-certification could be administered by PV system suppliers to reduce administrative burden. Customer sign-off is a requirement. Information such as a listing of power system components, supplier registration number, installer license number, and power rating according to a pre-determined methodology are some of the items that will be required for self-certification. Falsely self-certifying should remove the supplier's eligibility from future program participation. Additional details on administration of certification are forthcoming.

7. **What agency should be responsible for certification? What type of oversight should there be of certification?**

   See the answer to question 6.

8. **How should monitoring and/or verification be conducted?**

   See the answers to questions 5 and 6.

9. **How often and under what circumstances must a project or provider be recertified? How should recertification be handled?**

   For customer-sited PV systems, recertification could take the form of a follow-up questionnaire on customer-satisfaction. This information could be used as a mechanism to enforce supplier eligibility for receipt of program funds. Other mechanisms for quality assurance are needed and will be investigated further.

   Systems should also be recertified following significant and/or material changes to major system components.

10. **How does your proposal deal with the responsibility for demonstrating that at least half of a customer's electrical load is supplied by a certified renewable resource provider in order to be eligible for direct access (under Section 365)?**

    See the answer to question 5. Our proposal does not explicitly make suggestions in this regard. We suggest here that, for customer-sited PV systems, the methodology outlined in our answer to question 5 be used to ascertain the contribution from PV systems. If the customer has more than 50% of their anticipated load fulfilled by the PV system, then presumably they would be eligible for direct access. Alternatively, PV customers could

become part of a pool or be aggregated with other customers who in totality receive at least 50% of their energy from renewable resources. The balance of renewable energy need to achieve at least 50% renewables would be measured by the total kWh sold to the aggregated pool of direct access customers compared with the percentage that comes from certified renewable resources.

11. What kind of tracking mechanisms would be feasible if the requirement were placed on end-use customers?

Generally speaking, we do not believe the requirement should be placed on end-use customers, other than their role in the self-certification process described in our answer to question 5. Random inspections could be employed, however, for customer-sited PV systems with violations becoming the responsibility of the owner and/or the system provider.