CPUC ENERGY DIVISION STAFF PROPOSAL FOR

CALIFORNIA SOLAR INITIATIVE

DESIGN AND ADMINISTRATION 2007-2016

Rulemaking 06-03-004 (Filed March 2, 2006)

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1. EXECUTIVE SUMMARY

Introduction

On January 12, 2006, the California Public Utilities Commission (CPUC, or the Commission) approved the California Solar Initiative (CSI), an 11-year $3.2 billion incentive program which aims to install 3000 MW of new solar systems on-site at customers of the State's investor-owned utilities (IOUs). The CPUC portion of this program will cost $2.8 billion and target 2600 MW of solar technologies. The California Energy Commission (CEC) portion of the program will focus on the CEC's responsibility for statewide energy building codes. The CEC will seek to include solar systems in new home construction, calling upon a budget of $350 million with a target of 400 MW of new solar installations.

The CPUC Energy Division staff proposal below addresses the "Phase 1" program design and implementation for the CPUC's portion of the CSI program. A "Phase 2" proposal later this year will address additional issues such as design of the most effective incentives for affordable housing, a handbook outlining administrative details, and plans for program evaluation and cost-effectiveness analysis.

Principles

This Phase 1 staff proposal is based on the following set of principles:

- The CPUC makes a 10-year commitment (2007-2016) to continuing a sustained promise of incentives for solar energy installations.
- The design of the incentive structure is intended to signal that the Commission desires to reward system output performance, and that incentives will not be focused solely on the cost of solar systems. Metering and performance feedback approaches will be required to ensure that solar system owners are informed about the adequacy of their systems' performance.
- The program seeks to encourage solar component manufactures and system integrators to make a long-term commitment to high performance, and lower cost designs for solar energy. Incentives will be reduced over time to reflect these performance gains and expected cost reductions.
- There will be regular reviews and adjustments to the incentive structure over the program's duration, to ensure that ratepayers do not over-pay for the level of solar contribution the Commission seeks.
- The program will embrace all forms of on-site solar energy technology where market economics are not currently sufficient to make these technologies cost-effective on their own.
- Information will be put in place to provide consumers with useful information about solar technology ratings, performance, and costs.

- The program will encourage customers to consider not only solar applications, but also energy efficiency measures that offer attractive economic returns and other benefits such as comfort or convenience.

Multiple Solar Technologies are Eligible

This incentive program seeks to encourage participation of "non-PV" solar technologies alongside and in competition with the performance of solar PV technologies. The following non-PV concentrating solar technologies are eligible:

- Concentrating PV
- Parabolic dish/engine
- Parabolic trough
- Power tower

Annual Budgets

The CPUC plans to spend $2.5 billion for the period 2007-2016 for this program, with an additional $300 million in 2006 to support pent-up demand from 2005. Spending levels will reflect a planned downward adjustment of the incentives needed, as technology performance improves and costs are expected to decline. The CSI program budget will commence at $350 million per year in 2007-2009, then step down in stages to $275 million per year for 2010 – 2012, followed by $175 million each year for 2013 – 2015, and finally to $100 million for 2016. There will be mechanisms for retaining some flexibility if program activity varies from year to year.

Differentiated Incentives to Reflect Whether a System Owner Qualifies for Federal Tax Benefits for Solar Investments

The federal tax credit has a dramatic effect on those taxable non-residential entities that are eligible for the 30% (uncapped) federal solar tax credit. Residential solar systems are eligible for a much smaller incentive capped at $2,000. Non-taxable entities (governments, non-profit organizations) are not eligible for any federal solar tax credit.

For this reason we propose two incentive levels -- $2.25 per watt for residential and non-taxable entities and $1.50 per watt for taxable commercial entities. In the case of performance-based incentives, these per watt incentives are then translated into effective cents per kWh payments.

We will revisit the level of incentive if federal tax incentives change.

Incentive Structure

We propose two different forms of incentive structure:

1) Expected Performance Based Buydown (EPBB) – this is an up-front capital incentive payment, paid in $ per watt, where the incentive amount is adjusted for how well designed/situated a system is relative to direction and angle of the sun. Thus this estimates in advance a site-specific expected solar output. This form of incentive is proposed primarily for smaller systems < 100 kW, supplemented by metering and output feedback requirements.

2) Performance Based Incentive (PBI) -- this form of incentives pays based on actual metered solar output, over a period of time. The effective incentive payment is made in cents per kWh, based on that year's base $/watt incentive for the EPBB incentive, and then transformed into a cent per kWh payment on the basis of a standard capacity factor. The performance payments will be paid per kWh for 5 years. There is a limited "up-side" opportunity to receive 10% higher incentive amounts for superior performing solar systems. This incentive structure is proposed for large systems > 100 kW, and certain newer solar technologies.

   If it would be helpful to avoid disruption in the market for large solar installations, we are open to making a gradual transition from the 2006 capacity-based incentive to the PBI structure. We would do this in 2007 by paying 50% of the total incentive on an EPBB capacity basis at the time of verified installation, and 50% paid in a PBI mechanism over 5 years. The performance-based to EPBB capacity-based proportions would shift to 75% PBI in 2008 and 100% PBI in 2009.

Note: This dual incentive structure mirrors the way energy efficiency incentives are paid. For small-size efficiency measures and customers, standard rebates are paid for "deemed" (or typical) savings levels, Whereas for larger customers and more sophisticated technology, incentives are more often paid using measured performance or equivalent engineering calculation basis.

We also revise the system size limit to be 100 % of historical annual energy consumption.

The table below summarizes the incentive structure and levels that we propose. Section 2 of this report explains our rationale in detail, and provides examples of how these incentives will work.

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System type [1]	System size	Incentive type
Residential retrofit systems	Any size on single-family home	**Capacity based, EPBB.** 2007 incentive is **$2.25 per watt**.
Small commercial systems owned by *taxable* entities	Up to 100 kW	**Capacity based, EPBB** 2007 incentive is **$1.50 per watt**.
Small commercial systems owned by *non-taxable* entities	Up to 100 kW	**Capacity based, EPBB** 2007 incentive is **$2.25 per watt**.
Large commercial systems owned by *taxable* entities	100 kW or more	**Hybrid PBI**. 2007 incentive is equivalent to $1.50 per watt, or **17 cents per kWh for 5 years.**
Large commercial systems owned by *non-taxable* entities	100 kW or more	**Hybrid PBI.** In 2007 incentive is equivalent to $2.25 per watt or **26 cents per kWh for 5 years.**
New Commercial Construction	Any size in the CPUC's CSI program	**Capacity based, EPBB** for standard PV installations to incentivize building solar into new construction. For taxable entities the 2007 incentive is $1.50 per watt and for non-taxable entities this is $2.25 per watt. **100% PBI payments** for building integrated PV (BIPV) installations, at **17 cents per kWh taxable** and **26 cents per kWh non-taxable.**

[1] We will address the specific nature of incentives for affordable housing in Phase 2 of this proceeding. First, the form of incentives could be rebates, loans, and/or some combination of the two. Additionally, affordable housing comes in many sizes (single-family, mid-rise and high-rise multi-family, and mixed use residential units over commercial space. Affordable housing also can be found in new construction, substantial renovation and rehabilitation, or existing housing. The CPUC and CEC are collaborating with affordable housing stakeholders to design appropriate incentives for these situations.

Trigger Mechanism for Adjusting the Incentive Level Over 10 Years

- Staff considered a variety of possible systems for adjusting the incentive levels in future years to respond to market factors such as solar system price, market demand, customer economics with changes in energy prices, and technology performance. At this time we recommend a simple 10% Annual Ramp Down as the incentive adjustment.
- In parallel with the 10% per year planned downward adjustment, we reserve the flexibility with adequate advance notice to:
  - apply special adjustments (downward) to reflect breakthroughs in technology performance and associated cost per unit of output, as well as to
  - retain an incentive at the same level a second year in a row if market factors have not produced a lower cost per kWh.
- Comments are invited on specific alternate approaches.

Funding Levels

- Annual budgets for the program will follow the schedule published in the January 2006 decision.
- Budgets will be available based on each utility service area's prorated share of funding collection (e.g. PG&E 44%, SCE 34%, SDG&E 14%, and SoCalGas 9%.
- Budgets will be further divided based on customer class contributions to rates to determine the amounts available each year for award between/among the categories of solar installations and owners.

Program Administration

- The current SGIP administrators for the time being will continue to administer the CSI program for all systems > 100 kW
- For all smaller systems (both residential and commercial), there shall be a non-profit organization, under contract to one or more utilities.
- PG&E shall manage a competitive bidding process to select the non-profit administrator. A Commission advisory panel consisting of CPUC and CEC staff, and representatives from the Division of Ratepayer Advocates and TURN shall make the final selection.

Metering

- Small Systems: all CSI participants must have a dedicated system meter to measure output.
- Large Systems: all CSI participants must have a dedicated revenue-grade system meter to measure output. The meter must use a web-based reporting system or a utility reading and reporting system, including the option to attach a wireless modem. Systems 30 kW or larger must have the means to communicate remotely via the Internet.

CSI Impacts on Net Energy Metering

- Utilities are required to file estimated cost impacts of providing net energy metering to accommodate CSI participants, up to 3,000 MWs. We are aware that current net metering caps set by State legislation are far below this level.

Energy Efficiency Requirement:

- Energy efficiency audits are required for existing buildings that want to participate in the CSI
- Participants may select from an online, telephone, or onsite audit through an IOU program, or from a non-utility provider.
- Audits can be waived for buildings with energy efficiency certification through LEED or Energy Star

Acknowledgements

California Public Utilities Commission

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2. APPLYING A PERFORMANCE DIMENSION TO INCENTIVE PAYMENTS

2.1 Objectives for Incentive Design and Principles To Be Applied

California has embarked on a major initiative to stimulate higher volumes of on-site solar energy production. This initiative seeks to encourage long-term investment by the solar industry to be offer lower-cost, higher-output technologies that can be adopted by energy users with ever decreasing levels of ratepayer subsidies.

The California Solar Initiative announced in December 2005 seeks to achieve 3000 MW of on-site solar energy capacity between 2006 and 2016, with an estimated ratepayer contribution of $3.2 billion toward this end. (This is comprised of $2.8 billion for the CPUC's target of 2600 MW of solar, and $350 million for the CEC's goal of 400 MW in new residential construction.) Ratepayer contributions are not the only economic factor in stimulating investment in solar energy. During this ten-year period electricity prices among the investor-owned utilities in California will certainly rise. This means that solar energy will have increasingly higher value to those who use it. At the same time there are additional tax advantages at state and federal levels to those who make investments in owning solar production systems. These tax advantages will vary depending upon the type of taxpayer, and from year to year as tax laws change.

The CSI program envisions setting aside 15% of its funds for a combination of non-incentive expenditures that include program incentive administration, information and outreach, program evaluation of the incentive design and solar system performance, as well as targeted Research Development, Demonstration, and Deployment (RD,D &D) activities intended to help accelerate the technology cost and performance goals.[2]

This means the CPUC program plans approximately $2.4 billion for direct incentives for solar system purchase or the systems' solar energy production. On average, this implies that over the ten-year period, the average incentive value would be 90 cents to a $1.00 per watt of solar capacity. Today the CPUC's current solar incentive pays $2.50 per watt.

For this program to be successful within its expected funding commitment, there must be gains on three dimensions – technology and system installation costs must continue to be driven lower, solar system production efficiency must increase per watt of installed capacity, and business overhead costs to market and install solar systems must fall per unit sold. Progress with these factors will produce electricity and energy output that more closely matches the rising retail prices of conventional electricity and other forms of energy. In turn, this dynamic will enable public subsidies for solar energy production to decline and then disappear.

[2] The plans for RD,D&D will be addressed in Phase 2 of this proceeding. The CPUC expects to focus more on demonstration and deployment support (e.g. system testing, system installer design guidance) when such activities are not otherwise addressed by federal research, CEC PIER R&D plans, or the solar industry itself.

The CPUC's Self-Generation Incentive Program (SGIP) and the CEC's Emerging Renewables Program (ERP) currently pay incentives using a cost buy-down (CBB) incentive structure. The incentive is paid up-front as a one-time payment upon system completion. It is based on the reported system rating using CEC-approved PV modules and inverters, and CEC-reported Ratings[3]. While the CBB structure is administratively simple, it does not confirm or require that a system installation actually performs well before paying the incentive.

Today's staff proposal supports the enhanced vision of the 2007 – 2016 CSI by recommending new incentive designs and program features that reflect the following principles:

- Incentive payments should be based on expected or measured solar system performance, and not based on installed capacity costs alone.

- Knowledge about how to optimize solar system design and installation should be shared with all interested solar system buyers, designers, and installers so as to produce the most effective results from these investments.

- Introduction of any incentive framework changes should be done in measured steps so as not to disrupt the complex global and local market environments in which solar component manufacturing, design, sales, and service operate.

- There need to be transparent and predictable trajectories for decreasing the level of ratepayer subsidy from year to year.

- In selecting specific mechanisms for estimating or measuring solar system performance, we must compare their associated costs against the expected value of information to be derived from the particular mechanisms chosen.

- Setting the level of California ratepayer subsidy must take into consideration the combined effects of all subsidies, incentives, or other financial benefits that might accrue to the solar system owner or to ratepayers in general. These would include consideration of federal and state tax credits, the retail price of energy purchases saved by using solar energy, and any future renewable or market values for solar production that might apply to these systems. The goal should be for the ratepayer contribution to be set in such a way that we achieve our overall objectives with the lowest possible ratepayer contribution.

- We acknowledge that it will be impossible to design a "perfect" ten-year incentive system from the outset. There will be many changes over the years in relevant economic and market factors. Thus, the incentive design structure, or its

[3] This calculates an estimated performance based on the PTC module rating times the CEC-reported weighted inverter efficiency. PTC stands for "PVUSA Test Conditions." PTC watt rating is based on 1000 Watt/m2 solar irradiance, 20 degree Celsius ambient temperature, and 1 meter/second wind speed. The PTC watt rating is around 10% lower than the "Standard Test Conditions" (STC), a watt-rating used by manufacturers. The weighted inverter efficiency averages 90-95 percent.

administration, must retain flexibility to make sensible adjustments in response to market factors, technology breakthroughs, or perhaps new business models for delivering on-site solar and energy efficiency solutions. (For example, it may make sense in later years to incentivize combined efficiency and solar installation actions that could produce a lower overall ratepayer cost for the resource benefits achieved.)

To achieve these principles, staff applied the following considerations to the recommendations we describe in the report sections below.

Considerations Underpinning Staff Recommendations for Incentive Structure and Administration

Solar System Performance

- Assure solar production for ratepayers' funding contribution
- Support purchaser/ consumer assurance of system performance (via review of system design, installation, and/or performance measurements)
- Encourage product innovation that produces systems with higher energy generation efficiency relative to rated capacity and installed cost

Economic Feasibility

- Give consideration to availability of financing for system costs in excess of up-front incentive payments
- Maximize opportunities to utilize state and federal tax benefits
- Recognize that incentive must address economic feasibility to solar system buyer
- Reduce potential perceived risks of receiving multi-year performance payments

Market Flexibility and Adaptation

- Build in flexibility to adjust incentives to reflect values being obtained over time by system owners and ratepayers, and changes in technologies
- Minimize potential market disruption from the way changes in levels or forms of incentives are introduced

Manage Administrative Requirements and Costs

- Select incentive payment and administrative procedures that keep administrative costs to the minimum necessary
- Support a sustained market with planned annual budget levels for incentive funds

Staff analysis in selecting the level of incentive to recommend for 2007 reflects calculations that considered the following factors:

- Installed cost of the system
- Expected solar production over the product life
- Retail price value for energy purchases displaced by solar production
- Value of federal tax credits the solar system owners may be eligible to receive

- Offering enough of a ratepayer incentive to make the effective net cost of solar power production cost-competitive with retail energy purchases, and/or yielding a ten year simple payback for a system with a 25 year life
- Stretching ratepayer funds to reach the 2600 MW CPUC solar target over the 11-year measurement period.

Beyond the economic analysis, we also reviewed the administrative implications for administering the incentive program. In some cases we chose to streamline or simplify certain recommendations, such as incentive structures, performance verifications steps, and incentive adjustment mechanisms, in order to reduce the complexity and associated costs of a program with greater nuances.

That said, some may say that our recommendations here are still too complicated for prompt and cost-effective administration. We are open to hearing specific suggestions for accomplishing the CSI's overall goals with more simplicity of administration.

Factoring in Federal Tax Credits

Recommendation:

- CSI incentives will take into consideration solar system owners' eligibility for any federal tax credits.
- Non-taxable entities (e.g. federal, state, and local governments, schools, social and religious organizations) will be paid a higher CSI incentive payment than taxable entities. To qualify for the higher incentive, organizations must certify that they will own the solar systems, and will not enter into any third-party or financing arrangements that qualify participants for the federal solar tax credits.
- The total customer incentive – combining the CSI incentive with the benefits of the federal tax credit -- may not exceed 50% of total installed system costs.
- Incentives for taxable entities will be revisited if federal tax incentives are modified after 2007.

Rationale:

The Energy Policy Act of 2005 (EPAct 2005) increased the federal investment tax credit for commercial photovoltaic (PV) systems from 10% to 30% of eligible system costs and also created a new 30% investment tax credit (capped at $2000) for residential solar systems. Both changes went into effect on January 1, 2006, and – absent an extension – will last for a period of two years: the new residential ITC will expire, and the 30% commercial ITC will revert back to 10%, on January 1, 2008. The solar industry has been actively pursuing an extension of these credits and the credits may be extended beyond 2007.

EPAct 2005's PV tax credits do not provide the same amount of value to all prospective PV system owners. For example, commercial PV systems receive far more value from the 30% EPAct credit than do all but the smallest residential PV systems, due to the $2000 cap on the residential credit. Because of the $2000 cap on the residential tax credit, all but the smallest residential systems receive substantially less value from EPAct's credits than do commercial systems that are able to take full advantage of the credit. Residential systems are also unable to take advantage of the tax benefits of depreciation, and because of their small size are typically somewhat more costly per installed watt than larger commercial systems.[4]

Meanwhile, governmental and non-profit entities that do not pay income tax, as well as commercial entities with limited or no tax liability, will receive no direct value from the

[4] On the other hand, residential PV systems offset average retail rates that are typically higher than average commercial or industrial rates.

EPAct credits.[5] These entities are unable to directly utilize the EPAct tax credits. Thus it can be argued that they should receive a higher CSI incentive than commercial entities. We are also aware of various evolving third-party ownership arrangements (e.g., involving service contracts or power purchase agreements) which make it possible for governmental and non-profit entities, as well as other entities without tax liability, to indirectly utilize the EPAct credits.[6] In California non-taxable entities (federal, state, and local governments, schools, social and religious organizations) make up more than 10% of non-residential energy use, and will require a higher incentive payment than taxable entities.

A few other states have already reduced their PV grant levels in response to EPAct. New Jersey has cut the size of its PV grants by $0.80-1.10/W (depending on system size), though system owners that demonstrate an inability to utilize EPAct's credits will be subject to far more modest cuts of $0.15-0.20/W. Oregon has similarly cut its incentive by roughly $1.00/W across the board. Finally, Wisconsin has eliminated grants for systems smaller than 0.5 kW, and has reduced grants to other systems (except those owned by tax-exempt entities) by $0.50/kWh of estimated annual production (which equates to roughly $0.65/W at a 15% capacity factor).

Taken together, these facts suggest that CSI should offer different incentive levels to different customer types, depending on the degree to which each can use the EPAct credits. Without such differentiation, the CSI program may be heavily dominated by commercial over residential systems. Of lesser importance, lack of differentiation may also drive households towards smaller residential systems (to maximize the proportional value of the credit), and may also force non-taxable entities to pursue more complicated third-party ownership arrangements for systems hosted by tax-exempt (or tax-liability limited) entities. In conclusion:

- Staff acknowledges the additional administrative complexities of offering differentiated incentives. CSI application materials will need to make these choices very clear.
- We recognize that using higher ratepayer incentives for non-taxable entities will be more costly than if all solar owners were taxable entities. However on a net basis, staff's proposal to differentiate incentive by tax status of system owners means that ratepayers will pay less toward solar incentives than if federal tax incentives were ignored.
- To receive the higher incentives, non-taxable entities must certify that they are not utilizing any third-party arrangement that can use the federal tax benefits, will own the solar system, and not use taxable financing mechanisms to pay for them.

[5] This is true unless a third-party ownership structure (e.g. taxable leases, power purchase agreements) is used. In such cases a third party that is able to benefit from federal tax incentives may own the PV system, and use the tax benefits directly and pass on this benefit in the form of lower solar costs charged to the non-taxable host site.

[6] Third party ownership arrangements make less sense for residential customers, due to the much smaller system sizes involved.

Questions and Unresolved Issues:

- How the Internal Revenue Service (IRS) treats the CSI could have implications for residential program administration. Residential systems are substantially better off financially receiving *non-taxable* rebates, which may be the case if the CSI is considered by the IRS to be a "utility program." A program overseen by the Commission, but administered by the utilities – e.g., the current SGIP structure – is likely to qualify as a utility program. It is, however, somewhat less clear how a program overseen by the Commission, but administered by an independent administrator using utility funds, would be characterized. It remains an unresolved issue whether the IRS would determine that a program administered by a non-profit entity under contract to one or more utilities would be able to offer non-taxable incentives to the residential recipient as a "utility program."

2.2 Performance-Based Incentive -- Large Solar PV Systems >= 100 kW

Recommendation:

Hybrid PBI Phasing to Full PBI

For 2007 the incentive for **taxable** entities will be the equivalent of $1.50 per watt, translated to **17 cents per kWh** for 5 years, assuming a system capacity factor of 0.2.

The 2007 incentive for **non-taxable entities** will be the equivalent of $2.25 per watt, translated to **26 cents per kWh** with the same 0.2 capacity factor.

- If parties think it advisable to transition to the PBI payment system, staff proposes that for 2007 50% of the incentive would be paid on a capacity basis at the time of verified installation, and 50% paid out in a PBI mechanism over 5 years, with no discounting.
- In 2008 the hybrid PBI would be paid 25% up front as a capacity-based payment, and 75% over 5 years with no discounting.
- In 2009 incentives for all large commercial systems will be paid 100% on a 5-year PBI schedule (no up front payment).

All PBI payments will be fixed and flat for each applicant over the 5-year period. To simplify payment administration, there will be no discounting of the PBI payment.

PBI-based payments may be up to 10% more than estimated if metered output confirms higher system efficiencies.

Solar included in **new commercial building construction will receive EPBB** payments, except for BIPV installations where only 100% PBI payments will be made.

All incentives ratchet down 10% per year.

Rationale for Hybrid PBI Transitioning to Full PBI:

The PBI structure accounts for five distinct factors that affect system performance. Three of these factors are due to one-time actions or decisions and two of these factors are due to recurring actions, decisions, or events. They include:

1. Actual system rating may differ from reported rating due to incorrect equipment ratings and/or poor workmanship during installation
2. System design may not be optimal due to orientation (azimuth and tilt) and shading issues
3. Geographical location may reduce output because some areas of California have a better solar resource than other areas
4. System availability may be less than ideal due to soiling (dirty modules), poor system maintenance, and equipment failures that are not repaired in a timely manner
5. Weather variability may be different than the estimated typical year thus resulting in a lower or higher amount of energy than was expected

The first three could be verified after system installation. The fourth is subject to ongoing attention, and occasional "lumpy" replacement of component parts. Due to the relative newness of wide-scale installation of solar technologies, and the constant improvements to component technology, the fourth factor is unpredictable in its frequency and impact. There is a lack of data and a lack of industry consensus as to the degree of problem with this factor. The fifth factor of weather variation is believed to even out over a minimum of a 5-year period.

Overall, the PBI structure works best for larger systems and their owners who routinely have access to capital finance mechanisms that can accommodate the need for paying higher up-front costs in return for the five-year PBI incentive payment stream. (For example, the cost of a 100 or 200 kW system will be about $800,000 and $1.6 million, compared to the cost of a $15,000 - $20,000 residential system. Commercial customers routinely arrange financing for that size of investment.) Moreover, with this size of investment, facility owners and their on-site maintenance staff can be attentive to any problems and are likely to utilize metering and control equipment that closely monitor system performance.

Principles accomplished by staff's recommendation to adopt PBI for larger systems, and transition to this via a hybrid structure for 2007 and 2008, with full PBI in place by 2009:

- Start with a hybrid CBB/PBI structure to allow for learning to occur in the market as we make a gradual transition to a full PBI-based incentive structure.

- Minimize market disruption in making this transition by using the hybrid incentive phased in over three years the proportion of incentive paid as PBI.

- Encourage high performance and technology innovation by paying up to 10% more per solar installation that out-performs the assumed production effectiveness of a 0.2 capacity factor.

- Choose a middle-ground payment period of 5 years. A 3 year period would keep the costs of performance metering and incentive payment record-keeping to a minimum. A 5-year period is the minimum time that some parties recommended to allow for the natural variations in annual weather conditions that affect solar performance. Other parties believe that a 10-year period would better match the financing periods that most owners will employ. A 12-15+ year period would be needed to capture the likely time when the system inverter must be replaced and thus verify long-term power production.

- For simplicity, we do not consider interest costs potentially incurred by host sites that finance their systems. Nor do we apply a discount rate to account for the fact that performance payments occur over five years, and not up-front.

Example of Proposed PBI Incentives for > 100 kW Solar System							
Assume 200 kW (AC-CEC) system.							
Assume total installed cost is $8.00 per AC-CEC watt.							
System size -kW (AC-CEC)	200						
Installed System Cost	$ 1,600,000						
Capacity Factor (CF)	**0.2**	**0.22**					
Expected kWh performance per watt	1.752	1.9272					
Expected kWh Performance/yr	350,400	385,440					
Expected kWh Performance over 5 years	1,752,000	1,927,200					
	PBI Example for Taxable Entity				**PBI Example for Non-Taxable Entity**		
CSI Incentive							
Basis for incentive/watt	**$ 1.50**				**2.25**		
Expected 1 yr kWh performance per watt	1.752	Effective incentive paid				Effective incentive paid per	
Expected 5-yr kWh performance per watt	8.76		per watt				watt
Incentive per kWh over 5 years @ .2 CF	**$ 0.17**		$ 1.50		**$ 0.26**		$ 2.25
5- yr output if system performs at .18 CF	7.884	kWh per watt	$ 1.35				$ 2.03
5-yr output if system performs at .22 CF	9.636	kWh per watt	$ 1.65				$ 2.48
	.2 CF	***.22 CF***			***.2 CF***	***.22 F***	
Expected CSI Incentive over 5 years	**$ 300,000**	$ 330,000			**$ 450,000**	**$ 495,000**	
Federal Tax Incentive @ 30% of cost	**$ 480,000**	**$ 480,000**			**$ -**	**$ -**	
TOTL EXPECTED INCENTIVES	**$ 780,000**	**$ 810,000**			**$ 450,000**	**$ 495,000**	
Net cost to system owner (before deprec.)	$ 820,000	$ 790,000			$ 1,150,000	$ 1,105,000	
effective net cost per kWh over 25 years'	**0.094**	**$ 0.082**			**0.13**	**0.126**	

We acknowledge that this table ignores the potential interest costs of loans that may be used to finance a solar system, nor does it apply the variety of depreciation and other tax effects that would vary by the circumstances of individual solar applicants.

We considered permutations on the above analysis, with the following findings:

Taxable Entity CSI Incentive	**Range of effective net cost per kWh at 0.2 and 0.22 CF**	**Non-Taxable Entity CSI Incentive**	**Range of effective net cost per kWh at 0.2 and 0.22 CF**
1.50	9-8 cents	4.00	9-8 cents
1.00	10-9 cents	3.5	10-9 cents
0.50	11-10 cents	3.00	11-10 cents
		2.25	13 cents

We had no basis on which to project the market response to such choices, or the proportion of project applications that might be taxable or non-taxable. Such projections would be needed to estimate the magnitude of incentive dollars that would be affected by the choice of incentive level. Our recommendation is premised that offering lower than $1.50 per watt to the taxable market would be too big a shock from where we are today. The non-taxable market still can pursue third-party ownership arrangements if they want to access federal tax incentives for a more attractive overall cost of solar power.

Payment Structure

Most parties agree that PBI payments should remain fixed over the payback period for each applicant. Applications received in later years would receive a lower fixed PBI payment based on the declining incentive level over the life of the CSI program.

Payment period options

There is no consensus among parties regarding the correct number of payment years, although most parties advocated a payment period ranging from three to five years. CalSEIA and PV Now argue that due to high customer discount rates, a short payment period is desirable. CalSEIA recommended a payment period of one to three years. PV Now stated a payment period that was too short would have a higher weather risk and instead recommended a payment period from three to five years. TURN advocated a three-year payment period to help offset the cost of financing a PV system and lessen the barrier to entry into the program.

Both SDG&E / SoCalGas Co., and the joint comments of the SGIP program administrators supported a hybrid approach with 50% of the incentive being paid upfront (CBB or EPBB) and the remainder through a PBI over a five to seven year period. Parties that advocated a longer payment period believed it was necessary for ensuring long-term system maintenance, including replacement of broken inverters.

Rationale for EPBB Incentive (not PBI) for Solar on New Commercial Construction

Staff accepts the argument made by DRA that commercial property developers do not benefit directly from energy cost savings offered by PV installations included in new building construction. New construction also lends itself to newer, more innovative technologies known as "building integrated PV" (BIPV).

Incentive Level. Recent research by LBNL suggests that PV installation costs for new construction tend to be lower than for PV retrofits. For example, solar system installation can be integrated into the work schedules of tradespeople already working on site, such as roofers, electricians, and others. However, there is not an adequate database to affirm exactly how much lower the costs of such solar installations are. For this reason we do not propose any downward adjustment of the incentive level to be paid for solar on new construction.

Incentive Structure. The Division of Ratepayer Advocates proposed that incentives for solar on new construction be paid up-front in order to better address solar economics when buildings are either developed for speculative sale, or are built with the expectation of having commercial tenants, and not owner-occupancy. In such cases, the PBI payments and lower utility bills benefits from a solar system would flow through to the tenants, but not to the developer or building owner. The developer/owner would qualify for up-front incentives such as an EPBB incentive as well as a federal solar tax credit. For these reasons, we propose an EPBB mechanism for new commercial buildings.

- For new commercial developer financed solar installations greater than 100 kW, and using conventional solar technologies, the CSI incentive will be paid in the form of an up-front incentive based on the expected performance of the system (EPBB).

- For BIPV applications, it becomes difficult to ascertain the expected performance of the BIPV components when they replace traditional walls or roof materials. Thus for solar BIPV systems on new construction, incentives will be paid on a 100% PBI basis.

Questions and Unresolved Issues:

- Alternative PBI approach: Instead of a hybrid approach, do parties believe we should start immediately with 100% PBI for large systems (100 kW or more), paying the PBI over 5 years?
- Should new construction projects receive a LOWER incentive than retrofits to reflect the likely lower costs of installing solar as part of a new building ?

2.4 Expected Performance Buy Down Incentive -- Small Solar PV Systems < 100 KW

Recommendation:

Residential systems	Any size on single-family home	**Capacity based, EPBB. The** 2007 CSI incentive will be **$2.25** per watt.
Small commercial systems owned by ***taxable*** entities	Up to 100 kW	**Capacity based, EPBB. The** 2007 CSI incentive will be **$1.50 per watt.**
Small commercial systems owned by ***non-taxable*** entities	Up to 100 kW	**Capacity based, EPBB. The 2007 CSI** incentive will be **$2.25 per watt**.

- Small commercial systems ***may opt – in to the larger commercial PBI system*** if they feel the PBI payments per kWh would be more favorable to their systems' performance characteristics.
- All incentives will ratchet down 10% per year, or as further modified by the Trigger Adjustment Mechanism discussed in Section 4.
- Incentives for taxable entities will be revisited if federal tax incentives are modified after 2007.

Rationale:

At the PBI workshop on March 16, 2006, a number of parties expressed support for adopting an expected performance based buy down (EPBB).[7] Some parties indicated that an EPBB approach strikes an appropriate balance between encouraging system performance and allowing for administrative expediency.

An EPBB system provides upfront payments based upon the expected performance of a given system, taking into account issues such as orientation and shading. An EPBB incentive adjustment mechanism can encourage CSI participants to design systems to maximize expected output. Systems with close-to-optimal design parameters will receive higher incentive payments than systems with lower expected output.

To inform the development of an EPBB incentive structure, LBNL recently conducted a survey of the structural components of the major state and utility customer-sited PV incentive programs in the U.S.[8] These programs often use one or more of the following

[7] The EPBB approach was described in a presentation given by Tom Hoff of Clean Power Research. See workshop slides available at http://www.cpuc.ca.gov/static/energy/solar/060316_pbipresentations.htm

[8] Lawrence Berkeley National Laboratory recently performed this research. Detailed results of that research will be made publicly available.

design, installation, and location factors either to determine the level of incentive that a system receives or as threshold criteria for whether a system will receive any incentive:

- Panel orientation (i.e. azimuth and slope)
- Panel shading
- Geographical location (i.e. latitude, average cloud/fog cover)
- Installation workmanship (i.e. quality of installation)

Of the 18 programs that were reviewed that use up-front incentives for solar systems, 14 use panel orientation and/or panel shading as minimum design thresholds (i.e., if systems do not meet certain orientation or shading standards, they are simply ineligible for receiving incentive payments). Seven of the 18 programs that were reviewed go one step further and use orientation and/or shading to determine capacity-based incentive levels (i.e., incentives are tied to the expected performance of the systems based on orientation and shading, relative to an optimally oriented system with no shading at the site). Of these 7 programs, one goes ever farther, and ties incentive levels to not only expected performance relative to optimal performance at the site, but also to the geographic location of the site and therefore expected solar insolation. Another of the 7 programs takes an instantaneous measurement of system output to test for installation workmanship, and adjusts the incentive levels accordingly.

Based on this survey, it is clear that many programs either explicitly or implicitly address panel orientation and/or panel shading; only one of the programs addresses specific geographical location within a state. Issues of installation workmanship are most often addressed through post installation inspections.

CSI EPBB Incentive System

The CSI EPBB system will proportionally reduce the CSI incentive paid according to the ratio of expected to optimal output at that site according to the following formula:

CSI Incentive Paid = Incentive Rate x **System Rating** x **Design Factor**

System Rating

The System Rating is the AC rating of the entire installed system as defined under PVUSA Test Conditions (PTC). The Rating is calculated as follows:

Estimated Rating = Number and Capacity of PV Modules
x PV PTC Module Rating
x Inverter Efficiency
x Other Losses (Assumed to be 90%)

Design Factor

The **Design Factor** will be calculated at the time of the application submission. The Design Factor will equal the ratio of simulated output for the system that is specified divided by the simulated output for a system with an identical rating that is oriented south and tilted 30 degrees with no shading:

Design Factor = Minimum Simulated Output for Designed System / Simulated Output for Fixed 30º South-Facing System Without Shading

The model used to calculate the Design Factor will account for orientation, tilt, and shading and will be capable of performing the calculation for a system with multiple orientations/tilts. The Design Factor will not incorporate geographical location. Like panel orientation and shading, geographical location clearly affects the expected performance of a PV system. However, the use of geographical location to calculate incentive levels would discriminate against customers located in areas with less solar insolation. Since the CSI will be funded by all ratepayers of the state's investor owned utilities without regard to geography, we believe that the EPBB incentive structure should be designed so as not to reward or punish customers according to their location. In the alternative, paying a higher incentive for those systems located in areas with greater solar insolation could have the effect of "over-subsidizing" those systems that are already providing the greatest benefit in terms of offsetting retail rates. If we were to apply a geographic factor for the "availability of solar hours, this could amount to an incentive payment range of plus or minus 20 percent around an average California solar location.

Example EPBB Calculations

All of the following examples assume a solar system has an installed cost of $6.50 per Watt (DC). We show the recommended California Solar Incentive payment and the applicable Federal tax credit.

The following examples are based on **taxable commercial** installations receiving a CSI payment rate of $1.50 per watt (system AC) and varying design factor reduction taking into account panel orientation:

	Example 1	*Example 2*	*Example 3*
	Good Rating	***OK Rating***	***Poor Rating***
	30º Tilted, South, No Obstructions	***Horizontal, No Obstructions***	***Horizontal, No Obstructions***
System Size (kW_{DC})	50.0	50.0	50.0
Total system cost	$325,000	$325,000	$325,000
(1) CSI Rate ($/kW-AC)	$1,500	$1,500	$1,500
(2) System Rating (kW_{AC})	38.5	36.5	30.0
(3) Design Factor	100%	89%	89%
EPBB Incentive = (1) x (2) x (3)	**$57,750**	**$48,727**	**$40,050**
Federal Tax Incentive	$97,500	$97,500	$97,500
TOTAL INCENTIVE PAYMENTS	$155,250	$146,227	$137,550

The following example is based on a **non-taxable** installation receiving a CSI payment rate of $2.25 per watt and no design factor reductions (because of optimal installation).

	Good Rating
	30º Tilted, South, No Obstructions
System Size (kW_{DC})	50.0
Total system cost	$325,000
(1) EPBB Rate ($/kW-AC)	$2,250
(2) System Rating (kW_{AC})	38.5
(3) Design Factor	100%
EPBB Incentive = (1) x (2) x (3)	**$86,625**

The system described above would NOT be eligible for a federal tax credit.

The following example is based on **residential installation** receiving a CSI payment rate of $2.25 per watt and no design factor reductions (because of optimal installation).

	Good Rating
	30º Tilted, South, No Obstructions
System Size (kW_{DC})	2.0
Total system cost	$13,000
(1) EPBB Rate ($/kW-AC)	$2,250
(2) Verified System Rating (kW_{AC})	1.5
(3) Design Factor	100%
EPBB Incentive = (1) x (2) x (3)	**$3,465**
Federal Tax Credit	$2,000
TOTAL INCENTIVES	$5.465

Estimation Tools

Several software calculation tool options exist for estimating expected and optimal system output that will be used for EPBB incentive calculations. Options include the following:

- web-based tools such as PVWATTS developed by the National Renewable Energy Laboratory,
- shading analysis tools,
- proprietary software programs such as the Clean Power Estimator, and/or
- other generally –acceptable formulae used in other U.S. solar incentive programs.

Verification of Design Information in Applications and/or Performance

All projects 30-100kW must have a post-construction inspection. This will be required to verify the accuracy of installer data submitted in the original application. The EPBB incentive payment will be based on the verified information.

While reservations will be made based on the Estimated Rating, the incentive will not be paid until the system rating is verified.

The Design Factor will not change upon installation if the orientation and shading specifications of the system that is installed match the orientation and shading specifications of the incentive that is applied for. The purpose of the post-construction inspection is to verify the accuracy of installer data submitted in the incentive application. This requirement is consistent with historical practices in California, which have required post-installation inspections for participating systems at least 30 kW in size.

The Verified Rating is determined after the system is installed but before the incentive is paid. Comments are invited on the following approach:

System output will be measured for a one month period to determine what system output should have been based on measured insolation data collected for the same time and location (using satellite or some other location-specific data source) combined with the system's design (orientation, shading) and a simulation model.

- A Verified Rating that is between 95 and 100 percent of the Estimated Rating will be paid the incentive based on the Estimated Rating; this allows for some modeling inaccuracies in favor of the system owner.
- A Verified Rating that exceeds 100 percent of the Estimated Rating will be used in the incentive calculation; this will reward systems that have performance that is higher than expected.
- For a Verified Rating that is less than 95 percent of the Estimated Rating, the incentive will be calculated based on the Verified Rating; this will penalize systems with poor ratings due to faulty equipment or poor installation.

Systems smaller than 30 kW will be subject to random sampling verification. To the extent feasible, one inspection will be conducted for every solar integrator or contractor participating in the program. If any adjustments are necessary, the installer and system owner will be notified of the reasons why. Installers for whom a downward adjustment has to be made based on verified performance will go into a pool that may be subject to a higher percentage of random sampling in the future. Installation contractors and system integrators that repeatedly fail inspections may be excluded from future participation in the CSI.

Customer Class Distinction for Determining EPBB Eligibility

The customer classification on a customer's energy bill will be used to determine if a customer is a residential or commercial for the purpose of determining eligibility for the EPBB incentive (provided that the proposed customer system is less than 100kW).

- If the customer is classified as a residential customer on their energy bill they will only be eligible to receive the EPBB incentive.
- If a customer is classified as a commercial or industrial customer on their energy bill and they are placing a system sized less than 100 KW, they will have the option to choose whether to receive an upfront EPBB incentive payment or participate in the PBI payment structure

Questions and Unresolved Issues:

- What performance estimation tools would be most appropriate for EPBB calculations?
- Would that be unduly restrictive for BIPV systems?
- Is the verification protocol described above administratively feasible?
- Must the verification be done on-site, or is it possible to arrange for remote data collection to determine system performance, adjusted for weather factors?
- Can the cost of on-site verification be accommodated within the 10% limit for program administration and evaluation?
- Should verification for small systems be available on an opt-in basis if an applicant believes their technology performs better than average?
- Are there additional actions that should be taken to address installer requirements?
- Are there additional actions that should be taken to address equipment and warranty requirements?

2.5 System Size Adjustment

Recommendation:

- Revise the solar system size limit to 100 % of historical annual energy consumption.

Rationale:

In D.06-01-024, the Commission stated its intent to pay incentives for solar projects used to serve onsite load. In an effort to maximize program funding and avoid paying incentives to oversized systems, the Commission reduced the SGIP solar eligibility size from 200% of peak load to 100% of peak load. This reduction has had the unintended result of restricting the ability of some 2006 SGIP solar projects applicants to take full advantage of net energy metering (NEM) benefits on an annual basis.

We considered two sizing approaches to ensure SGIP projects will be able to optimize net metering:

a) revert back to the 200% peak demand requirement in effect between 2001 and 2005, or
b) base project size on the site's actual or estimated annual energy use.

The table below compares the various system sizing methods, utilizing actual data from a sample of 2006 SGIP solar reservation requests:

Comparison of System sizing Options[9]

Project #	Peak Demand (kW)	200% of Peak Demand (kW)	100% Annual Usage
1	540.6	1081.2	1312.5
2	135.8	271.6	204.1
3	80.0	160	127.6
4	194.0	388	359.7
5	206.0	412	367.1
6	909.6	1819.2	2343.0
7	348.6	697.2	700.8
8	1744.2	3488.4	3037.9
9	175.0	350	211.3
10	238.0	476	478.7
11	188.0	376	300.6
12	56.8	113.6	76.2
13	755.0	1510	309.8
14	89.6	179.2	141.1
15	231.6	463.2	296.5
TOTAL	**5892.8**	**11785.6**	**10267.1**

The table indicates that in most cases, sizing to 200% of peak demand results , in a larger PV system capacity than sizing to annual site energy use. It also results in annual PV output that is uncompensated under NEM rules. Sizing the system based on 100% of annual historical consumption reflects the site's actual usage, maximizes net metering benefits, and prevents potential over sizing of systems relative to annual energy use.

Questions and Unresolved Issues

- With respect to non-solar SGIP projects, should the Commission retain the 100% of peak demand requirement, revert to the 2005 requirement of 200% of peak demand, or apply the same requirement as that proposed for solar of 100% of historical annual use?

[9] Assumptions:

Residential Load Factor	0.45
Small Commercial Load Factor	0.47
Agricultural Load Factor	0.35
Capacity Factor	17%
Inverter Efficiency	95%

3. INCENTIVES FOR NON-PV SOLAR TECHNOLOGIES

Recommendation:

- Provide incentives for these non-PV concentrating solar technologies:
  - Concentrating PV
  - Parabolic dish/engine
  - Parabolic trough
  - Power tower
- Concentrating Solar Power (CSP) incentive levels and amounts will mirror those for PV.
- Projects must be equipped with a meter capable of measuring displaced energy, including natural gas. Meters for thermal applications must be able to support a BTU to kWh conversion, or supplemental unit converters, along with communication technology to transmit the data to the IOU for incentive calculation and payment.
- Because of near-term advances expected both for CSP technology costs and performance, beginning in 2009, PBI and EPBB incentives for these technologies will begin a steeper decline than for PV, decreasing annually by at least 15%.

Rationale:

In a December 12, 2005 joint staff report with the CEC, we recommended that non-PV technologies be eligible for CSI participation. The Commission concurred, and adopted a two-pronged approach to incorporate these types of projects into the program. D.06-01-024 directed SDREO to develop and submit for approval a pilot incentive program for solar water heating, which would be available to SDG&E residential, commercial, and industrial customers. The Commission also stated its intent to explore the details of incentive levels for solar thermal heating, ventilation, air conditioning, and concentrating solar technologies.

This staff proposal is to include incentives for the following non-PV concentrating solar technologies:

- Concentrating PV
- Parabolic dish/engine
- Parabolic trough
- Power tower

We acknowledge the challenge of determining appropriate incentives for customer-side non-PV technologies. California is one of the first states to develop a large-scale solar thermal incentive program for technologies beyond water heaters. Traditionally, small solar thermal incentives are capacity-based, through tax credits, or up-front payments equal to 30-50% of installed costs. For the most part, published capacity factors for CSP technologies are based on installed projects with capacity sizes over the CSI 5 MW

maximum size. Our proposal, which **includes performance-based incentives for solar thermal projects**, is informed through incentive practices in Europe, from Arizona's experience with CPV demonstration projects, and from that state's recently-adopted solar thermal incentive program.

Solar Power Cost and Performance Overview

CSP Technology	Capacity Range	Capacity Factor %	Capital Cost $/kW	Unsubsidized Power Cost Cents/kWh
Concentrating PV	22-140 kW	21-26	5,500	TBD
Dish Stirling	5–50 kW	25.2	2,650	16.7
Parabolic Trough	30–80 MW	22-29	2,877	13.4
Power Tower	30-200 kW	22	2,713	9.0

SOURCE: NREL, Arizona Public Service, and Stirling Energy Systems.

This demonstration data may suggest that "power tower" technology does not require an incentive.

Initially, the CSI will utilize the incentive levels and structure we propose for PV. Our assumption is that solar thermal projects will fall into similar customer categories based on onsite needs and project characteristics. Since solar thermal projects may displace electricity and/or natural gas, payments will be calculated on a system output basis by converting metered BTU into a kWh equivalent, where 3,412 BTUs = 1 kWh. Utility-grade production meters are required on projects sized 100 KW-equivalent and above, and must be capable of measuring and converting displaced energy. Where displaced energy is natural gas, the production meter must have the capability to convert BTUs to kWh and to transmit this data to the applicable utility for incentive calculation and payment.

The general structure for all non-PV solar technologies will be:

- Up to 100 KW: Choice of EPBB or PBI
- 100 KW and over: PBI

We **make no incentive recommendations for stand-alone solar water heaters at this time,** as SDREO will address this area in an upcoming proposal submitted to the Commission. In the statewide CSI, we **propose to include water heating for large commercial installations if the project design includes other solar thermal applications,** such as space heating and cooling, ventilation, or process heating and cooling.

We propose to revisit all solar thermal incentives in 2008. By mid-2008, SDREO's solar water heating pilot program will be completed, and the results can be factored into the statewide program. Based on discussions with representatives of solar thermal technologies, staff believes that beginning in 2009, PBI and EPBB incentives for CSP

technologies should begin a steeper decline than for PV, and should decrease annually by at least 15% to reflect the anticipated increase in equipment production, and to ensure overall CSI program cost reductions. As with PV, this approach recognizes the differences among small residential, small commercial and large commercial solar thermal applications. As discussed later in this section, large-scale systems provide domestic hot water, space heating and cooling, and process heating and cooling, and displace natural gas and electricity on a large scale. These systems are more complex, and are designed to operate as part of a central system. A long-term PBI for large systems is expected to provide assurance to investors, making it easier to obtain commercial financing.

This approach is also consistent with the Commission's stated goal of developing a long-term, sustainable solar market. We believe this approach will promote development and installation of new solar products at a time when global PV costs are increasing. Silicon, the most expensive PV component, is currently in high demand and short supply. This shortage, combined with worldwide demand for new renewable generation, may create competition for scarce PV cells, which can mean higher costs passed on to California ratepayers. Until such time that solar PV systems offer greater efficiency, concentrating solar thermal technologies can contribute slightly greater efficiencies, and by 2009 at potentially lower prices.

Concentrating PV

PV cells can be more cost effective if optics such as mirrors or lenses are used to concentrate light on the cells. In simple terms, concentrated photovoltaic (CPV) uses inexpensive lenses to leverage PV cell performance. CPV will be eligible to receive CSI incentives.

CPV can have higher efficiencies than flat-panel PV, up to 30%, and can generate about 10 times more power than a non-concentrating PV application. A CPV project should result in lower system costs because it requires only one-tenth the semiconductor material (typically silicon) than flat- panel PV, and because the concentrating optics are cheaper than solar modules. Most CPV projects use tracking mechanisms to follow the sun throughout the day, either through single or dual axis tracking, which allows concentrators to take advantage of as much daylight as possible.

Some companies are now building smaller, higher-efficiency concentrator devices in the 10-200 KW range that may be suitable for commercial rooftops, and possibly even residential settings. Currently CPV project economics need a subsidy, but prices are expected to go down later. in the near term there is an opportunity for CPV to get established over the next two years of the silicon shortage. by 2008 or 2009 when the silicon shortage is expected to resolve, CPV prices and the CSP incentive will be lower. it seems to make more sense that to categorize CPV as PV, and pay the higher incentive to CPV for ten years.

Eligible Solar Thermal Electric Functions

For purposes of the CSI, D.06-01-024 adopted a maximum system capacity size of 5 MW. We propose that solar technologies 5 MW and below are eligible to receive incentives, provided they perform one or more of the following functions:

1. Heating, cooling, and ventilation;
2. Electrical or mechanical power;
3. Any combination of the above by means of collecting and transferring solar generated energy;
4. Swimming pool heaters associated with large projects that also utilize solar thermal for heating, cooling, or water heating purposes.

Eligible solar project applications are discussed in greater detail below.

The collectors, storage units, heat exchangers, and installation must be warranteed for up to five years. The remaining components and their installation must be warranteed for at least one year.

Solar Heating, Ventilation, and Cooling (HVAC)

Active solar thermal space heating, ventilating, process heat, and cooling projects are eligible for CSI participation, including absorption heaters and chillers. All solar HVAC projects must be metered for output to calculate and receive incentives. For this reason, passive solar heating products are not eligible under this program.

In general, the larger the system, the lower the per unit cost of collector area. The economics of an active space heating system improve if it can also heat water in the summer. Significant space heating and/or water heating can be accomplished with the same equipment used for the solar cooling system. Any solar water heating proposal adopted by the Commission must account for these duplicative, complementary design features.

Ventilation preheating systems use air to absorb and transfer solar energy. Solar air collectors preheat the air passing into a heat recovery ventilator or through the air coil of an air-source heat pump. Solar process heat systems typically provide hot water and hot water space heating for large institutions such as schools, office buildings, prisons, and military bases. Ventilation preheating and solar process heat systems are eligible to receive incentives.

Absorption heat pumps use an absorption cycle to provide heating and cooling. A refrigerant is condensed to release its heat, pressure is then reduced and the refrigerant evaporates to absorb heat. If the system absorbs heat from the building's interior, it provides cooling. If it releases heat to the interior it provides heating.

Certain solar thermal applications, such as ventilation air preheating, solar process heating, and solar cooling may be most practical for commercial and industrial buildings, although absorption coolers are now commercially available for very large homes. Since

these technologies are being refined continuously, the CSI should not limit their application strictly to non-residential projects.

Questions and Unresolved Issues:

We ask parties to comment on:

- Ways to integrate solar HVAC with the solar water heating program proposed by SDREO.
- Technical solar HVAC specifications for inclusion in the CSI Program Handbook.
- Whether a certification process should be required for BTU-to-kWh equivalent conversion technologies, or for BTU ratings equivalent to solar PV ratings. Alternatively, should we establish the incentives for solar thermal on a per BTU basis?
- Based on current CSP technology costs and performance levels, do we risk over-paying the incentives for CSP technologies? Do they need the same performance-based incentives as PV? Are there effective costs per kWh or BTU produced greater or lesser than solar PV?.

4. INCENTIVE LEVEL TRIGGER ADJUSTMENT MECHANISM OVER 10-YEAR PERIOD

Recommendation:

- A 10% annual ramp down of the incentive is the proposed method for adjusting the incentive level, unless one of the alternatives discussed below is accepted as superior.
- We reserve flexibility to apply special adjustments (downward) to reflect breakthroughs in technology performance and associated cost per unit of output.
- We reserve option to retain an incentive at the same level for a second year if market factors have not produced a lower cost per kWh
- We will provide adequate advance notice of any adjustment OTHER than the annual default 10% reductions
- Separately, as explained in Section 2.2, we will revisit the level of incentive if federal tax incentives change.

Rationale:

Staff considered but rejected four alternative approaches to an annual ramp down of the incentive. These options and our reasoning are described in the text below. Our reasons:

- The approximate 10% annual decline in the incentive level was contained in the January Commission decision., and is consistent with declining the incentive over the program's 2006-2016 period.
- The adjustment of 10% per year is selected because of its simplicity and transparency.
- If we track market price only, we would be reactive, and not seeking to drive down the price.
- If we use more complex economic models to inform the incentive level, we become less transparent, and may not correctly capture or weight market factors.
- If we use an auction approach, we risk being too disruptive to the current market place. Moreover, an auction could result in large commercial systems winning all of the offered incentive funds.
- The proposed mechanism is transparent, and can be tracked via the administrators' weekly website posting of application and budget status.

Many parties have expressed an interest in having the Commission review BOTH the CSI base incentives and trigger adjustment mechanism to reduce incentives. In response to the Commission's March 2006 reduction in the CSI incentive based on a volume trigger having been reached, a number of parties filed comments requesting a review of incentive and trigger issues. One common theme was that market complexities justify the need to develop better analytical tools for a trigger mechanism that accounts for market factors because setting the "ideal" rebate level is very difficult. Comment from parties included the following:

- "SDREO requests that the Commission provide clear direction on how sector-specific market conditions would be evaluated in order to determine when a rebate should be reduced and which market sectors should be evaluated…"

- ASPV stated that "Data collection, transparency and effective communication amongst the parties through an open public process are critically important to ensure that these adjustment points are identified and that the necessary adjustments are made in the most effective way. Transparent data for reasoned, periodic review are required to ensure the success of the CSI."

- Cal SEIA stated that "We are concerned that the proposed triggers insufficiently take into consideration numerous marketplace factors which play a significant role in system prices, and ultimately consumer motivation to purchase. We believe that, particularly given the duration of the proposed program, a much more dynamic evaluation model should be developed for the purpose of determining appropriate incentive reduction timing, which should take into consideration a number of factors beyond the passage of time and the amount of megawatts funded."

In addition to the already-established CSI program budget, variables to consider in setting the CSI incentive level and market trigger mechanism include the following:

(1) time (e.g. incentives drop with the passing of time);

(2) market demand (e.g. incentives drop after reaching pre-determined MW blocks in reservations);

(3) industry economics (e.g. incentives could be linked to the output of an economic analysis tool which takes into account technological innovations such as module improvements and price reductions);

(4) individual customer economics (e.g. to reflect changes in retail energy rates that mirror the value of avoided purchased energy); and

(5) policy changes (e.g. federal and state tax incentives as these affect the tax benefits to different types of solar system owners).

The following are some possible options to more closely tie the CSI incentive level and market trigger mechanism to market forces.

Alternate #1 Increased Monitoring of Market Developments Impacting Installed System Costs

As recommended by various parties, CSI staff and administrators could perform increased monitoring of data regarding average system costs. Staff could also take into account any significant changes affecting customers' installed costs such as global PV module or other component prices. Staff and administrators also could monitor system performance data, since as performance increases and bill savings increase relative to the system size, the required incentive payment should decline. To fully capture the benefits derived from increased system performance will require data from automated monitoring

systems and/or the program's measurement and evaluation (M&E) activities. Staff and administrators will need to coordinate this approach with the CSI M&E plan to be addressed in Phase 2 of this proceeding. The method and schedule used to review cost and performance changes could be published in the CSI program handbook.

Alternative #2 Flexible Market Trigger

Another option to more closely tie the CSI incentive level to market forces would be to create a Flexible Market Trigger (FMT) mechanism, which could be used to adjust the incentive rate on a quarterly basis. The FMT would determine when the incentive rate should be reduced based on the volume of applications received relative to the allocated budget for the quarter. The incentive market would be constrained when the dollar value of confirmed incentive reservations exceeds the dollar value of the budget that is available for incentives during that quarter. A confirmed application would be one that has been submitted to the reservation process during that quarter and that has paid the application fee.

When the market is constrained for a given quarter, the incentive for the following quarter would be automatically reduced. The incentive would ratchet down absent specific ALJ approval to retain the previous quarter's incentive level (if there are compelling market conditions. The incentive could be reduced by 10¢ per Watt (or 1¢ per kWh for a PBI structure) for the following quarter. If a market is constrained and too many applications are received during a quarterly period, applications will continue to be accepted in the day/date-stamped order received. Applications not selected could be returned to submitters, or automatically entered into the next quarter's market if the customer so advises.

Alternate #3 Economic Model

An economic model that takes into consideration a variety of data, such as:
- installed cost of solar system
- effective cost of solar system per unit of output (factoring in system performance)
- changes in retail price that host site is avoiding by using solar energy
- setting ratepayer value on a time-of-availability basis for net metered energy (for customers not already on TOU rates)
- tax status of the system owner
- assumption about return on investment or payback levels needed to prompt solar adoption.

Several parties and consultants offered spreadsheet models that applied this kind of approach to determining "optimum" incentive levels for different kinds of solar owners, both taxable and non-taxable. Our preliminary analysis of such models suggested the tendency to pay incentives at higher levels than the market appears to need, based on application volume experience.

Alternate #4 Auction

One approach that was mentioned at the PBI workshop on March 16, 2006 was to let the market establish the CSI incentive level through the use of a periodic (e.g., quarterly) auction. A monthly or quarterly auction of incentive bids from contractors and integrators, offering incentives to the LOWEST incentive levels bid. Through the market clearing mechanism, all relevant market factors would be automatically reflected in the auction clearing price, maximizing the amount of solar installed given the already-established CSI budget. While this maximizes consideration of market factors, it introduces volatility an uncertainty on three fronts:

- for solar system integrators and contractors in their business planning, pricing, and contracting activities,
- for the CSI program budget should incentive bids be higher than expected,
- for buyers.

Variation A: A "Dutch Auction". In such a system the highest-accepted incentive level bid becomes the clearing price for all incentives to be paid that period. In such a system, the monthly or quarterly pro-rata share of the annual incentive budget would be offered for bid.

Variation B: Rolling Auction Bids. From the day after the closing day of the current quarter's auction until the first non-holiday weekday of the following quarter, the CSI Incentive Rate could be set at 95 percent of the clearing Incentive Rate from the previous quarters auction. The Incentive Rate could increase by 1 percent each non-holiday weekday of the following quarter until the program is fully subscribed for that quarter. The program would be fully subscribed for the quarter when applications equal or exceed the quarterly budget. The process would work as follows:

- The Incentive Rate for all applications accepted during the quarter would equal the clearing Incentive Rate for the day that the program becomes fully subscribed; this protects early submitters from being penalized with a lower rate.
- Applications submitted prior to the closing day would automatically receive a reservation; this would reward early submitters for being willing to accept the lower rate.
- Applications submitted on the closing day could be randomly selected until the accepted applications for the quarter equal the quarterly budget.
- Applications not selected could be electronically returned to the applicant so that they can be resubmitted the following quarter.
- Projects would be reserved once the application fee is paid. Accepted applicants would have 7 days to pay the application fee.
- Applications that do not pay the fee or reserved projects that expire from some previous period and the resulting budget that is "freed up" would be added to the following quarter's budget.
- Submitters could have an on-line account where they submit their application electronically and could monitor their own application status.

Although an auction approach averts the inherent difficulties and accuracies of building the model described in #3, we rejected this approach as being too disruptive to the current market place. Moreover, it might result in large commercial systems winning all of the offered incentive funds.

Questions and Unresolved Issues:

- Parties are requested to submit comments regarding the options outlined above.
- If parties feel that an alternate approach is warranteed, they are welcome to supply explicit, detailed proposals for setting the CSI incentive level and adjusting it over time.
- Parties should include discussion of administrative feasibility for all options discussed.
- If an adjustment method other than the 10% per year method is proposed, do parties believe it will be necessary to apply such a trigger on a different basis or different schedule for residential versus non-residential solar systems, or for small versus larger systems, in response to potentially different market segment trends for solar system costs?

5. FUNDING LEVELS

Recommendation:

- Annual budgets for the program will follow the revenue requirement schedule published in the January 2006 decision.
- Budgets will be available based on each utility service area's prorated share of funding collection (e.g. PG&E 44%, SCE 34 %, SDG&E 13%, and SoCalGas 9%).
- Budgets could be further divided based on customer class contributions to rates to determine the amounts available each year for award between/among the categories of solar installations and owners. However, as discussed below, this may be administratively difficult to match to the incentive structure and administrator assignments that are based on system size, and not customer class. We have no specific recommendation on this issue yet. *
- In the first half of each calendar year utilities and administrators (to the extent there are non-utility administrators) are free to move funds downward to small customer or system size categories (i.e. transferring funds from large customer funds to smaller customer funds) if demand warrants.
- During the second half of each calendar year, funds may be transferred across customer groups or size categories in any direction on a first come, first-served basis.
- As per the January 2006 decision, the CPUC can authorize administrators to borrow up to 15% of the next year's budget if demand exceeds current year funding. In such a case, and reflecting the overarching principle of managing CSI budgets and adjusting incentive levels in the face of excess demand, any incentives paid out of next year borrowed funds must be paid at the next-year incentive levels.

Rationale:

- We will let each year's funding level act as a "brake" on ratepayer contributions, so as not to use up excessive amounts of funding in earlier years when incentive levels are higher. A table below shows what the annual budget levels would be by utility service area and statewide.

- It is important to preserve equity across service areas by limiting funds available to each utility's pro-rata share of funding. [Question – CEC did NOT do this for their < 30 kW ERP program, where incentives were paid first-come, first-serve, regardless of utility service area. SGIP did impose the per service area limit. Is CPUC required to maintain the latter?]

- We believe it fair to give smaller customers at least the first half of each year to get their applications in without competing for funds with larger customers and systems.

- All current year funds must be exhausted across all customer types and sizes in a particular utility service area before next-year funds can be borrowed ahead.

- Borrowing ahead and using those funds at the next year's incentive level will lead to fluctuation in the incentive offered during individual program years whenever the annual budget is depleted. However, staff believes the tradeoff is reasonable to support a more dynamic balance between market demand and CSI incentive budgets.

IOU Annual Revenue Requirements for CPUC Portion of CSI, and Annual Limit of Funds that Would be Committed at Each Year's Incentive Levels

(in millions of dollars)

Year	PG&E	SCE	SDG&E	SoCalGas	Total	Incentive Funds (85% of Total)
2006[10]	$132	$102	$39	$27	$300	$255
2007	$154	$119	$45.5	$31.5	$350	$298
2008	$154	$119	$45.5	$31.5	$350	$298
2009	$154	$119	$45.5	$31.5	$350	$298
2010	$121	$93.5	$35.75	$24.75	$275	$234
2011	$121	$93.5	$35.75	$24.75	$275	$234
2012	$121	$93.5	$35.75	$24.75	$275	$234
2013	$77	$59.5	$22.75	$15.75	$175	$149
2014	$77	$59.5	$22.75	$15.75	$175	$149
2015	$77	$59.5	$22.75	$15.75	$175	$149
2016	$44	$34	$13	$9	$100	$85
Total 2007-2016	**$1,100**	**$850**	**$325**	**$225**	**$2,500**	**$2,125**
Total 2006-2016	**$1,232**	**$952**	**$364**	**$252**	**$2,800**	**$2,380**

[10] Funding for 2006 is in addition to existing SGIP solar-related budget of approximately $42 million.

Staff has not identified an effective way to reserve funds the first six months of each year for smaller systems versus larger systems (less than 100 kW systems and over 100 kW systems. An under 100 kW system could be put on any kind of customer -- even the largest ones.). It would be easier to do so for residential versus non-residential systems, although this still would not be perfect. For example, how are multi-family housing buildings of different sizes treated? Most will have individual "residential" meters for the units, and possibly "commercial" meters for common areas and other entire-building energy use?

Questions and Unresolved Issues:

- Parties are invited to comment on whether and how incentive "buckets" could be reserved by type of customer or size of solar system.
- Parties are invited to comment on how to maintain statewide uniformity of incentive levels offered, if solar applications reach their limits I one service areas, but not in all., requiring the "depleted" utility area to borrow against the next year's funds and offer a lower incentive level. Alternatively, should we simply require those applications to wait until the following calendar year?

6. INCENTIVE ADMINISTRATION

6.1 Large systems

Recommendation:

- Current SGIP administrators maintained for now
- Payments based on gross metered performance [the end user still gets paid the allowed NEM credit for power produced in excess of what can be consumed on-site]
- Credit ideally would be applied to a monthly utility bill (electric or gas). However we do not set this as a requirement, and recognize that each utility has different billing systems, with different capabilities, and varying costs associated with offering on-bill performance data and solar performance or NEM credits. Coordination would also be necessary with municipal utilities.
- Incentive payment over 5 years deposited into interest earning account in year that system is completed. This should assure lenders that payouts will be made as per performance agreement.

Rationale:

- Keep the status quo. Minimize any disruption in the market for larger systems.

Payment Frequency

Most parties did not provide significant comments regarding the ideal frequency of PBI payments. Only CalSEIA commented that a monthly PBI payment would be ideal. Monthly payment periods give customers relevant information regarding the performance of their systems in relation to their monthly energy bills. staff establishes monthly PBI payments included in the customers' energy bill as a meter technology working group goal described below in the Meter Requirements section of this document. Should monthly PBI payments not be possible at the start of the program, in the interim quarterly PBI payments will be made.

Questions and Unresolved Issues:

- Utilities should advise if on-bill payments of PBI could be in place by January 2007, or if an interim solution would require off-bill payments.
- On what frequency should solar PBI incentive payments, NEM credits, and system performance data be reported and/or paid? (monthly?, quarterly?, annual?)
- Utilities also should discuss feasibility and set-up costs for an on-bill PBI payment system.

6.2 Small systems, including Residential Retrofit and Small Commercial Program Administration

Recommendation:

- The type of entity desirable for administrator will have a demonstrated commitment to promoting solar development and innovation in California.
- This shall be a non-profit organization, under contract to one or more utilities.
- This administrator shall handle all applications for system sizes below 100 kW.
- PG&E shall conduct a competitive bidding process to select a third-party administrator, and prepare a short-list of leading candidates.
- A Commission advisory panel consisting of CPUC and CEC staff, and representatives from the Division of Ratepayer Advocates and TURN.
- The final decision will be made by the Assigned Commissioner.

Rationale:

Type of Administrator. Currently, CEC staff administers the residential/small commercial solar incentive program for projects under 30 KW in size, but by January 1, 2007, the Commission will consolidate incentives for residential retrofit and all non-residential solar projects into the statewide CSI program. The CEC will limit its new portion of the CSI program to new residential construction projects. Thus, a transition from CEC administration of the small solar incentives to some other administrative structure is necessary. In. D.06-01-024, the Commission announced it would consider expanding non-IOU program administration within the framework of the statewide CSI, specifically by engaging a non-profit entity to administer the residential retrofit portion. By that decision, the Commission indicated that the new administrative structure for smaller solar incentive applications should be carried out by an organization with demonstrated commitment to promoting solar development and innovation in California, and without any perceived or inherent conflicts that might discourage solar installations

There were three alternatives for administering the smaller solar system applications:

1. Administer all of the CPUC portions of the CSI using the existing SGIP administrative structure (i.e., the utilities and the San Diego Regional Energy Office (SDREO)), although this would not entirely meet the Commissions' stated desire to engage a new form of administrator
2. Utilize a competitive bidding process to select a third-party administrator of any kind for the small systems

3. Prescribe the type of entity (such as a non-profit organization) desirable for administrative responsibilities, and then utilize a competitive bidding process to select the appropriate entity.

Based on D.06-01-024, we believe it is the Commission's desire to utilize the third alternative above. That is, staff believes that the Commission's desire is to develop a specific set of criteria that a new administrator for the small systems portion of the CSI must meet. This is for several reasons.

First, the existing program administrators of the SGIP, with the exception of SDREO, do not have current experience or infrastructure prepared to handle large numbers of applications for small system incentives. The sheer number of applications involved in this portion of the program would threaten to overwhelm the existing utility infrastructure administering the SGIP. Moreover, we expect that like the CEC's current small system incentive program, there will be economies of scale in treating large numbers of more homogeneous solar incentive transactions.

In the case of the second alternative above, staff is not convinced that simply soliciting a private sector bidder (such as a consulting firm) to administer the CSI small retrofit portion will result in finding an administrator that is committed long-term to the success and sustainability of the CSI program.

Thus, staff intends that a third-party administrator proposal be solicited that has certain prescribed characteristics that we will discuss in more detail below.

This approach is consistent with the approach that the Commission adopted for energy efficiency third-party programs. The Commission, as part of R.01-08-028, considered various administrative options, including creating administrative entities, entering into contracts with existing entities, placing responsibilities on the IOUs, increasing Commission staff involvement, and a combination of these approaches.

In 2005, the Commission adopted a structure whereby the utilities solicit, select, and administer third-party energy efficiency programs. The Commission Energy Division staff, in collaboration with CEC staff, is responsible for measurement and evaluation of these programs.

As described in our December 2005 staff report, the Commission is familiar with non-profit entities as program administrators. By way of example, a non-profit entity, the San Diego Regional Energy Office, administers two solar incentive programs in SDG&E's service territory to serve residential and non-residential customers: the SGIP and the Rebuild San Diego Program. [11]SDREO also manages a number of publicly-funded energy efficiency, education, research, and technical assistance programs.

For the CSI, we will follow a similar approach where the Commission selects an

[11] Rebuild San Diego provides incentives to residential customers displaced by the Summer 2002 fires in that area.

administrator with a demonstrated commitment to promoting solar development and innovation in California, and without perceived or inherent conflicts to discourage solar installations. The CPUC will maintain the consistent agency oversight required to achieve a single statewide solar program.

Under our proposal, program administration for the residential retrofit and small commercial sector would be performed by a non-profit organization, under contract to one or more utilities. Because the funding for the CSI program is collected as part of the utility distribution revenues, the utilities will and must remain in fiscal control of the contract with a non-profit administrator.

Role of the Administrator. In addition, staff recommends that the new administrator be tasked with handling applications for all system sizes below 100 kW, which is consistent with our recommendation that systems 100 kW and over in size be given a performance-based incentive. By dividing the administration at the 100 kW cutoff point, it ensures that the administrator or the small systems will be offering incentives with the same basic set of rules, while those administering systems of 100 kW and above will also have a consistent set of rules for their incentives.

For purposes of the CSI, we distinguish between oversight activities performed by the Commission; administrative functions related to applications, information provision, and measurement and verification; and fulfillment activities performed by third party contractors selected by the administrator. This approach moves the program closer to the desired outcomes of clear responsibilities, broad participation in program delivery, and consistent statewide application of program eligibility rules.

Commission staff oversight responsibilities

- Participate in selection of small system program administrator.
- Select and oversee independent evaluation(s) and/or audit(s) of CSI program, including administration, peak demand reduction, and overall system performance.
- Provide an advisory function to administrator(s) on procedural and compliance matters.
- Coordinate periodic public workshops regarding the most effective approaches to the administrative functions.

Administrator duties

- Provide the primary point of contact for program applicants.
- Review applications to determine project eligibility.
- Monitor adherence to “proof of progress” milestones.
- Authorize payments for installed systems.
- Provide information, application forms, and program instructions on websites and in more traditional formats.
- Provide the Commission with monthly status reports on the program's progress.
- Maintain an interactive website to accept online applications, provide real-time information about application status, funding levels, number and types of systems

funded, and number of applications in progress and on a waiting list.

Implementation fulfillment, coordination, and outreach activities

- Coordinate with energy efficiency programs to assure each customer maximizes energy efficiency improvements prior to installing a solar system.
- Verify system installations.
- Process incentive payments.
- Conduct education and outreach, coordinating with existing marketing efforts, such as Flex Your Power and energy efficiency marketing.

The administrator must have sufficient access to the annual administrative budget, and to the incentive funds it will pay out in CBI and EPBB customer rebates. The Commission has already approved CSI program funding and a budget which is allocated among the utilities. The Commission will need to determine the amount of budget necessary for the small systems (<100 kW) to be allocated to this segment of the CSI (See Section 5 above). The Commission should direct the utilities to appropriate and distribute the administrative budget allocation to the non-profit entity no less than annually, and distribute the annual incentive budget in a manner that will not delay rebate payments to the solar project applicants.

Administrator Selection. We recommend the Commission direct one utility, PG&E, in consultation with CPUC and CEC staff, to initiate a competitive bidding process that would solicit contract proposals from existing and newly-formed non-profit organizations to administer the residential retrofit/small commercial portion of the CSI. In order to limit the potential for conflicts of interest, an appearance for conflicts, and to minimize program costs, the solicitation should require that bidders be certified 501(c) (3) nonprofit or governmental organizations.

Proposals should demonstrate the organization's ability and willingness to work cooperatively with energy efficiency program administrators and the CSI independent evaluator. They should also provide information describing their qualifications for managing this major funding program and how they plan to initiate the program expeditiously. The program administrator should identify all subcontractors that will be hired to perform administrative and implementation tasks.

More specifically, PG&E should require the following qualifications:

- Experience managing projects of a similar budget size, either regionally or statewide; fiscal and accounting capability for handling large budgets is a necessity.
- Experience managing energy-related programs, such as energy efficiency, solar, distributed generation, demand response and/or training, marketing, and outreach.
- Demonstrated logistical resources appropriate for the geographic region proposed to be covered, such as multiple offices, access to site inspectors in multiple locations, etc.

- Demonstrated logistical ability to track large numbers of applications (through software, databases.)
- Adequate staffing resources to address workload (or adequate plan for attracting those resources quickly).
- Technical staff with strong knowledge of solar system production, installation, and functioning.
- Marketing and outreach staff capable of handling large program outreach and a well thought-out plan for initial marketing of this portion of the CSI.
- History of good working relationships with utility counterparts.
- Ability to work cooperatively with CEC staff to transition small systems from CEC program to new administrator between the end of 2006 and the beginning of 2007.

We expect PG&E to retain the program administrator(s) in time for third party(ies) to assume administrative duties on December 1, 2006. The initial review and screening process will be conducted by the utilities, in close consultation with CEC and Commission staff. To facilitate the administrator selection process, non-profit entities may submit Statements of Interest to the Energy Division by July 31, 2006. Submittals may be sent via US or electronic mail service, or by facsimile to

Valerie Beck,
505 Van Ness Avenue,
San Francisco, CA 94102,
vjb@cpuc.ca.gov or 415-703-2200(fax).

Staff will share these statements with the CEC staff and utility representatives involved in developing the RFP.

The bidders will be narrowed to a short list of no more than four contenders. The Commission Energy Division staff will form an advisory panel to participate in the final interviews of these contenders, and make the final selection. The panel will be comprised of CPUC and CEC staff, and representatives from the Division of Ratepayer Advocates and TURN.

Administrative Selection Schedule

July 31	Statements Of Interest submitted to Energy Division
September 6	PG&E issues Request For Proposal
October 1	Administrative proposals submitted to PG&E
October 8	Short list submitted to Energy Division
October 15-16	Final interviews held by Advisory Panel at the Commission's San Francisco office
October 21	Final selection announced
November 15	PG&E completes contract
December 1	Administration begins

Questions and Unresolved Issues:

- At what intervals should the IOUs transfer administrative funds to the non-IOU administrator(s)?
- Does non-IOU administration also require selection of an independent fiscal administrator?
- As described in Section 2.2, solar projects installed in 2006 and 2007 receive significant tax credits. IRS rules consider solar rebates received through a "utility program" as non-taxable income. Does the proposed non-IOU administrative structure jeopardize or restrict a program participant from taking advantage of federal solar tax credits? Could a utility-funded program administered by a third party be considered a utility program under IRS guidelines?
- Are there reasons to re-consider the idea of a non-profit administrator, perhaps expanding consideration to utilities (if this would ensure better integration with energy efficiency programs) or to a for-profit administrator (if this would increase greater certainty of finding an administrator with the right skills and experience to operate this program as of January 2007)?

7. METERING AND DATA COLLECTION REQUIREMENTS

There are several interrelated issues here:

- Meter requirements to monitor and measure system performance
- Communications requirements to support remote retrieval of this information
- Alternatives for sharing the monitored information with the host site owner
- The potential for displaying solar system performance information on the utility bill

Meters

All participants in the CSI program must have a revenue-quality solar system dedicated meter. This is essential to tracking a system's output, Although this is essential for measurement and evaluation of systems on a PBI incentive, the meter also is important to providing performance feedback to owners of systems that receive an up-front EPBB incentive. While system performance is indirectly included in the customer's monthly electric bill, it may be difficult for customers to interpret their bills due to fluctuations in monthly energy demand versus PV system output.

Meters are available with accompanying software programs allowing customers to track their systems' output via computer. Revenue quality meters are necessary for accuracy and timely reporting of energy production. Eligible revenue-grade meters must use a web-based reporting system or a utility reading and reporting system and include the option to attach a wireless modem (potentially through an RS232 cable jack or RJ45 phone jack).

The cost of adding a utility revenue-grade meter to a PV system is modest. For single-phase residential-scale systems, digital display electronic meters are available at an installed cost of roughly $100. Three-phase commercial-scale meter costs are in the range of $200 - $500. For systems over 30 kW this equates to about 0.25% of system costs.[12]

Remote Solar System Performance Data Collection and Reporting

Energy Division staff desires to explore options for web-based meter reporting/data collection, as well as potential later on-bill system performance and incentive data reporting for the CSI Program. Energy Division recommends exploration of these web-based reporting options with the goals of reducing administrative costs and providing valuable system performance data to the customer and respective administrators; Internet based remote meter reading may provide a cost-effective approach for data collection and reporting. Web-based systems are accurate to plus or minus 5% and can provide the customer with real-time electricity production and usage information resulting in a potential for energy conservation. Web-based metering is a centralized data management

[12] "Designing A Performance-Based Incentive for Photovoltaic Markets", Bonneville Environmental Foundation, Thomas J. Starrs, July 2004.

tool providing independent, real-time monitoring of energy generation from a customer's PV system. Information from a digital meter is transmitted through a phone line system modem, wireless modem, or Internet connection to a data collection and management system. Access through a website or other vehicle is provided to the customer and administrators remotely. This data can be transmitted to the utility billing system for inclusion on the customer's monthly energy statement. There are at least three such web-based management tools currently available to customers.[13]

- For example, Automated Energy, Inc. recently provided Internet-based meter reporting services to the City of Palo Alto's remote meter reading pilot program. This Remote Reading Application enables users to retrofit existing Interval Data Recording (IDR) meters to communicate over the Internet. This eliminates the need for dial-up phone lines and reduces the risk of missed data. Costs for meters capable of communicating via the Internet are slightly more expensive, although more in line with three-phase commercial-scale meter costs. Communication and software costs for this approach might cost $30 to $50 per month.

Alternatives On the horizon

Other participants mentioned the near-term prospect of communicating meter systems that can be "baked" into the design of solar systems. SoCalGas and SDG&E suggested that a development effort could provide for remote monitoring of solar unit operating characteristics. Once developed, these systems would be available to vendors to integrate into equipment components or installation designs. Depending on customer preferences, the utility or a third party could perform the role of system monitor. Such technology offers the promise of smart monitoring arrangements that can provide prompt notification if a solar system's production falls short of targets, or stops entirely for any reason. This monitors unit safety, security, diagnostics, and maintenance conditions. Expectations are that this approach for communication and software might cost an average of $25- $50 per year.

Energy Division staff recommends that a work group of solar and metering communications industries, utility, and regulatory representatives convene to explore how technology and remotely transmitted meter data from the PV system can be best incorporated into third-party reports or into utility billing networks with the ability to display information on the customer's monthly energy bill. Recommendations regarding promising metering and communications techniques should be made to the CPUC staff and the CSI program administrators for their consideration. If the recommendations are found to be technologically feasible and cost-effective accepted, these recommendations could be reflected in future editions of the CSI program handbook(s). .

[13] "Decision on Pilot Performance-Based Incentive Program", California Energy Commission, January 2005.

7.1 Large systems > 100 kW

Recommendation:

1. All CSI participants must have a dedicated system meter to measure output.
2. The meter must have the following attributes:
   - revenue-grade.
   - use a web-based reporting system or a utility reading and reporting system
   - include the option to attach a wireless modem (potentially through an RS232 cable jack or RJ45 phone jack).
   - Systems 30 KW and above must be able to communicate remotely via the internet.

Rationale:

Energy Division staff proposes the above recommendations for meter requirements, data collection, and reporting are applied to large PV systems over 100 KW that wish to participate in the CSI program. A performance-based incentive payment requires a system dedicated revenue-grade meter in order to accurately measure generation of the PV unit allowing for incentive payments on a cents per KWh basis.

In addition, ED along with industry and utility representatives will be exploring options for including PBI payments and performance data within the applicant's energy bill. In order to have a cost-effective means of developing this reporting tool, meters that can communicate remotely are desirable; Internet based remote meter reading may provide a cost-effective approach for data collection and reporting. Web-based systems are accurate to plus or minus 5% and can provide the customer with real-time electricity production and usage information resulting in a potential for energy conservation.

Questions and Unresolved Issues:

- Utilities should advise if web-based on-bill reporting of incentive and performance data could be in place by January 2007, or if not, what kind of interim solution could be in place, such as a quarterly report that coincides with off-bill incentive payments.
- Utilities also should discuss set-up costs for web-based on-bill system data reporting.

7.2 Small systems < 100 kW

Recommendation:

- Staff recommends that all CSI applicants be required to obtain revenue-grade meters.
- Systems over 30 KW should have the ability to communicate remotely via the Internet as described above.

Rationale:

Due to lack of on-site maintenance staff, residential systems have a higher likelihood of having availability issues than large non-residential systems. It appears that the availability uncertainty primarily is due to a lack of information about the performance of their solar systems. The best solution is a good, low-cost system to inform residential customers how well their systems are performing and, if their system has a problem, to notify them and advise what to do about it.

At the March 16th, 2006 CSI workshop participants indicated meters capable of communicating via the Internet are cost-effective for PV systems 10 KW and above. The definition of cost-effective was 1% of total system costs.

Questions and Unresolved Issues:

- ED would like feedback regarding the applicability of requiring meters capable of communicating remotely for solar systems sized between 10 - 30 kW, including cost information for these systems.

7.3 Net Energy Metering Considerations

Recommendation:

- Utilities are required to file estimated cost impacts for providing net energy metering to accommodate CSI participants, up to 3,000 MWs, and address other questions posed in the "Questions" box below.

Rationale:

Pending legislation proposes to increase California's net energy metering cap from .05% of statewide aggregate installed capacity to 2.5%. Traditionally, net metering has been assumed to be a necessary component of wide-scale solar proliferation. An eligible customer-generator up to 1 MW receives the bundled retail rate for solar production to offset onsite consumption of utility-provided electricity. Net energy metering customers

are exempt from interconnection and standby charges, and pay the public goods charge and DWR-related surcharges based on net consumption. These costs are shifted to utility ratepayers.

The CSI will have the intended effect of increasing solar installations over the next ten years, potentially up to 3,000 MW by 2017. Policymakers require more information regarding the costs and benefits to subsidize up to 3,000 MW through net metering. The Commission is already in the process of developing a cost-benefit methodology to calculate the attributes of solar and other DG projects. As part of this effort, the Commission should require parties to provide estimated impacts of net energy metering (NEM) under various scenarios.

Questions and Unresolved Issues:

The utilities and other parties with this knowledge are should address the following:

- What percentage of SGIP projects participate in net metering?
- How much energy (versus their MW system capacity) is credited via the NEM mechanism for NEM participants? What % of renewable DG customer gross demand is credited back?
- What does this amount to in terms of % of each utility's system wide retail sales?
- How critical is NEM to eligible projects? How does the credit mechanism affect a project's economics?
- Provide estimated annual costs not paid by NEM customers since the maximum system capacity requirement was increased from 10 kW to 1 MW. Estimate the impact on other ratepayers if the NEM cap is increased to 2.5% and 5% of aggregate peak demand.
- If the NEM cap were increased to meet the CSI goal of an additional 3,000 MW of solar capacity added in 2006-2016, what percentage of total gross peak electrical demand would be met by solar technologies and at what cost? Parties should include and identify assumptions regarding the percentage of CSI projects (1 MW or less) that would be eligible for NEM, and what portion of their gross solar production would receive a NEM credit.
- Taking the potential benefits of NEM-eligible DG into account, what is the net subsidy to NEM customers? Calculations should use E3's recently-updated avoided costs, and at minimum, should include transmission, distribution, peak energy production, and diversity.

8. ENERGY EFFICIENCY REQUIREMENTS TIED TO SOLAR INCENTIVES

Recommendation:

- Program participants must obtain a building audit through an online, telephone, or onsite utility program, or through a non-utility provider.
- The audit requirement is waived if the home or building already is energy efficient as demonstrated via LEED-certification, Energy Star-certification, or having a previous acceptable energy audit report during the past 3 years.
- CSI participants are encouraged, but not required at this time, to make the recommended energy efficiency improvements .

Rationale:

In D.06-01-024, the Commission determined that energy efficiency audits are required for retrofit buildings to participate in the CSI. The manner in which the audit requirement is implemented must provide adequate signals to promote efficiency improvements concurrent with solar installations, but not act as a barrier to either action. At a minimum, a building audit must establish an efficiency baseline, and educate the applicant regarding the increased efficiencies and economic benefits these improvements provide.

PG&E, SCE, SDG&E, and SoCalGas provide no-to low-cost online, telephone, and onsite energy efficiency audits for residential, commercial, and non-residential customers. Some audit programs focus on public buildings, schools, or specific industry sectors. We expect that the utilities will continue to offer these programs throughout the CSI ten-year implementation period (though, of course, improvements may be made to the audit programs). All audit programs should be continuously available and funded by the utilities, and the program administrators should work together to facilitate seamless coordination between the audit programs and the CSI.

For purposes of the CSI, program participants may choose from among the applicable online, telephone or onsite audits provided through the IOU's energy efficiency programs. We expect that the IOU-sponsored telephone and onsite programs can accommodate many, but perhaps not all, of the increased audit requests due to this CSI requirement. Therefore non-utility audit solutions are also allowed. Applicants will receive an automatic waiver of audit requirement if the home or building shows it is already energy efficient via LEED-certification, Energy Star-certification, or previous acceptable energy audit report in past 3 years.

Applicants are required to submit audit results to the CSI program administrator during the application process. At this time applicants will be encouraged but not required to make building efficiency improvements to be eligible for CSI incentives..

Questions and Unresolved Issues:

- What certification or audit protocol should we accept for acceptable energy audits by providers outside the utility audit programs?
- In the future, should the Commission consider reducing the authorized solar system size (e.g. to one-half the otherwise allowed size) if a building has not undertaken recommended efficiency measures that have a simple payback of less than 3 years?

Appendix A

On March 16, 2005 the CPUC held a workshop on performance based incentives, which also included discussion about the federal tax credits recently enacted as part of the Energy Policy Act of 2005. Prior to the workshop, the CPUC received proposals from the following parties regarding how to structure a PBI program:

- Electric Utilities
  - Pacific Gas & Electric (PG&E)
  - Southern California Edison (SCE)
  - San Diego Gas & Electric/Southern California Gas (SDG&E/SoCalGas)

- Industry Representatives
  - PV NOW
  - Americans for Solar Power (ASPv)
  - California Solar Energy Industry Association (CalSEIA)
  - Golden Sierra Power
- CPUC Division of Ratepayer Advocates (DRA)

The workshop included an introductory presentation on PBI design issues by Tom Hoff of Clean Power Research, a presentation by Brandon Rose of the California Energy Commission (CEC) regarding the CEC's pilot effort in PBI, and a presentation by Ryan Wiser of Lawrence Berkeley National Laboratory regarding the implication of the recently enacted federal tax credit for installation of solar. [14] In a series of panel discussions, parties responded to questions from CPUC staff and members of the audience regarding their proposals.

Categorization of Incentives Proposals Submitted at PBI Workshop

Category	Utility				Industry Representative			Consumer Advocate
Customer Type	**PG&E**	**SCE**	**SDG&E/ SoCalGas**	**Golden Sierra Power**	**PV Now**	**CalSEIA**	**ASPv**	**DRA**
Commercial								
PBI	X	X	X	X			X	
CBI								X (New Construction)
Hybrid					X	X		X (Retrofit)
Residential								
PBI			X	X			X	
CBI	X	X			X		X (EPBB)	X (New Construction)
Hybrid						X		X (Retrofit)

[14] All proposals submitted by parties and presentations from the March 16th PBI workshop are available on the CSI Web site.

Appendix B

Summary of Proposals Submitted for March 16, 2005 PBI Workshop (Source: LBNL)

Party	Customer Class	Type of Incentive	Payment Period	Payment Structure	Changes in Incentive Rates over Time	Basis for Determining Incentive Amount	Incentives Should be Reduced to Reflect Federal Tax Credits?	Alternatives Considered and/or Other Details
PG&E	Non-Residential	PBI	10 yrs	Flat PBI rate for each project over its payment period	Incentive rate declines over time for projects installed in later years, according to incentive schedule in CPUC order	▪ Set at a level such that NPV of payment stream is no greater than CBI in CPUC order ▪ Use a reasonable discount rate that appropriately incorporates all stakeholders' risks	-	▪ If over-subscription becomes an issue, should conduct auctions ▪ Rather than a flat rate, could "front- and back-load" incentives over each project's 10 yr payment period ▪ Supports consideration of a feed-in tariff to combine PBI and net metering into a single incentive structure that declines over time
	Residential	CBI	n/a	-	-	-	-	▪ Possibly move to PBI for residential down the line

Party	Customer Class	Type of Incentive	Payment Period	Payment Structure	Changes in Incentive Rates over Time	Basis for Determining Incentive Amount	Incentives Should be Reduced to Reflect Federal Tax Credits?	Alternatives Considered and/or Other Details
SCE	Non-Residential	PBI	5 yrs (or less, for projects with >20% capacity factor)	Flat PBI rate for each project over its payment period	Incentive rate declines over time for projects installed in later years, according to incentive schedule in CPUC order	▪ Convert CBI levels in CPUC order into PBI rate assuming a 20% capacity factor ▪ Total payment per project capped at the equivalent to the CBI levels in CPUC order (i.e., systems performing at >20% capacity factor would receive the same total incentive as systems with 20% capacity factor) ▪ Proposed rate schedule converts CBIs to PBIs.	Yes	-

Party	Customer Class	Type of Incentive	Payment Period	Payment Structure	Changes in Incentive Rates over Time	Basis for Determining Incentive Amount	Incentives Should be Reduced to Reflect Federal Tax Credits?	Alternatives Considered and/or Other Details
	Residential	CBI paid over time	5 yrs	Half of CBI paid upon installation; remaining half split into equal annual payments over five yrs, following annual inspection to verify continued system operation	Same as above	▪ Based on CBI rates in CPUC order ▪ Adjustment to annual payments needed to account for time-value (general statement, no details on how)	No	-
SDG&E/ SoCalGas	Did not specify	PBI	Seems to suggest that it should be based on the usable life of the facility	Flat PBI rate for each project over its payment period (possibly moving to a time-differentiated pricing structure in the long run)	-	-	Yes	▪ Rather than a flat PBI rate, a portion of total incentive could be paid out over a short time frame

Party	Customer Class	Type of Incentive	Payment Period	Payment Structure	Changes in Incentive Rates over Time	Basis for Determining Incentive Amount	Incentives Should be Reduced to Reflect Federal Tax Credits?	Alternatives Considered and/or Other Details
Division of Ratepayer Advocates	Non-residential retrofit	CBI+PBI	3 yrs for the PBI (although they say 4 yrs)	Flat PBI rate for each project over its payment period, in addition to up-front CBI	Rates should decline 10% per year for 2007-2009; no discussion of later years	▪ In their example, the CBI is 25% of $2.8/W and the remaining 75% is converted into a PBI rate, based on 3 years of output, 18% capacity factor, and 0% discount rate	-	-
	Residential retrofit	CBI+PBI	They say 2 yrs for the PBI (but probably mean 1 yr)	Same as above	Same as above	▪ Same as above	-	-
	Non-residential new construction	CBI	n/a	$2.8/W	No change incentive rates for 2007-2008; no discussion of later years	▪ The incentive should be based on the connected load of installed central A/C and lighting	-	-
	Residential new construction	CBI	n/a	Same as above	Same as above	▪ The incentive should be based on the connected load of installed central A/C	-	-
ASPv	Non-residential projects >100kW	PBI	10 yr	Front-loaded PBI rates; i.e., the PBI rate declines annually over the payment period for each project	Declines over time for projects installed in later years	▪ ASPv developed a model to calculate optimum PBI rates	Yes	-

Party	Customer Class	Type of Incentive	Payment Period	Payment Structure	Changes in Incentive Rates over Time	Basis for Determining Incentive Amount	Incentives Should be Reduced to Reflect Federal Tax Credits?	Alternatives Considered and/or Other Details
	Non-residential projects <100kW	Adjusted CBI or choice between Adjusted CBI and PBI	10 yr (for PBI, if offered)	PBI payment structure is same as above; Adjusted CBI is an up-front payment	-	▪ CBI is adjusted based on design, orientation, installation, shading ▪ If a choice is offered between adjusted CBI and PBI, the relative levels of the CBI and PBI should reflect the impact of performance risk on customers' discount rate	Yes	-
PV Now	Non-residential	CBI+PBI	5 yrs for PBI	Flat PBI rate for each project over its payment period, in addition to up-front CBI. Rates vary by year of installation.	Total incentive (CBI+PBI) declines over time for projects installed in later years, but PBI becomes an increasingly larger fraction of the total (and thus in some years increases relative to the prior year)	▪ PV Now developed a model to calculate optimum incentive rates	-	-
	Residential	CBI	n/a	CBI paid up-front	Declines over time for projects installed in later years	▪ Same as above	-	-

Party	Customer Class	Type of Incentive	Payment Period	Payment Structure	Changes in Incentive Rates over Time	Basis for Determining Incentive Amount	Incentives Should be Reduced to Reflect Federal Tax Credits?	Alternatives Considered and/or Other Details
CalSEIA	-	Generally favors hybrid approach; cautious about PBI for small systems (<30 kW)	Multiple payment terms (duration and amount) should be offered	Flat and declining PBI rates could both be offered; payments should be made monthly	PBI should be phased in over time as an increasing portion of total incentive	-	-	▪ Market research should be conducted in advance of the program, to gather data on customer reaction to potential PBI structures ▪ Continued PBI pilots should focus on large systems (>250 kW)
Golden Sierra	-	PBI	-	-	-	▪ Suggest that the PBI should be 10% more than the current CBI ($2.80/W)	-	-