PERFORMANCE BASED INCENTIVES FOR PV VIA AUCTION

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ABSTRACT

A Performance Based Incentive (PBI) for photovoltaic systems allocated via auctions at regular intervals could maximize public benefit from public funds and maintain program consistency and stability for the industry.

1. INTRODUCTION

The German EEG has been a tremendous stimulus to the growth of PV in that country. This success has generated calls for a similar PBI in the United States. California has set aside $10 million to experiment and develop this concept. There are many advantages to PBI schemes. Chiefly, they reward the systems that produce the most output.

A criticism of the German program is that at times, the incentive may have been set too high, causing too much demand, quickly using up available funds, and causing a temporary stoppage of the program. If the incentive was too high, then less than the maximum public good was extracted from the available funds (a lower incentive could have been offered, resulting in the wider distribution of funds to more systems). Running short on funds by over-stimulating demand also caused a lengthy pause in the program, disrupting efficient business processes and planning.

A similar problem has appeared in the California Public Utilities Commission Self Generation Incentive Program in 2004 and 2005. In 2004, funds for the year were completely reserved in less than three months. On the first day when the program was restarted in 2005, PG&E's (the public utility for the northern part of California) part of the program received applications for 14 times as much money as the program had allocated, not counting carry over from 2004[1].

1.1 Goals of the Program

The goals of a photovoltaic incentive program should include:

1. Maximize public benefit derived from or inspired by public incentive funds
2. Maximize long-term industry stimulation with available funds
3. Reward and encourage only the most desirable and best performing technologies and installations
4. Maintain predictability and consistency of incentives to allow for industry investment and growth

The oversubscription of programs indicates that the level of incentive is too high, failing to maximize the public benefit. The resulting year-long halt in the program hinders industry stimulation, forcing the players to consider conservative growth strategies due to lack of visibility into the future. Finally the current "buy-down" incentive programs do little to maximize system performance. The question becomes "What is the right amount of incentive and how best to apply it?"

2. PERFORMANCE BASED INCENTIVES VIA AUCTION

2.1 Maximize Public Benefit

An auction of the incentive funds to the bidders willing to install the systems for the lowest incentive per kWh produced will maximize the expected energy production for a given funding pool. It will also stimulate the largest amount of capacity to be installed, giving maximum industry stimulation.

Installed costs in the PV industry have been said to be dropping 5 to 7% per year. Electric rate inflation is between

3 and 7% per year. If it is assumed that the economic payback or rate of return needs to be the same from year to year to attract investors, then a lower incentive will be needed in future years due to the improving economics due to dropping costs and rising benefits (savings).

An economic analysis was conducted to determine both the estimated amount of PV that could be installed with $60 million per year, and the phase out of the incentive. It was determined that an incentive of less than one cent would be required in 2015 to stimulate PV sales with the same rate of return as today[2]. A $60 million annual incentive would support the installation of 14 MW of PV this year and 745 MW in year 2015. See Figure 1 for expected installations vs. needed PBI level thru 2015.

2.2 Encourage the Best Performing Installations

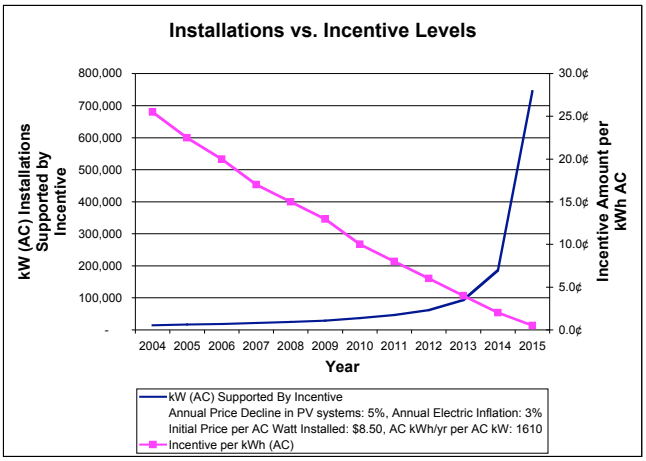

Fig. 1: Installations vs. Incentive Levels thru 2015

If the incentive is performance based, it will encourage the best systems in the most suitable locations with the greatest likelihood of maximum performance. This will be particularly true if it is auction based, because the investors and installers will need to seek these best locations in order to be able to bid lowest for their needed incentive.

2.3 Maintain Incentive Predictability For Industry and Investors

If the auction is conducted periodically, and the funding pool divided and allocated to each of the auction periods, then the supply of funds will be assured to last for the duration of the program and be available in completely predictable amounts. Winning bidders get to move ahead with their projects. Losing bidders get to try again in the next period. An auction interval of 1 to 2 months should be sufficiently frequent to allow the regular submission of bids and awarding of funds, without creating long delays for the bidders or an unmanageable task for the managing agency. It also allows changes to be effected in short order as unforeseen complications arise. The incentive program should last for at least 10 years so that suppliers and installers can make investments based on the assuredness of the future market.

The cost of such a long-term program is completely predictable, as it is assured that all the funds, but no more, will be spent to implement the program.

3. IMPLEMENTATION OF THE INCENTIVE

3.1 Dutch Auction Bidding

A "Dutch Auction" would allow distribution of an equal incentive to all winning bidders. Winning bidders would be determined in bid value order. The total number of winners would be based on estimated aggregate production of the low bidders, sequentially adding the next higher bid until the funding limit for the period is reached. Each system bid would estimate production by an approved method. There would be little incentive to "fudge" the production estimate, since the actual incentive paid would be based on metered and verifiable performance. Penalties and limits could apply for significant errors over and under estimated production.

3.2 Standard Auction Bidding

A standard low bid auction may also be an acceptable method of determining the winning bids. It would further optimize the total energy produced, but would create complication because each winning system would have a unique production (per kWh) incentive value, rather than a single production incentive uniform across all systems for each auction period. The increase in total installed capacity and production may not be worth the added complication.

To maintain the distributed generation benefits of PV, an annual generation limit of 200% of site recent historical consumption could be an upper limit on system bid size.

3.3 Incentive Differentials for Sub-Categories

If different configurations of systems or installations are preferred, bonuses or penalties could be applied to the incentive amount. For example, a "Brownfield" ground mount system, BIPV, or roof mounted system could receive a 20% PBI bonus over a Greenfield ground mount system.

Large Greenfield ground mounted systems might be disallowed altogether in order to encourage only systems that have a distributed generation nature by being close to the load.
Different groups need different incentives. For-profit commercial businesses, residential, and non-profit /

government entities get different tax and lending treatment, which affects their financial results. In order to create an incentive across all market segments, the incentive pool should be divided for separate bidding among each group. There may be other distinguishing factors that need to be considered. Methods for distinguishing groups could be tax filing status and/or utility rate schedule.

3.4 Minimum Incentive Levels

Sales to certain customer groups may be difficult for auction-based incentives. Residential sales, for example is often more of an emotional, rather than a hard financial decision. Not knowing what the incentive might be may make it difficult for the residential solar salesman to close the sale.

Establishing a minimum level of PBI for those who don't want to go into the auction might offer an alternative. Some may want to try the auction to get a larger PBI, while others may want the assurance of a guaranteed PBI level in order to move forward with the decision. The state (agency who grants the PBI) could adjust the PBI minimum periodically – every 3 months or so. Initially, it could start low, then, for example, be raised to a percentage of the average of the last several months.

3.5 Limitations

As stated in 3.4, auction-based incentives might not work well at all for residential customers as it could cause a lot of difficulty. Uncertainty makes sales difficult. It may be inappropriate to apply an auction-based system to residential systems. The incentive system should become more clear and transparent after each successive auction. The first few months may be volatile, but over time, the market should stabilize.

3.6 Pay Incentives Out Over Time

The greatest assurance of long-term high performance of the system is to pay the incentive out over the longest period of time feasible. This motivation must be balanced by the managerial difficulties and added expense of tracking systems over many years. It seems reasonable to consider paying an incentive over at least 5 years, but perhaps not longer than 10 or 15 years.

Another benefit of having a longer-term payment period is the data collection and long-term system performance tracking data that will become available. It will also motivate system owners to pay closer attention over the longer term, and invest in maintenance and repairs.
It would not be appropriate to aggregate the payments to a Net Present Value and pay the incentive contemporaneously with the system's installation, since that would have the same drawbacks as a buy-down program in that there is less incentive to ensure system performance. If initial cost is a barrier, equity financing is usually available. If interest rates rise, solar system investors will factor the additional cost into their needs in terms of bidding on the incentive amount.

3.7 Gaming Risks and Safeguards

There is a risk that some players may try to "game" the system. The program will need to have a governing oversight body that has the flexibility to modify the rules to counter such gaming. One example of gaming might be re-application for a project at higher incentive levels after the project has won and had funds reserved. This might be done in hopes of securing a higher incentive, with the intention of canceling the lower original award. A careful project tracking system would need to be put in place to guard against abuse. Another safeguard might be to require a bid deposit at the time of bidding. The deposit becomes non-refundable for projects that win the bidding in the event of cancellation or lack of follow-thru. This might help to reduce speculative bidding.

3.8 Net Metering and REC Ownership

A system meter will be required to record and track system performance, and provide a point of verification and audit. How the utility interconnection is made will depend on net metering being a legal option. If net metering on the utility revenue meter is allowed, then the incentive required to satisfy the investor will be less.

However, if net metering is disallowed, the system owner will lose a valuable benefit of system ownership, which will need to be made up in the form of a higher incentive payment in the PBI. This will be reflected in the PBI auction bids.

The net metering incentive is a form of subsidy that is paid by the utility in the form of reduced utility revenue. It is the author's contention that the utilities will respond more favorably to solar if it doesn't affect their revenue stream. If net metering is not available, it will cost additional program incentive dollars to fund the PBI or reduce the total amount of solar capacity installed for the same funding level.

In California and other regions that have graduated, tiered electricity pricing (the greater the usage, the higher the incremental cost per kWh), removing net metering will have a negative financial impact on large residential users. This may homogenize and democratize the market, giving a roughly equal payback to large and small users alike.

Removing net metering would level this playing field, however, it might have negative effects not contemplated here. The author is not suggesting the removal of net metering for PBI awarded systems, only pointing out some of the issues.

Renewable Energy Certificates (RECs), depending on who is awarded ownership of them, will affect the economics of the solar investment and the incentive needed. However, their effect is to add to the PBI. Therefore, it seems to make the most sense to award the RECs to the system owner, giving them even more incentive to maximize system performance. However, the net effect may be a wash.

4. BENEFITS

A PBI mechanism on an auction basis will stimulate partnerships between investors and installers. There will be a regular and constant push for installers and suppliers to innovate to keep the costs coming down, and for investors to be willing to accept ever more moderate rates of return on their investments as they grow in confidence that these systems actually perform as predicted.

An auction-based incentive will allow trends to be observed based on true market behavior. The true right amount of incentive will be found and used. This will also evolve automatically as market conditions require or as new technologies present opportunities for additional savings.

CONCLUSION

A Performance Based Incentive for photovoltaic systems allocated via auctions at regular intervals could maximize public benefit from public funds and maintain consistency and stability in the program for the industry. This would provide the best opportunity for the industry to grow, while providing strong incentives for all players to drive costs down and increase system performance.

RECOMMENDATIONS

Examination of how other markets apply similar concepts is warranted, such as the Google stock market Initial Public Offering, which was offered via Dutch auction.

The stock market is an auction-based system. Is there enough volume in solar PBIs to make a fluid and liquid market? Could someone arbitrage, that is, bid for a block of PBIs, then create a secondary market? Could PBIs be traded like the stock market, or could they be offered for retail sale so that a vendor can know and offer them to their customers for a fixed amount? This might be a bit like buying an option to get a PBI at a predetermined price. This probably won't make sense until the market gets very large, and only if the rules allow. However, it might create flexibility in the marketplace to allow transactions to happen more smoothly.

REFERENCES

(1) Pacific Gas & Electric Company, Self-Generation Incentive Program web page, http://www.pge.com/selfgen/, February 11, 2005

(2) Black, A., Financial Payback on California Solar Electric Systems, Proceedings of the 32nd ASES Annual Conference, The American Solar Energy Society, July 2003