Arizona Public Service: Incentives for Photovoltaic Distributed Generation

Recommended Reductions and Modifications to Incentive Structure

Submitted To:

Arizona Public Service Company

Produced By:

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About VEIC:

Vermont Energy Investment Corporation (VEIC) is a non-profit based in Burlington, Vermont, with more 180 professional staff and over 22 years of experience in renewable and energy efficiency markets. VEIC's mission is to reduce the environmental and economic impacts of energy use. To learn more about VEIC and our consulting work visit www.veic.org. For this assignment, the VEIC team includes:

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I. Executive Summary

Arizona Public Service Company (APS or the company) has been supporting the growth of photovoltaic (PV) and other distributed generation technologies through direct consumer rebates since 2002. The Company's efforts in this area have been consistent with corporate and state objectives for promoting the growth of renewable energy resources as a means for gaining economic, energy security and environmental benefits.

In the past two years growth of participation in APS's Renewable Energy Incentive Program (REIP) has been very strong, particularly for grid connected residential PV systems. Indeed, as documented, further in Section III of this report, 2008 and 2009 both experienced more than 100% annual growth, with participation rates in the first quarter of 2010 showing no signs of slowing down. Thus, in tough economic times, the APS initiative is clearly helping to promote rapid growth in Arizona's solar market.

The rapid growth in the number of residential grid tied PV systems installed now places APS amongst the market leaders. Section IV of this report provides a population normalized comparison of system installations per month for 4 comparative markets. APS leads all of the cases analyzed, including California and New Jersey, the two largest state markets for PV in the United States. The benefits of this type of growth include a growing local infrastructure – with job and other economic impacts, lower installed costs, greater consumer awareness, progress towards renewable portfolio standard goals and reduced environmental impacts.

At the same time, this level of growth can create problems. As documented in this report, the current incentive levels and program participation rates risk having the program run out of money available for new incentive reservations in the mid 2nd Quarter of 2010. Without funding for new incentive approvals available, the risk is that business development for new systems and consumer demand for new systems may be put on hold for 7-8 months, causing significant disruption to the market's progress and frustration for consumers and business owners.

In response to the current situation, APS asked Vermont Energy Investment Corporation (VEIC) to conduct a rapid analysis of residential grid-tied PV incentive levels and structure and make recommendations for immediate actions that can eliminate or minimize the potential market disruptions.

Based on market conditions and comparative analyses with other states, that are presented in this report, VEIC recommends APS and the Arizona Corporation Commission (ACC) consider the following changes to incentive levels and incentive structures:

1) **Reduce incentives for residential grid tied PV systems (immediately effective on Commission approval) to $2.30/Watt DC and then to $2.10/Watt DC once 4 MW of new commitments @ $2.10/Watt have been made.**

2) **Divide the remaining 2010 REIP uncommitted funds into two funding cycles; funding cycle 1 would run from May 1-Aug 31; funding cycle 2 would run from Sept 1-Dec 31.**

3) **Reflecting lower overall installation costs, tier rebates so that larger projects get proportionally less rebate than smaller projects.**

4) **Remove the 50% of installed cost maximum on incentive payments, and rely on market competition and pricing to continue trends towards lower installed costs.**

These recommendations provide an immediate program response and adjustment to unsustainable market/program budget conditions. If implemented, this adjustment will help to minimize potential market disruptions, and establish a framework for a multi-year capacity block incentive structure (described in preliminary format under Section VI of this report). The recommendations in this report are consistent with the overall design principles that support sustained orderly market development and growth.

The growth in APS's REIP program, and more generally, in Arizona's renewable energy markets have been very strong in the last few years. The immediate actions recommend in this report should help to maintain this positive market momentum. As detailed in Section V of the report there may be some periods during 2010 when new incentive reservations are not being issued. The strategies recommended will limit the duration of these periods, and also distribute them more evenly across the calendar so that consumer demand and business sales and installation cycles are less impacted.

When coordinated with complementary strategies and analyses addressing other technologies and market sectors, the recommendations for residential grid tied PV incentives presented in this report should provide solid ground for consumers and businesses to continue their participation in Arizona's growing market for distributed renewable generation.

II. Introduction and Background

Residential roof-tops around the country are becoming a more and more common host for photovoltaic systems that help to off-set or supplement the customer's consumption of electricity. Policies and strategies such as net metering, direct customer rebates, federal and state tax incentives, and renewable portfolio standards –with distributed generation or solar specific set asides – have driven market growth, which is still in its nascent stages.

APS is emerging as a leading supporter of growth in this market through both the incentive and the non-incentive strategies and services provided through the REIP program. The program has been running successfully since 2002, experiencing significant growth, particularly in the last few years. The REIP program has not had an established mechanism for reducing program incentives as the market grows.

In March of 2010, APS requested assistance from the Vermont Energy Investment Corporation (VEIC) to conduct a rapid market analysis and make recommendations on incentive levels and structures. VEIC is a national energy efficiency and renewable energy organization with headquarters in Burlington, Vermont and offices in Massachusetts and New Jersey. VEIC is known for our cutting-edge work on energy efficiency and renewable energy. Founded in 1986, VEIC has an annual budget of $35-40 million and a staff of 170. We have served a wide variety of public and private sector clients throughout the U.S., in 6 provinces in Canada, and in 5 European and Asian countries.

VEIC is a national leader in the design, development, and implementation of renewable energy programs and initiatives for utilities throughout the U.S. VEIC has a talented team led by senior managers, each of whom has more than 20 years of experience in the efficiency and renewable energy industry. The VEIC Renewables Team has direct experience identifying opportunities for integrating efficiency with distributed and customer-sited solar electricity, solar heating, wind, biomass, combined heat and power, geothermal, and energy storage technologies. In addition, we specialize in the design and implementation of comprehensive, coordinated, community-based efficiency and renewable energy programs. VEIC has direct experience working with utilities and power authorities to review and select among the variety of program designs that can be used to achieve RE market development goals. These include: direct rebates for customer-sited systems, utility procurement of systems for location on either the customer or utility side of the meter, financing, and tariff supplements.

Since its inception in 2007, VEIC staff have managed and processed all RE incentive payments for more than $235 million of activity for the New Jersey statewide Clean Energy Program, resulting in more than 100 MW of installed PV capacity throughout the state. This level of activity in the program and the ability of our 4-person New Jersey staff to manage the program and process that quantity of incentive payments makes VEIC a national leader in direct RE program implementation. VEIC has also managed the Vermont Solar and Small Wind Incentive Program since its inception in 2003, administering $5.6 million in incentives for PV, solar hot water, small wind, and recently micro-hydro installations.

Objectives

The fundamental objective of the assignment is to provide analysis of residential solar incentive levels considering customer financial returns, and recommend a reduction in incentive levels and/or incentive structures that will help the REIP continue to support sustained orderly market growth and development, while maintaining the ability of the program to stay within current program year budgets.

Once the VEIC team reviewed the program demographic database – the focus for this report was sharpened – to concentrate on the residential grid tied PV market and related incentives. As summarized in Table 1 while the total number of residential solar hot water systems and residential grid tied PV systems are roughly equivalent the incentive payments (and therefore budget impacts) are completely dominated by grid tied PV by more than a factor of 10:1 compared to hot water.

Table 1: Residential REIP Solar Participation and Incentives

	Number of Installations 2002-2010	Total Incentive Payments 2002-2010 $Million
Residential Grid Tied PV	3,999	$72.2
Residential Solar Hot Water	3,554	$6.8
Off Grid PV	480	$1.7

Given the compressed time horizon for this assignment the VEIC team has therefore focused the analysis and recommendations in this report on the grid tied PV market.

Methodology & Structure of Paper

The analysis conducted for this report consists of four primary elements:

1) Review and analyze program data to look at participation, system demographics and current trends. The primary goals of the assessment will be to examine installed costs (acknowledging that current incentive designs may be allowing for artificially above market pricing), system sizing, participation by technology, and the activity rates for new applications and completions. Section III of this report presents our analysis and findings.

2) Conduct an analysis of customer financial economics. Due to time constraints the current report is focused on residential grid tied PV systems. Our analysis includes all available program and tax incentives, net metering and residential rates for APS customers. The analysis assesses customer returns with current program incentive of $3/Watt, and with the recommended lowered incentive levels of $2.30 and $2.10/Watt. A comparative analysis of the financial returns for APS customers installing a system in 2007 - before changes in the federal tax incentives – and in 2010 is also presented.

3) A comparison with 6 other relevant markets provides context for the current and recommended incentive reductions proposed for APS. The results of this analysis, presented in Section IV, suggest that customer financial returns are moderately strong for APS and will remain favorable under the recommended incentive reductions.

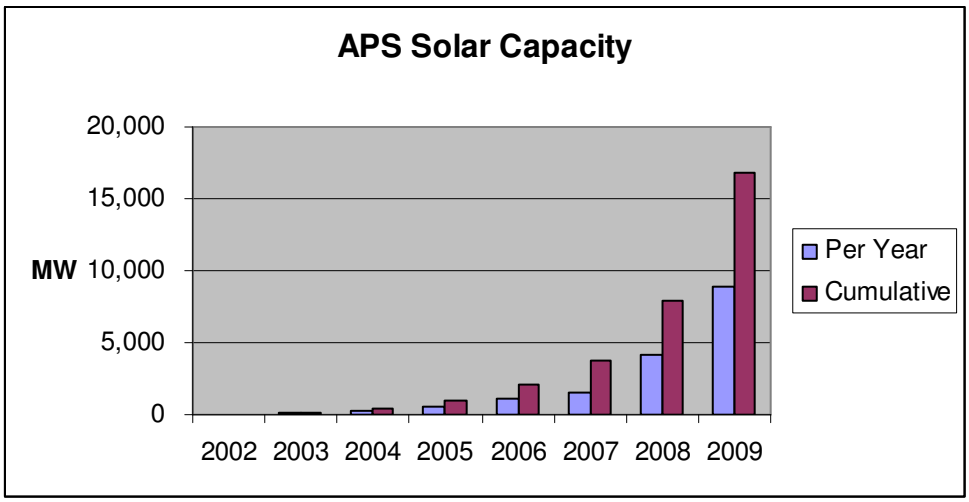
4) Section V provides a detailed set of recommendations for the reduction and restructuring of the incentives for residential grid tied PV systems. This section also provides rationale and justifications citing the analysis and experience from other jurisdictions. The recommended incentive modifications will help to address the program's current budget challenges, and provide a platform for continued market growth and development.

III. Program Description

Analysis of Database and Program Demographics

With more than 16 Megawatts of residential grid tied capacity now installed, APS is experiencing exponential growth in its residential solar PV market.

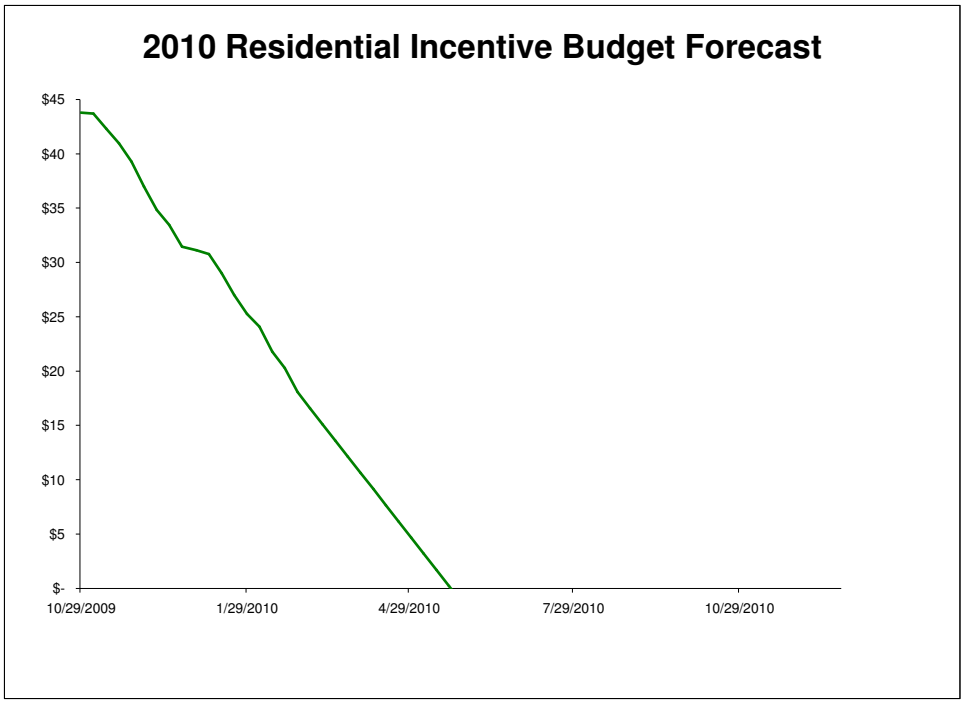
Figure 1: Annual Incremental and Total Residential PV Installed



In 2008 and 2009 in particular, despite a very difficult economic environment, annual installation growth has been greater than 100%. Some of this can be attributable to the uncapped residential federal investment tax credit (FITC). Another major factor, which is impacting programs nation wide at this time is a rapid reduction in installed costs, based on growth in supply and expanded installation infrastructure and business capabilities. As reduction in installed costs are expected to continue, the FITC remains in place through 2016 and solar adoption continues to grow, this growth trajectory should continue for the foreseeable future. VEIC believes the trends in the markets provide an opportunity for APS to reset incentive levels and put in place mechanisms that can be used to reduce incentives steadily as the market continues to grow.

Participation has continued, and even strengthened during the first quarter of 2010. As illustrated in Figure 2 with the current rates of new incentive approvals and no changes to incentive levels or structures, the available 2010 budget could be exhausted some time in the second quarter of 2010.

Figure 2: Program Participation and Funding Trend Estimate 2010 – No Incentive Changes



While there have been some ups and downs, there has been an overall decline in installed cost per watt from $7.53 in 2002 to $6.92 in 2009 (Figure 3). Currently, the database indicates an average installed cost of $6.33/Watt for 2010, but recent market quotes and the presence of the current 50% of installed cap on incentive levels, lead VEIC to estimate that the current market may already be able to support costs below $6.00/Watt installed. Based on discussions with APS program managers, the VEIC team adopted an installed cost of $5.60/Watt for the analysis of immediate incentive level reductions.

The recent decline in current market quoted costs, as well as the situation where current market quotes are below the historic averages in program data sets are both trends appearing in other states as well as in Arizona. The program database information on 2009 and early 2010 installed costs are similar to the experience of other states, and reflect the global decline in panel costs, and the influx of installers into the market.

Figure 3: APS Residential PV Grid Tied Systems Average Installed Costs

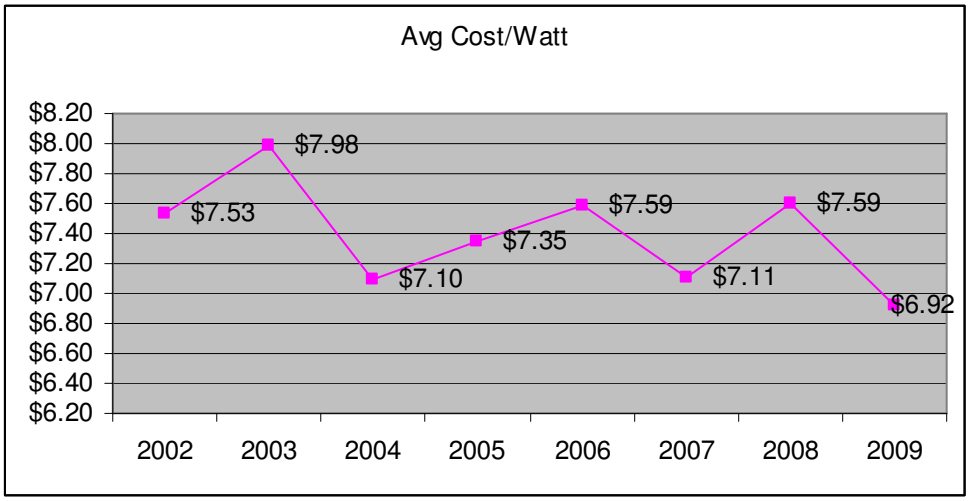
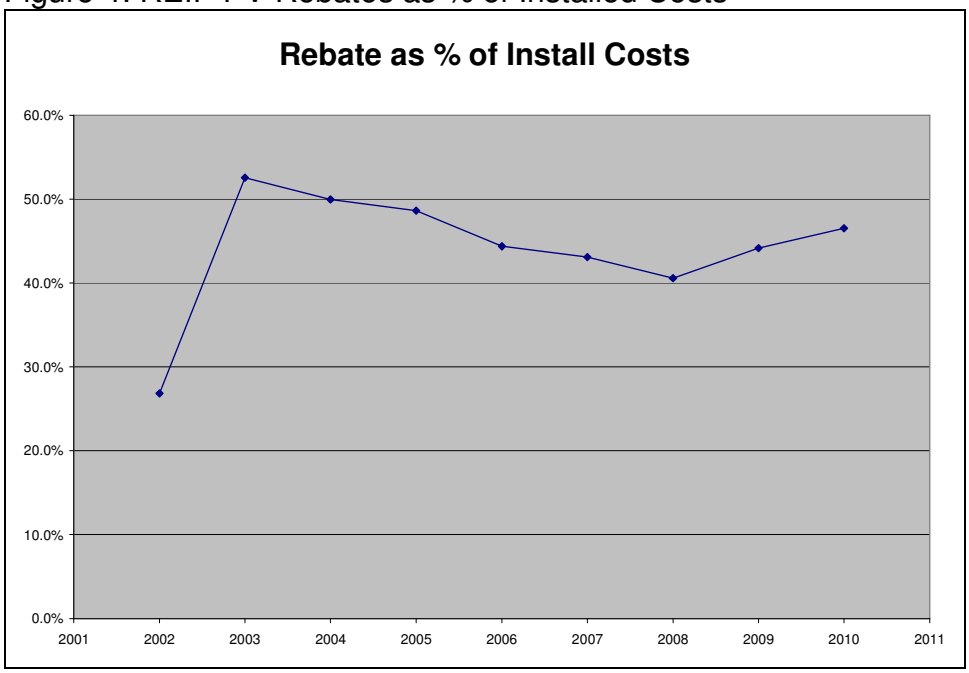


Figure 4 illustrates that since 2003 rebates have represented between 40% to 50% of total installed costs.

Figure 4: REIP PV Rebates as % of Installed Costs



A general program design objective that VEIC follows is to support a sustained orderly market development based on the expectation amongst market participants that rebate levels will decline over time as the markets develop. This is a key foundational component of market transformation and helps to incentivize technology and business innovations and installed cost reductions.

IV. Customer Financial Analyses

In order to promote sustained orderly development of the distributed PV market, incentive programs aim to offer incentives that provide customers with a financial return sufficient to prompt investment. If incentives are "too rich" then markets can become overheated, leading to participation rates that are higher than available budgets can sustain, the potential creation of queues for incentives, stop and start funding, and ratepayers paying a higher cost than necessary to reach desired targets.

The incentives used to promote investment commonly include direct rebates, net metering, tax credits, sales and property tax exemptions, and less frequently, also may offer performance based incentives (through payment for Solar Renewable Energy Credits – or a performance based payment).

In addition to the incentives, a number of other factors that impact a customer's financial returns on an investment in distributed PV. These include: the available solar resource at a site, the total installed costs for a system (which is influenced by the site specific conditions, local market infrastructure, and global/regional competitive pricing trends), and the availability of financing (either directly through market actors or third parties).

Therefore, it is not sufficient to simply compare the direct incentive levels of state to another. For example, while the direct rebate offered by State A maybe ½ the value of State B, it is necessary to account for the fact that State A may have 2x the solar resource, retail electric rates that are 75% of those in State B, and a state tax credit. Our approach to comparing incentive levels – either over a given time horizon, across distributed renewable energy technologies, or across jurisdictions, is to conduct a comparative analysis of customer financial returns.

In this report we compare the financial returns for an APS customer investing in a residential PV system in 2007 (before the $2,000 cap on Federal Tax incentives for residential systems was removed) with the customer financial returns for an APS customer in 2010. Due to the removal of the $2,000 cap on the FITC, and the reduction of installed costs as the local and global markets, the returns in 2010 are expected to be higher – and potentially able to support proposed incentive level reductions. These results are documented in Figure 5 below. We also compare the current 2010 results for Arizona with results from six other jurisdictions (California, Colorado, Nevada, New Jersey, Long Island and Vermont).

It is important to note, that in some cases, customers may be willing, or even eager, to invest in PV although it may not provide them with a positive financial return. As the model results below demonstrate, some markets are seeing sustained market growth, even though customer financial returns are not positive. A variety of factors, including consumer education and attitudes, installer marketing, and general economic conditions will impact how much of a positive economic return consumers, on average, require in each market.

Description of Model

VEIC has developed an in-house Excel™ spread-sheet based customer financial analysis model that we use to support our work with incentive program design and analysis. This model has been used to assess the customer financial returns for incentive programs in New Jersey, New York, Pennsylvania, and

Vermont. The model calculates a discounted net present value and simple payback returns for customers investing in distributed renewable energy technologies, based on available financial incentives, technical system data, market conditions, and financing.

The fundamental cost and revenue streams for a residential scale PV project calculated by the model include:

Costs:

- Initial down-payment
- Recurring loan payment
- Occasional system maintenance

Revenues:

- Electricity savings
- SREC revenues
- Federal tax credit
- Tax effect of loan

Some of the model inputs are shared across the cases analyzed for this report, whereas others are based on individual program, market, and solar conditions. Table 1 summarizes the common model inputs.

Table 1: Shared Customer Financial Analysis Input Values

Financing:		
	% total cost financed	80%
	Loan term	20 years
	Interest Rate (annual)	8%
Technical:		
	System life	25 years
	O&M	10 yr inverter replacement
Other:		
	Retail Rate Escalation	2%
	Real Discount Rate	6%
	Federal Tax Rate	34%

Table 2 summarizes model inputs that are case specific with notes on sources and references.

Table 2: Comparative Financial Analysis Inputs

State	Average Cost[1]	$ / Watt DC Incentive[2]	kWh/kW/year[3]	Average Residential Retail Rate[4]	State Tax Credit[5]	State Limit	State Tax Rate[6]
APS '07	$7.14	$3.00	1,617	$0.103	yes	$1,000	4.24%
APS '10	$5.60	$3.00/ $2.30 / $2.10	1,617	$0.113	yes	$1,000	4.24%
CA	$6.25	$1.43	1,470	$0.227	no	N/A	9.55%
CO	$6.50	$2.00	1,565	$0.100	no	N/A	4.63%
NV	$6.75	$2.30[7]	1,664	$0.129	no	N/A	0.00%
NJ	$7.00	$1.75	1,183	$0.150	no	N/A	6.37%
LIPA	$6.80	$2.75	1,273	$0.196	yes	$5,000	6.85%
VT	$6.50	$1.75	1,120	$0.140	yes	$5,000	8.25%

[1] **Average Cost**

CA – Recent installed cost estimates of $6.25 being reported for residential systems in San Diego market. Average installed cost for residential and small commercial systems between 2kW and 7kW through California Solar Incentive program for completions and applications during March 2010. https://csi.powerclerk.com/CSIProgramData.aspx were higher at ~$7.80 per watt. Note that observation of current market conditions being ~20% lower than database average is consistent with Arizona and other market observations.
NV & CO – VEIC estimates based on recent market trends.
AZ– Average installed costs from program database for 2009 are $6.92, for 2010 the average has dropped to $6.33. Current market quotes are believed to be in part related to the 50% of installed cost cap on incentives which provides a disincentive to quote below $6/Watt. The $5.60/Watt reflects estimate of current market conditions so that impact of incentive reductions can be assessed.
NJ, LIPA, VT – Based on communications with program managers on recent installed costs and database analyses.

[2] **$ / Watt DC Incentive**

CA – Reflects March 2010 incentive level (Step 6) for the California Center for Sustainable Energy (includes SDG&E) and PGE. This incentive declines based on meeting installed MW levels. An AC/DC factor of 0.77 was used to convert the AC or PV USA Test Condition (PTC) incentives to an equivalent DC incentive level for comparison to other states.
CO, NV, NJ, LIPA, VT - Data from program managers and incentives listed through the DSIRE website. http://www.dsireusa.org/summarytables/finre.cfm .

[3] **kWh/kW/year**

PVWatts Version 1 (http://www.pvwatts.org/) was used to estimate the annual production of a fixed (non-tracking) 1 kW system with a tilt set at latitude and a true south orientation. The NREL default de-rate factor of 0.77 was used to account for inverter and transmission losses. For establishing a suitable comparison, weather stations in the neighboring states of CO (Pueblo), NV (Las Vegas) and CA (Los Angeles) were selected based on similarity to Arizona's (Phoenix) state average daily insolation levels (hrs/day).

[4] **Average Residential Retail Rate**

US Energy Information Administration average retail price of electricity from Electric Power Monthly data set for December 2009 (http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html). These rates do not reflect time of use or pending rate increases planned for 2010. Rates for NJ and LIPA were obtained through program manager data. Rates for CA reflect the kWh block for Tier 3 level of 131-200% of baseline energy usage in PG&E territory http://www.pge.com/tariffs/doc/E-1.doc .

[5] **State Tax Credit & Limits**

Individual state income tax credits and limits listed through the DSIRE website. http://www.dsireusa.org/summarytables/finre.cfm. Retail sales tax exemptions available in several states are assumed to be reflected in the average installed cost.

[6] **State Tax Rate**

Average state income tax rates for single filers in 2009 (http://www.taxfoundation.org/files/state_ind_income_rates-20090710.pdf). For this comparison an average income for single filer of $100,000 was selected.

Customer Financial Analysis Results

Comparison of APS 2007 versus APS 2010

The first customer financial analysis we conducted for this report compares the financial returns that a residential APS customer investing in PV in 2007 versus the same residential customer deciding to invest in a PV system in 2010. As stated above, during this time period several changes occurred that result in an improved customer financial return. These include: lower installed costs for PV systems as the local market infrastructure and competition grows and increased global supply of PV modules lowers prices, changes in the federal tax incentives that removed a $2,000 cap for residential systems, and increased retail electric rates.

Established by the federal Energy Policy Act of 2005, the FITC for residential energy property initially applied to solar-electric systems, solar water heating systems and fuel cells. The Energy Improvement and Extension Act of 2008 (H.R. 1424) extended the tax credit to small wind-energy systems and geothermal heat pumps, effective January 1, 2008. Other key revisions included an eight-year extension of the credit to December 31, 2016, the ability to take the credit against the alternative minimum tax, and the removal of the $2,000 credit limit for solar-electric systems beginning in 2009.

For Solar-electric property:

- There is no maximum credit for systems placed in service after 2008. The maximum credit is $2,000 for systems placed in service before January 1, 2009.
- Systems must be placed in service on or after January 1, 2006, and on or before December 31, 2016.
- The home served by the system does not have to be the taxpayer's principal residence.

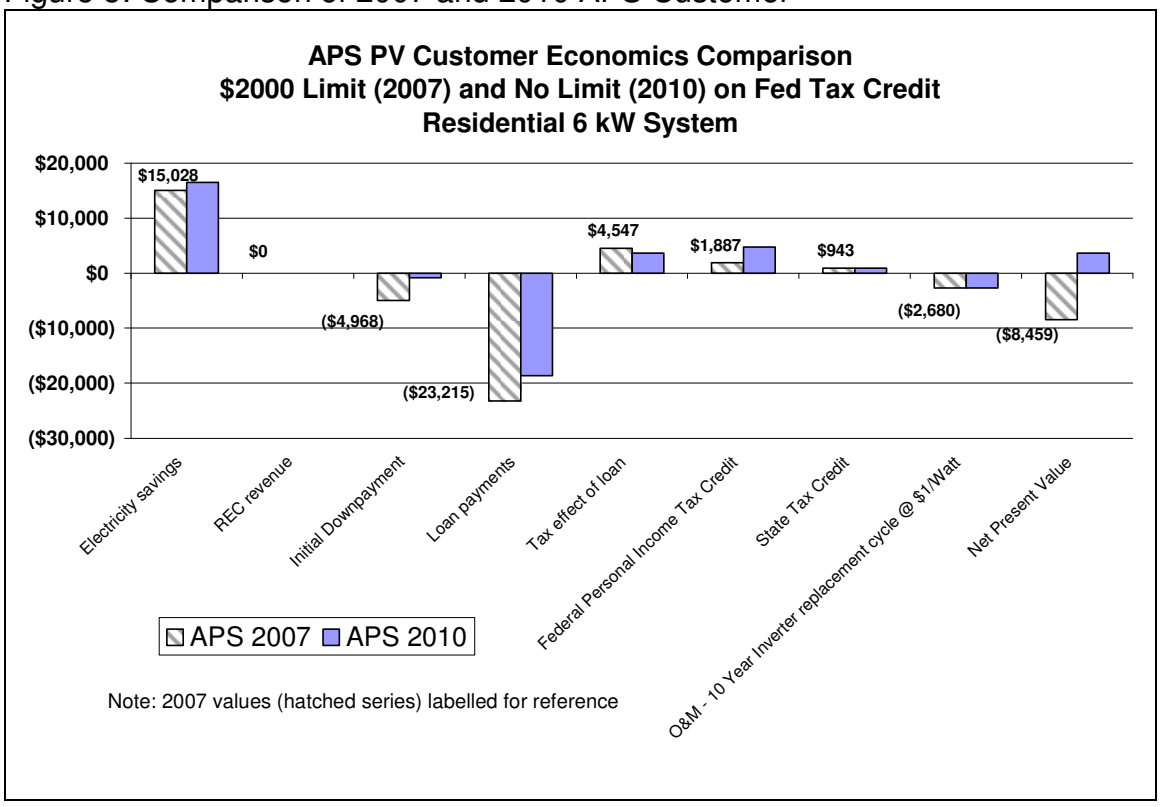
Table 3 summarizes the input parameters used to compare the APS 2007 versus APS 2010 customer financial returns.

Table 3: APS Residential System Comparison

	2007	**2010**
Incentive $/Watt DC equivalent	$3.00	$2.80 (capped @ 50% installed)
Installed Cost $/DC Watt	$7.14	$5.60
Residential Retail Electric Rate	$0.103	$0.113
Maximum Federal Tax Credit	$2,000	No cap, 30% of installed cost
Other	1,617 kWh/DCkW/Yr; 20 yr loan; 8% interest; 20% down-payment; 25 year system life, 6 kW system size,10 year inverter replacement	

A graphic comparison of the discounted present value of each of the major cost and revenue streams for a 6 kW residential is provided in Figure 5. The total net present value is represented by the bar furthest to the right. The hatched bars represent revenues and costs for a system installed in 2007, the solid bars for a system installation in 2010. Note that for clarity, only the dollar values of the hatched bars are shown on the graph.

Figure 5: Comparison of 2007 and 2010 APS Customer



The first observation is that there has been a significant shift from overall negative to positive customer financial returns between 2007 and 2010. While the net present value for an investment in 2007 was close to a negative $8,500, by 2010, the return is more than $3,671 positive net present value, and total change in customer financial return of ~$13,000. This dramatic improvement in customer financial returns is primarily caused by lower installed costs, (roughly 22% lower in 2010), the increase in the federal tax benefit by a factor of 2x (from $1,887 to $4,415), and the estimated increased value of electric savings over the course of the system's lifetime of roughly 10%. With the incentive level remaining at $3/Watt in both 2007 and 2010, the incentive as a share of total installed costs has increased from roughly 42% to 47%.

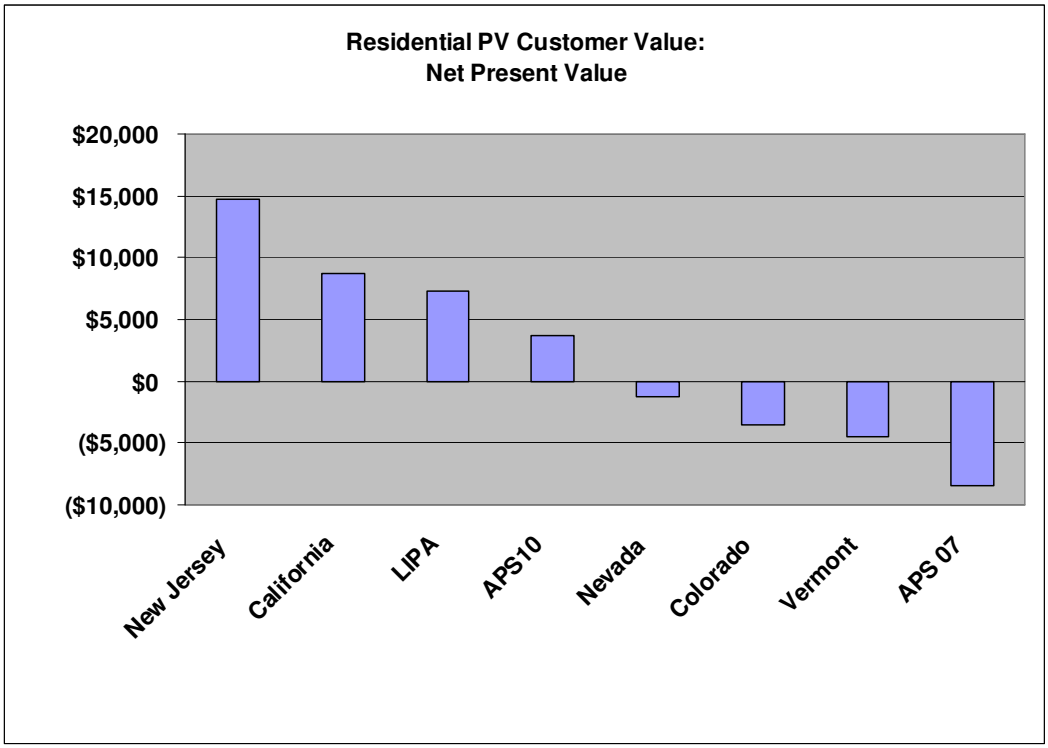
We have also conducted an analysis of the customer financial returns if incentives are reduced to $2.30 and $2.10/Watt. Positive customer financial return (NPV = $1,693) is maintained at $2.30/Watt with no further reductions in installed costs. If the incentive is reduced to $2.10/Watt the customer financial return also remains positive (NPV = $910) under current installed costs.

Comparison with Other Jurisdictions

The preceding analysis indicates that customer financial returns for APS residential grid tied systems are strong under the current $3.00/Watt rebate and remain moderately positive with a reduction to $2.30, and to $2.10/Watt even without further declines in installed costs. As mentioned earlier however, it is also important to note that PV markets are not driven strictly by positive customer financial returns, and that in many markets, customers are willing to invest in PV systems that still have negative net financial benefits. This section compares and contrasts the financial returns from six other jurisdictions to provide a broader context against which the incentive reductions in Arizona can be considered.

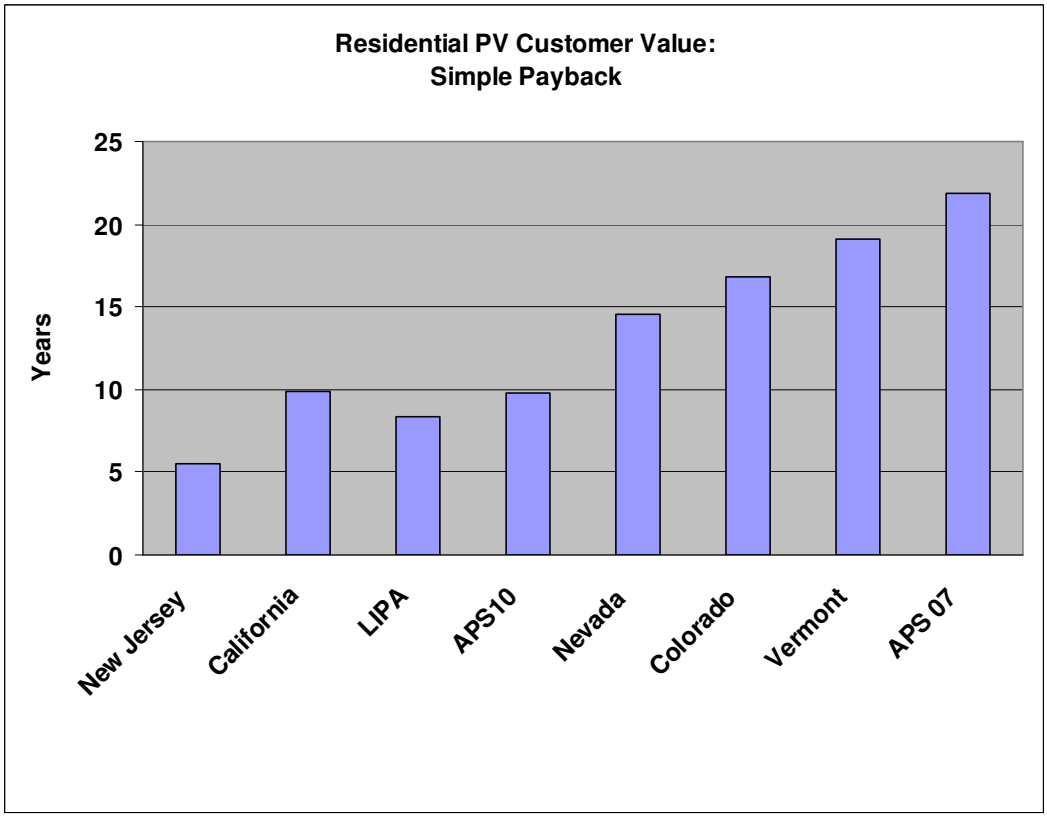
The following two figures compare a discounted net present value and simple payback returns for residential PV systems in Arizona and the other jurisdictions included in the analysis conducted for this report. Values for Arizona are presented for 2007 and 2010. These are compared to the 2010 results for the other jurisdictions. Figure 6 illustrates the estimated Net Present Value returns, showing positive results for New Jersey, California, LIPA and APS 10.

Figure 6: Comparative Customer Financial Analysis: Net Present Value



The simple payback chart (Figure 7) presents the same information, but in this figure a lower bar represents a more rapid return on investment, and therefore more favorable customer economics.

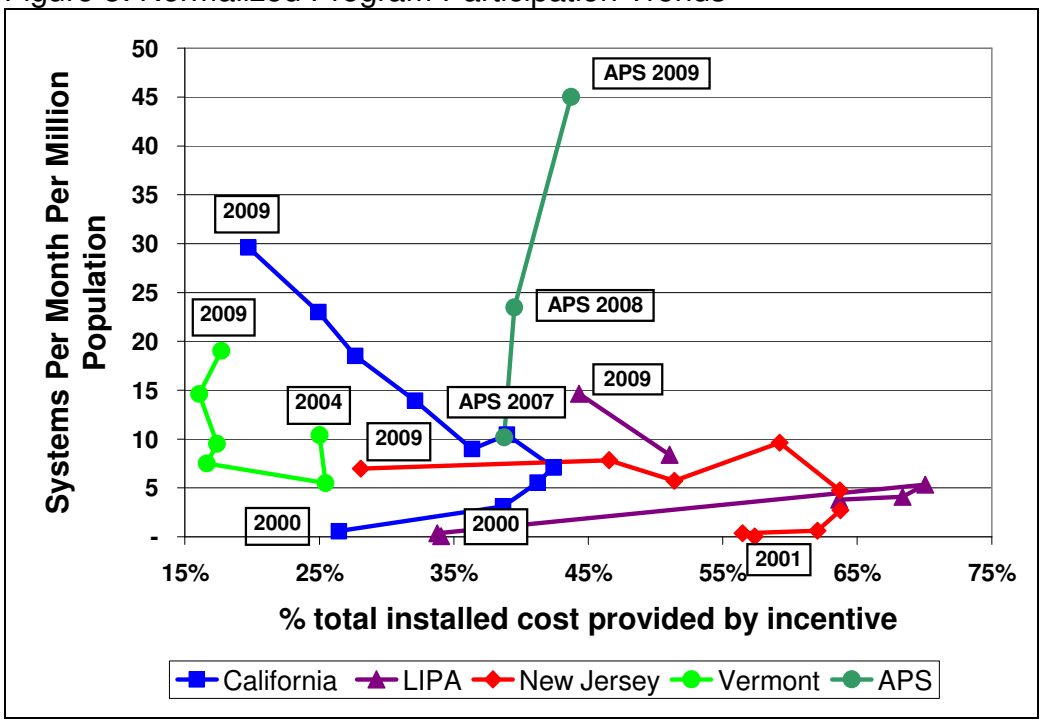
Figure 7: Comparative Customer Financial Analysis: Simple Payback



As the figures above illustrate, APS in 2010, with the current $3.00/Watt rebate (adjusted to $2.80/Watt if installed costs are $5.60) is one of four jurisdictions that currently have positive customer financial returns. It is important to note that there is robust growth in all of the markets that are included in this analysis – even those for which the estimated customer financial returns are negative.

To further examine the relationship between incentive levels and growth of markets over time, we include an analysis that compares population normalized participation against the average incentive as a share of total installed costs (Figure 8). The results show continued increases in activity for all programs, even in light of decreases in program incentive levels.

Figure 8: Normalized Program Participation Trends



The trend line for each program in Figure 8 runs in chronological order, showing the behavior of this relationship as the programs have matured. For example, California's program began in 2000 with a 26% incentive level and very few installations. Incentive levels were increased for several years to promote activity and were then lowered again, to as low as 20% of cost by 2009. In spite of this much lower incentive contribution, the number of PV installations per capita has increased greatly.

APS shows a very steep growth in the normalized number of systems per million population, and by 2009 the data suggest that, for this indicator Arizona, is leading the other programs included in this analysis. The APS trend line also indicates the rapid growth has been accompanied by an increasing share of incentive as total of installed costs. The other programs on the chart have continued to grow even as the incentive % of installed cost metric has declined.

This pattern – of growing market as incentive share declines - holds for LIPA and New Jersey, though New Jersey's systems installed per capita value has been fairly stable over the past few years – due in part to growth in the number systems that are being installed with out a direct rebate (and are therefore not included in this Figure) but are relying strictly on the Solar Renewable Energy Credit (SREC) market. Vermont's program has had very low incentive levels since the beginning of the program. Even there, decreases in incentive levels as a percent of installed cost have not limited the growth in activity.

These patterns document the promising trend that continued growth of markets is feasible while incentive levels are becoming lower. On the other hand, a total of eight programs in 12 states have increased the incentive level for individual systems in the current year. While such incentive increases may be designed to help achieve other program objectives, such as jump-starting a lagging market, the performance of the programs documented here is quite important to keep in mind when designing incentive structures.

V. Incentive Structure Analysis

In proposing the structure for the rebates, VEIC had the following design principles in mind:

- maximize the number of projects which can be funded with the remaining 2010 program
- couple the rebate reduction with the implementation of a transparent, predictable objective methodology for managing subsequent rebate reductions
- minimize extended periods of inactivity due to budget constraints
- while respecting customer ROI requirements, wean the market from rebates over time to stimulate market innovation, cost reductions and improvements in service levels

In summary, VEIC is proposing the following:

1) **Reduce rebates effective on Commission approval to $2.30 and then to $2.10 when 4 MW of new commitments have been made @ the level of $2.30/Watt.**

2) **Spread the remaining uncommitted finds into two funding cycles; funding cycle 1 would run from May 1-Aug 31; funding cycle 2 would run from Sept 1-Dec 31.**

3) **Reflecting lower overall installation costs, tier rebates so that larger projects get proportionally less rebate than smaller projects.**

Each of these recommendations is discussed in more detail below.

1) **Declining Capacity Block:** Residential rebates will initially be dropped from $3.00 per watt to $2.30 effective on Commission approval and thereafter reduced to $2.10 after the first 4 MW of capacity commitments are issued. A preliminary recommendation for subsequent capacity blocks and budgets is presented in Section VI.

   The declining block structure has several benefits including:

   a. sends a message to the market that solar projects will (gradually) be weaned off rebates as the markets continue to grow
   b. encourages solar panel and balance of system manufacturers, and installers to innovate, reduce costs and improve service levels in order to remain competitive
   c. is predictable, transparent and objective; allows to market participants to plan for future rebate reductions and minimizes the potential for abrupt, seemingly arbitrary changes in rebates that can de extremely disruptive.
   d. Is self-correcting, if rebates are too high, application volumes will be high and the block will be consumed faster than if rebates are too low.
   e. If pre-approved by the regulatory authority, rebate adjustments can be made quickly versus having to engage the regulators every time a rebate reduction is required.

In order for this approach to be effective, APS will need to publish current information on how much of the capacity block has been consumed. VEIC would suggest weekly postings on the website should be sufficient; if reports can be easily generated and published more frequently that would be of value.

It is also important to note that the MW committed in a capacity block are based on actual approved amounts, and do not include cancellations which can otherwise keep the 4 MW as a moving target and difficult to administer. Also, application materials need to ensure that applicants acknowledge the possibility that the rebate commitment they receive may be different from the rebate in effect at the time they apply for a rebate.

2) Two Funding Cycles: The uncommitted 2010 budget, estimated to be $20 million as of April 15, 2010 should be divided into two funding cycles of $10 million each. The funding cycles are proposed to run from May 1-Aug 31, and from Sept 1-Dec 31.

The table below indicates the expected approval metrics in each funding cycle assuming $20 million in total residential budget will be available on May 1, 2010.

	Funding Cycle	
Total Dollars	$10,000	$10,000
% PV (a)	85.00%	85.00%
Weekly Apps $ (b)	$1,380	$1,260
Weeks to Consume	6.2	6.7
Projects ©	853	934
MW (d)	3,696	4,048

(a) assumed % of residential budget for PV

(b) based on 2010 run rate excluding first two weeks of year, reduced by expected rebate reduction

© assumes average rebate of $13K per application

(d) assume average system size of 6.2kW

The benefit of a funding cycle approach is to minimize extended periods in which new applications are not accepted, and counter market perceptions that the program is "shut down". In the absence of the funding cycle approach, the entire budget would likely be consumed sometime in July 2010 (due to cancellations), effectively freezing the program from accepting new applications until 2011. With the funding cycle approach, the program may still need to stop accepting new applications in mid June or early July, but would reopen in September, and based on current trends would be able to remain open for new applications into the middle of October.

The funding cycle approach also has benefits for the program administration as well; if approvals can be spread out then it is possible to smooth peaks and valleys in downstream activity including inspections and payment processing. The installer community benefits as well; for example, with a six month shutdown sales staff might need to be furloughed, while the need to complete multiple projects before rebate expiration might create short term labor and equipment shortages.

2) **Two Tier Rebate Structure:** Two tiers of rebates are proposed as reflected in the chart below:

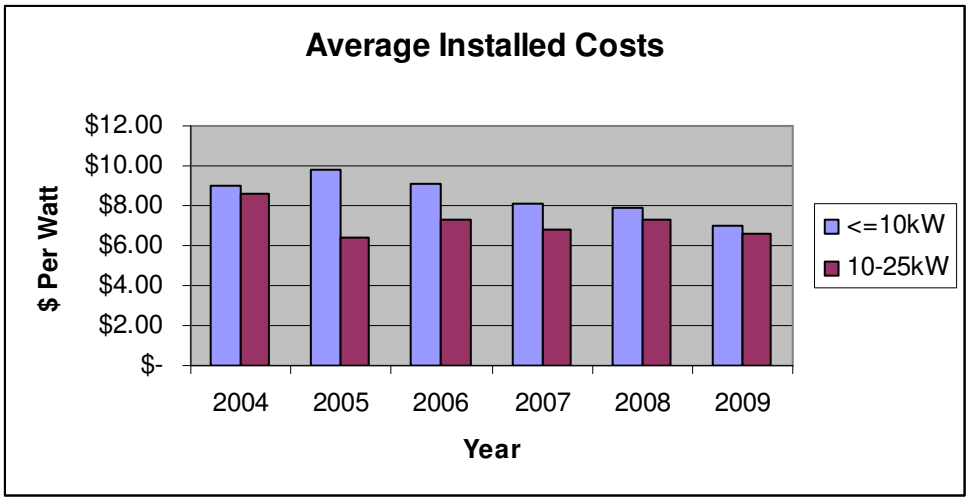
Tier	New Proposed Rebate
< 10kW	$2.30
> 10kW	$2.00

Under this approach, for example, a 15kW system would be rebated as follows:

First 10kW @ $2.30 = $23,000
Next 5kW @ $2.00 = $10,000
Total = $33,000
Effective Rebate Per Watt: $2.20

A tiered rebate structure reflects the fact that larger projects enjoy economies of scale, thereby lowering installation costs, and requiring less of a rebate to support the project economics. The chart below shows the annual difference in installed cost between projects <10kW and those between 10-25kW. On average, since 2004 installed costs per watt for >10kW have been 15% less than for 10kW projects. Accordingly, the 2nd tier rebate proposed at $2.00 is approximately 15% less than the $2.30 first tier rebate.

Figure 9: Average Installed Costs for Small and Large Residential PV Systems



The tiered rebate approach also can support stretching the budget dollars to more projects, and supporting a broader distribution of funds to more participants. For example, based on the approximately 120 >10kW projects approved in 2009, the tiered rebate approach would have saved approximately $243,000 thereby enabling roughly 20 additional projects to be funded.

Once the 4 MW capacity block is committed and the standard incentive declines to $2.10/Watt, the 2nd tier of the rebate structure would also be reduced to $1.80 per watt; maintaining the approximately 15% proportional reduction. This 15% proportional reduction approach should be applied to future rebate reductions in 2011 and thereafter.

VI. Additional Recommendations

VEIC was also able to make preliminary recommendations for a longer term (2011-2014) incentive structure for residential grid tied PV. The proposed incentive structure is designed to meet compliance targets for installed residential distributed PV generation of approximately 85 MW of additional capacity installed over this time horizon.

The proposed incentive reduction structure starts with incentive level for less than 10 kW systems at $2.10/Watt in 2011 – and proceeds – through a series of eleven capacity block reductions – to steadily decrease the incentive level to $0.65/Watt by the end of 2014. Each capacity block represents 8 MW of new incentive approvals. The approximate annual incentive budgets are represented in Table 4.

Table 4: Preliminary Multi-Year Incentive Structure

	Block #	Size MW	Cumulative Installed MW	Level $/DC Watt	Incentive Budget $ Million	Annual Incentive Budget Million		Installed Cost Benchmark
2011	1	8	8	$ 2.10	$ 16.8			
	2	8	16	$ 1.90	$ 15.2			
	3	8	24	$ 1.70	$ 13.6	**$**	**45.6**	$5.35
2012	4	8	32	$ 1.50	$ 12.0			
	5	8	40	$ 1.35	$ 10.8			
	6	8	48	$ 1.20	$ 9.6	**$**	**32.4**	$4.90
2013	7	8	56	$ 1.05	$ 8.4			
	8	8	64	$ 0.95	$ 7.6			
	9	8	72	$ 0.85	$ 6.8	**$**	**22.8**	$4.50
2014	10	8	80	$ 0.75	$ 6.0			
	11	8	88	$ 0.65	$ 5.2	**$**	**11.2**	$4.25
					Total	**$**	**112**	

Note that the far right column provides an estimate of the installed cost benchmark that would need to be attained to maintain positive customer financial returns given the incentive level at the end of each year. Thus, a further reduction of ~24% from the estimated cost of $5.60 in the current market would be required by the end of 2014 to maintain positive customer economics holding other modeling assumptions constant. This preliminary analysis can be refined and expanded as required, for example to include technologies other than grid tied PV, during further program design and planning.

VII. Appendix: Comparative Financial Returns for Other Jurisdictions

The following charts present individual jurisdiction customer financial returns for the cases investigated for this report.

Figure A1: Comparative Customer Financial Analysis: New Jersey

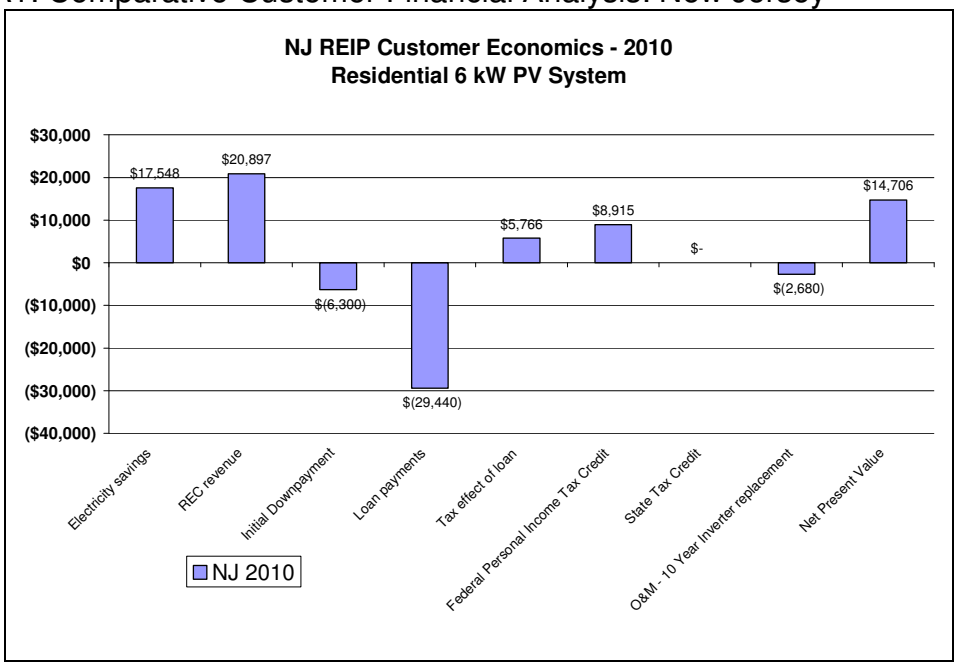


Figure A2: Comparative Customer Financial Analysis: California

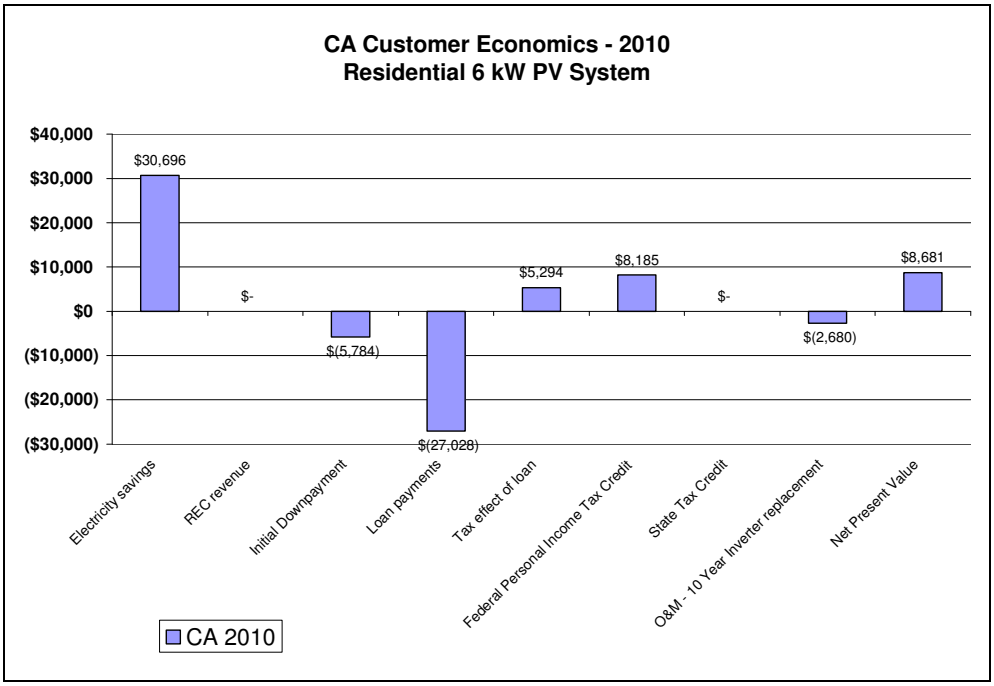


Figure A3: Comparative Customer Financial Analysis: LIPA

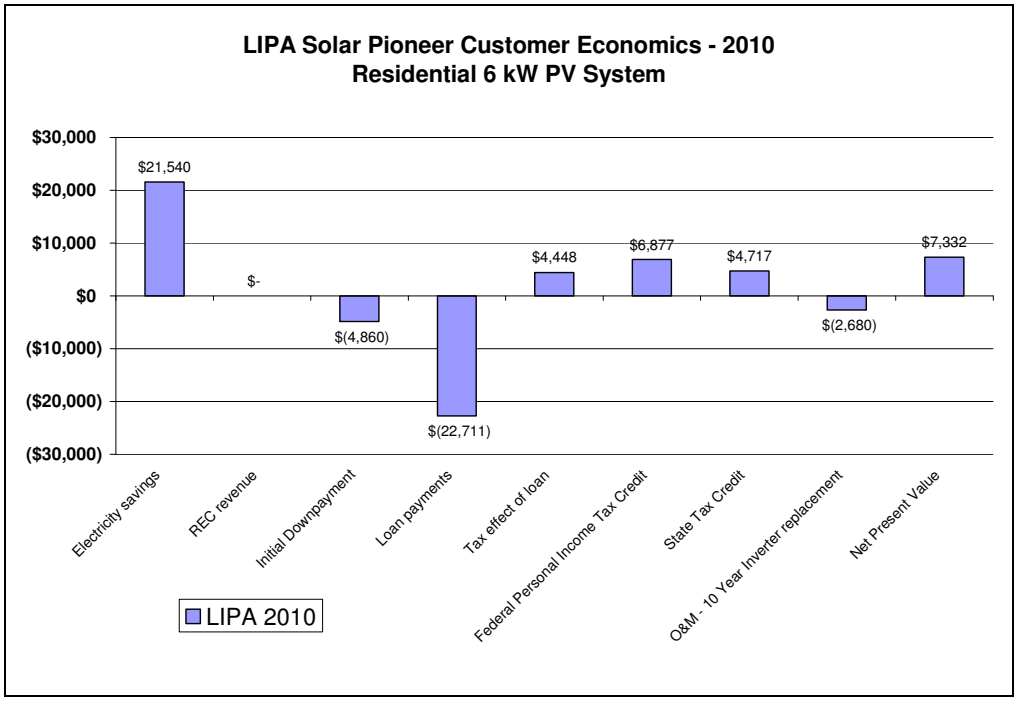


Figure A4: Comparative Customer Financial Analysis: Nevada

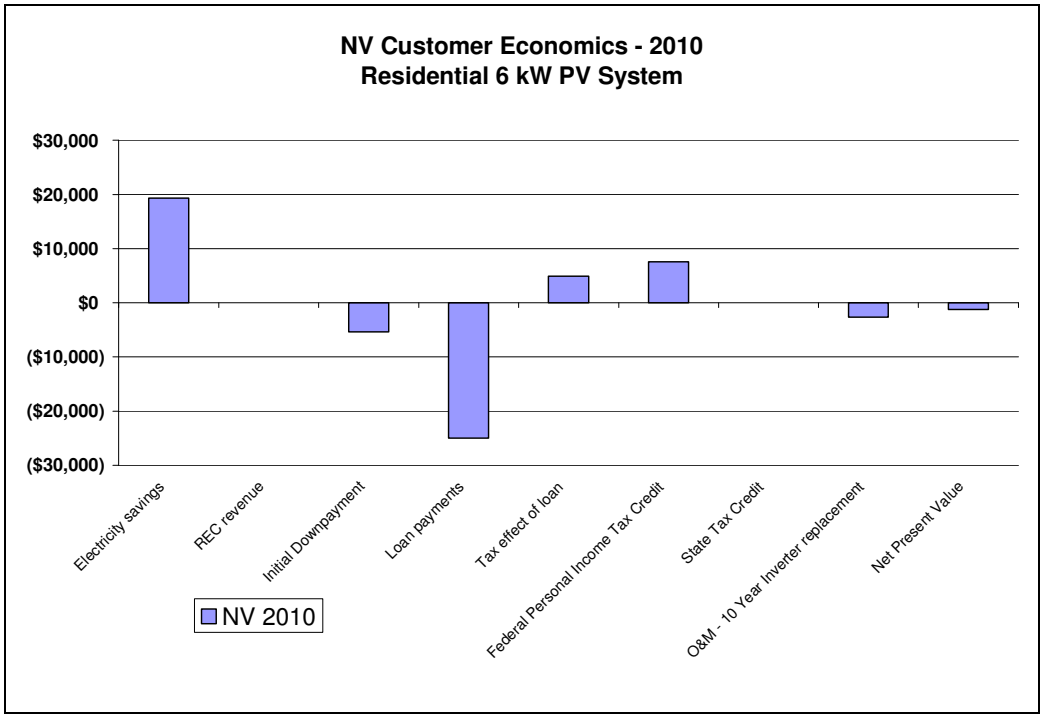


Figure A5: Comparative Customer Financial Analysis: Colorado

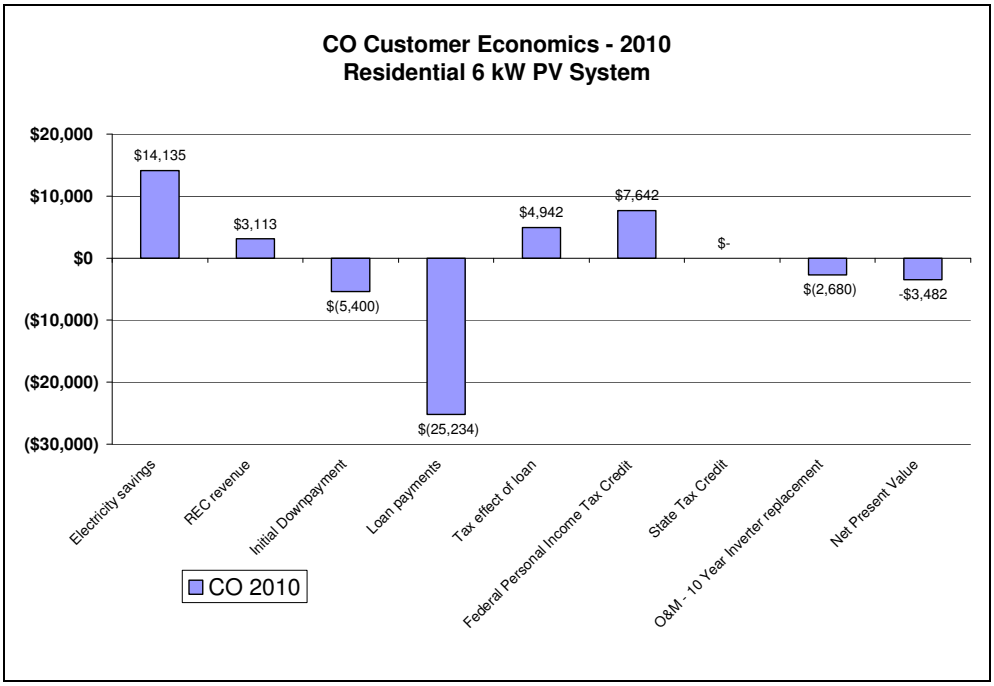


Figure A6: Comparative Customer Financial Analysis: Vermont