SOLAR SHARES BUSINESS MODEL

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Abstract

The solar shares business model provides utility scale, multi-megawatt photovoltaic (PV) systems the ability to distribute energy values across multiple utility customer classes, while capturing demand reduction at the site of the PV system, as well as valuing the renewable energy credits (RECs). Net-metering in California opened up a new grid-tied market for PV in the 1990's. The potential exists to again increase the electricity market share for PV with off site net-metering, or wheeling, of the electricity produced from PV systems. The solar shares business model is more likely to be adopted at public utilities than at investor owned utilities. Two business examples are provided for publicly owned and investor owned utilities.

1. INTRODUCTION

The solar shares business model contractually breaks up the ownership of large photovoltaic fields into small pieces. Hundreds of utility customers who might otherwise not be able to own solar systems, can own a part of the large system.

The concept provides the opportunity for a much larger participation in solar, providing the opportunity for customers to contract for solar power without the many inconveniences of a rooftop application.

Existing solar programs that require a rooftop application currently exclude:

- Renters
- Condominium owners
- Shaded rooftops
- Aging rooftops
- Customers contemplating a move

The solar shares business model provides energy value to customers, without having to locate the system onsite. Economies of scale can be realized by installing very large PV systems, like the one shown in Fig. 1. With stabilized PV module prices, large scale PV systems can be installed for $\$5/watt_{PTC}$ or less.

Fig.1: SMUD Rancho Seco, Utility Scale Photovoltaics (Photo Courtesy of SMUD).

2. HOW SOLAR SHARES WORKS / SOLAR SHARES EXAMPLE

Centralized, locally produced electricity enables residential and commercial utility customers to purchase ownership shares of a PV system, with monthly energy credits accruing to their individual utility bills. The utility might be able to finance the systems, providing their low cost of money to the residential customer (shares purchaser), with re-payment of the loan as a line item on the residential utility bill.

Solar shares combines utility, commercial and residential values in one PV system [1]. An example solar shares story is as follows:

> Tom was a municipal utility customer representative, with a problem. One of his commercial accounts, after exhausting all efficiency measures, was exceeding the rated capacity of their electrical service. The distribution planners had a planned upgrade for this line, only it was five years from when the customer needed the capacity. Tom noticed that an unshaded field at the commercial account was a possible candidate for a single axis tracking PV system, except they didn't have a tax burden or the capital needed for a large PV installation.
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> George, another residential customer representative at the utility, had collected hundreds of requests for solar electric systems by environmentally concerned residential customers. At lunch, these two utility staff people decided to float an idea to management that might work for the commercial and residential customers. The idea was for the commercial account to install 1 MW_{PTC} of PV, and acquire the demand credit from the system so that the utility upgrade could be postponed. Individual residential customers would buy shares of the system and get the kWh energy credit on their bills for the actual monthly electricity produced, as well as tax credits. This is called off site net-metering, originally allowed in California legislation for the PVUSA site. The City of Davis net-meters a land fill facility off the PVUSA site even though they are located miles away from each other (2002 California legislation SB 1038). More recently, 2006 AB 2573 allows for Hetch Hetchy Water and Power to use Pacific Gas and Electric's utility lines to deliver electricity from remote located PV systems, to the City of San Francisco.
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> A low cost installation of $5 million was performed by California Construction Authority (CCA, in 2004 CCA averaged $4.64 / PTC watt). Residential customers purchased specific modules on a website, similar to purchasing and choosing a plane seat (See Fig. 2). The Smith's for example purchased Qty-5 200 watt PTC modules, numbers 300 to 305. This 1 kW PTC of PV produced 1,900 kWh's per year, of which, every month, an electrical reduction was calculated off the Smith's utility bill by the local municipal utility. Similarly 1,000 other customers were off-site net metering.

Fig. 2: Smiths own specific modules (Photo Courtesy of SMUD, CalExpo parking)

> The residential customers were pleased that they didn't have the headache of installation on their home, no shading, roof penetrations, or worries about home resale values. Some lower income customers were able to afford the Solar Shares program.
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> The commercial facility was still metered for all the electricity the facility consumed, but the demand charge was reduced by the equivalent kW produced by the 1 MW_{PTC} PV system. They did pay $1 million for the inverter, with a payback of 4 years for their demand reduction and small tax credit. The commercial customer was no longer exceeding the rated capacity for their electrical service.
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> The utility reduced their needle peak demand by a small amount due to the single axis tracking coincidence with a 7 PM production in the summer time. It called for creative metering and billing, but there was no need for rebate payments from public goods funds. Specific paybacks and potential tax credits need to be calculated for each scenario.

3. MUNICIPAL UTILITY ISSUES

There are some significant barriers to implementing the concept at a municipal utility district, like at the Sacramento Municipal Utility District (SMUD).

The current name of the potential solar shares program at SMUD is "Solar Choice / Solar Gold". This program has some very compelling attributes worth evaluating.

Solar panels are more traditionally sized to displace a large portion of the customers energy use. In California, a solar shares program makes it possible to size ownership to displace only energy in the highest priced third tier, the most expensive rates. Perhaps the greatest advantage is the ability to benefit from economies of scale with construction of a single large solar farm.

In concept, a utility would support the program with long term financing terms, guaranteed energy delivery, transfer of net metering benefits directly to the customers residence, with flexibility to add PV kW, and transferability to a new residence in the event of a move.

4. POTENTIAL UTILITY BUSINESS MODELS

The following business models support a utilities' goal of being a leader within the solar industry and providing easy and affordable consumer access to clean solar power.

4.1 Business Model 1 – A Utility Ownership Model with the following attributes:

- A utility is the owner of the photovoltaic plant.
- Potentially a utility can create a mutually beneficial nonprofit umbrella organization.
- A utility owns the environmental attributes of the plant.
- A utility complies with environmental quality laws, like the California Environmental Quality Act (CEQA).
- A utility procures equipment, acquires real property, builds, operates, and maintains the PV plant.
- A utility site plant location, convenient to Distribution Services' needs (e.g., closer to load centers).
- Customer buys/owns contractual rights to the fixed output of solar production.
- Unlimited as to the number of customers that participate.
- A utility packages "Solar Credits" in 0.5, 1, 1.5, 2, 2.5, and 3 kW sized PV blocks.
- Customer receives net metering based on generic profile "guaranteed" delivery for term.
- Net metering is transferable to any billing meter within a utility service area.
- Includes an aggressively market utility program.

4.2 Business Model 2 – Third Party Ownership Model with the following attributes:

- Third party is the owner of the photovoltaic plant.
- Third party procures equipment, acquires real property, builds, operates, and maintains plant.
- Third party receives benefit of federal tax credits.
- Utility enters into Power Purchase Agreement with third party for 100% output and for environmental attributes.
- Utility packages "Solar Credits" in 0.5, 1, 1.5, 2, 2.5, and 3 kW sized PV blocks.
- Customer pay flat fee per month for block of power for 30 year deal.
- Customer receives net metering based on generic profile "guaranteed" delivery for term.
- Net metering is transferable to any billing meter within a utility service area.
- Includes an aggressively market third party or utility program.

4.3 Business Model 1 Economics

TABLE 1: BUSINESS MODEL 1 ECONOMICS, UTILITY INCENTIVES REQUIRED TO PRODUCE BREAK-EVEN FOR A TYPICAL THIRD TIER CUSTOMER.

		With 30% Tax Credit	Without Tax Credit
Install Cost per Watt	$5.50	($1.83)	($2.33)
	$6.00	($2.33)	($3.66)
	$6.50	($2.83)	($4.16)
	$7.00	($3.33)	($4.66)
	$7.50	($3.83)	($5.16)
	$8.00	($4.33)	($5.66)
	$8.50	($4.83)	($6.16)
	$9.00	($5.33)	($6.66)
	$9.50	($5.83)	($7.16)
	$10.00	($6.33)	($7.66)

Table 1 represents the Utility incentive that would produce a break-even investment for customers over the life of the system in Sacramento. From

this table it is evident that even under the best of conditions (less the $6.00 per Watt), break-even is not attainable without some public goods funding. Additional systems costs are directly correlated with the additional incentives required. A system cost of $5.50 - $1.83 = $3.67 is needed with tax credits for no utility incentives.

TABLE 2: MONTHLY RENT PER INSTALLED KW.

		Without Utility Incentives	With Utility Incentives $3.00/Watt
Install Cost per Watt	$5.50	$45.29	$24.32
	$6.00	$48.79	$27.81
	$6.50	$52.29	$31.31
	$7.00	$55.78	$34.81
	$7.50	$59.28	$38.30
	$8.00	$62.77	$41.80
	$8.50	$66.27	$45.29
	$9.00	$69.77	$48.79
	$9.50	$73.26	$52.29
	$10.00	$76.76	$55.78

Table 2 shows estimated monthly solar rents for the customer contract for a 1.0 kW system without Utility incentives and with a $3.00 per Watt Utility incentive in Sacramento.

4.4 Business Model 2 Economics

TABLE 3: UTILITY INCENTIVES ($/WATT) REQUIRED TO PRODUCE BREAK-EVEN FOR A TYPICAL INDEPENDENT POWER PRODUCER (IPP)

		$180/MWh PPA with Utility	$200/MWh PPA with Utility
Install Cost per Watt	$5.50	$0.84	$0.62
	$6.00	$1.02	$0.85
	$6.50	$1.24	$1.08
	$7.00	$1.51	$1.32
	$7.50	$1.77	$1.55
	$8.00	$2.00	$1.78
	$8.50	$2.22	$1.97
	$9.00	$2.43	$2.16
	$9.50	$2.68	$2.40
	$10.00	$2.92	$2.63

The evaluation of Business Model 2 is slighting different, in that it attempts to evaluate the benefits of a commercial tax credit and depreciation of a third party provider (IPP) with a Power Purchase Agreement (PPA).

Table 3 assumes a utility is targeting a $0.18 to $0.20 purchased power contract ($180 to $200/MWh) with a reasonable return on equity of 15%. The level of incentives are identified for a variety of initial install costs per watt. A utility may prefer a performance based incentive rather than the upfront incentives indicated in the preceding table.

5. POLICY RAMIFICATIONS

The language in the federal tax code needs to change from “on someone’s house” to “purchased” for the residential tax incentive. A third party ownership would need access to existing utility customer base, at the very least to allow for reimbursement of sales taxes paid for billed energy.

SMUD is investigating the following policy clarifications:

- Seek “No Action Letter” from SEC regarding whether this arrangement is for a security and whether there are any reporting obligations.
- Seek “Private Letter Ruling” from IRS regarding whether customer is eligible for Federal tax credits.

Current net metering rules at a utility might not allow this concept since the tariff includes all solar shares owners getting a retail credit regardless of their location. Ratemaking is an infrequent process at utilities governed by the MUD act. Also, a utility distribution services might not give any offset credits for PV. Capacity benefits from PV are typically not realized because most utilities peak after a typical PV systems peak.

6. CONCLUSIONS

The Solar Shares Business model is new business model for PV. With a solar shares program a publicly run utility like SMUD can provide PV energy values to its rate payers, demand reduction at a specific commercial facility, capacity benefits for that commercial location, with potential peak reduction for the utility grid, and utility owned environmental credits to offset the installation costs.

The two business models presented have potential for meeting the needs for a solar shares program; however both models will require some form of

subsidy or incentive to make the project economically viable.

7. ACKNOWLEDGMENTS

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8. REFERENCES

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