Bringing solar into the fold

ASSESSING THE OWNERSHIP OF SOLAR PV GENERATION
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ABSTRACT

Evolving regulations, governmental support, and increasing public demand have driven investor-owned electric utilities (IOUs) towards ever greater integration of environmentally-sourced distributed generation (DG) into their portfolios. The question addressed here is what is the most appropriate business model for the deployment of one such resource, solar photovoltaic (PV). Potential models include the direct utility ownership of generation (UOG) capacity; ownership by independent power producers (IPP) who supply the utility; and innovative hybrid production ownership models.

This position paper describes those policies that have a bearing on the financing of solar PV generation, and assesses the relative merits of UOG versus IPP approaches for IOUs, with respect to both the maximizing cost-effectiveness, and minimizing risk to their critical (and regulated) role as public service provider.

Utility ownership of solar PV is found to be a favorable model, reducing both cost and risk, but hybrid ownership models, such stakeholder participation should be explored further.

INTRODUCTION

The U.S Energy Information Administration Annual Energy Outlook for 2012 (EIA, 2012), has projected that electricity generation from renewable sources (excluding hydro power) will grow to 450,000 gigawatt-hours (GWh) by 2035. Supplying this scale of environmental generation will be a considerable challenge, and will require maximum utilization of scarce capital (both public and private). Public policies, that are needed to encourage this capital investment, must be both cost-effective in the long-term, while maintaining the appropriate level of service from the grid infrastructure. PV systems offer one of the more attractive forms of renewable energy, thanks to a cost curve that is rapidly intersecting with non-renewable generation – so-called ‘grid parity’. The technology has shown remarkable growth in installed capacity over the last 5 years (up from 100 megawatts (MW) in 2006 to 4,000 MW by the end of 2011 (SEIA, 2012)) and PV seems certain to be a major component of the 450,000 GWh renewable energy generation envisaged for 2035. PV is also a form of renewable energy that presents an extreme diversity in potential means for delivering capacity to the grid. It can be deployed through a variety of technologies and site types, and across a number of scales and business models. Some aspects of this delivery spectrum are well-delineated. For example, analyses on the relative merits of residential, commercial and utility-scale PV show that, utility-scale deployments (greater than one megawatt (MW)) are the most cost-efficient means of raising PV capacity.

Among systems installed in 2010, the costs per watt of installed capacity, for systems smaller than 2 kW, averaged $9.80/W; while large commercial (utility-scale) systems over 1,000 kW averaged $5.20/W. Large utility-sector systems (including roof-mounted and ground-mounted systems) installed in 2010 registered even lower costs, with a number of systems in the $3.00/W to $4.00/W range (Chen A., LBNL, 2011).
A similar economy of scale is shown in the sensitivity of installed system price per watt (NREL, 2012, Fig 4):

![Installed Solar PV System Price](chart)

**Figure 1.** Economy-of-scale benefits: residential and commercial rooftop, ground-mount utility-scale PV. (NREL, 2012)

But much less analysis has been applied to the most appropriate financial and business models for deploying PV, and in particular the relative costs and benefits of utility-scale PV being supplied by IPPs (through Power Purchase Agreements (PPA)) against that generated by the utility themselves (Utility Owned Generation, or UOG). In part this is because, until recently, investor-owned utilities (IOUs) were discouraged from considering UOG by a number of factors, meaning quantitative data for comparison is lacking. These factors include (Kann, S., GTM, 2010):

> a lack of in-house utility experience with deploying and operating PV technology (so-called Engineering, Procurement and Construction (EPC) skills)

> a regulatory bias that discourages undertaking investment risks where cost recovery may be uncertain

> IOU accounting treatments that favor PPA solutions

> the locking out of IOUs from federal tax incentives

Thus the initial models for PV deployment favored generating capacity that was delivered by IPPs, implemented as PPAs between the IOU and the third-party IPP. An analysis of the utility PV market (Kann, S., GTM, 2010) recorded that:

> “Of the more than 3,000 utilities in the United States, fewer than 50 have direct experience with PV on the utility side of the meter.”
Some of the early UOG pioneers included DTE Energy, TECO, and PSE&G. However, the dynamics surrounding the PV industry have shifted significantly in the last few years, and many of these shifts have made UOG considerably more attractive. These developments include:

- the introduction of legislation to enable IOUs to claim federal tax incentives (through the repeal of the Public Utility Exemption in the Emergency Economic Stabilization Act of 2008 (Division A of Pub.L. 110-343, 122 Stat. 3765))
- PV penetration which has reached non-trivial rates in several utility markets, bringing material impacts to the grid
- a greater degree of IOU comfort with the technological and operational challenges presented by solar PV

As a result, more utilities are investigating, or implementing, UOG approaches to solar PV deployment. The issues surrounding the relative costs and benefits of these two approaches therefore merit further investigation.

**GENERAL STATEMENT OF POSITION**

Social pressure for significant environmental energy generation over the next two decades, as underpinned by strong federal and state policies, requires a massive capital investment into PV deployment. The US Department of Energy has estimated a total cost of $250 billion by 2030 (in 2010 US dollars) to deliver a 14% solar energy penetration of projected 2030 electricity demand (EERE, 2012, pp21). This investment will bring with it major risks in the transformation of U.S. electrical power grid, so it is essential that operational and strategic risks from PV deployment are minimized, alongside ensuring the best cost-efficiency from such deployment.

On that basis, it is assessed that UOG provides the more secure and cost-effective path towards realizing the societal goal of significant clean energy deployment by 2035. UOG allows for a reduced capital cost, (from both lower cost of fund access, and the regulator’s capping of utility ROI) greater operational freedom and control, and reduced structural risks of utilities being left unable to deliver a transformed grid, as a result of necessary expertise and direction residing with third parties.

While IPP solutions can ostensibly reduce near-time project risks in deployment, such initial implementation risks are seen as less significant than the greater risk associated with properly integrating PV into a transformed energy grid. Additionally, UOG offers the opportunity for IOUs to earn a (capped) return on investment (ROI), and to reduce nominal debt burdens associated with PPAs. The costs of curtailed power supply (when supply peaks higher than demand), which are typically born by the power purchaser under PPAs, can also be avoided with UOG.

Regulation and policy should therefore aim to encourage OUG; this could be effected by revisions to legislation governing the accounting treatment of IOUs. The comparison between OUG and PPA should, however, not be seen as a binary choice; it remains important for IOUs to minimize overall risk by selecting solar PV from both sources, guided by local conditions and regulatory frameworks.

**CONTEXT OF THE ISSUE**

**THE ROLE OF INCENTIVES FOR ENCOURAGING SOLAR PV DEPLOYMENT**

Most environmental energy sources (taken to include hydrogen biomass and biogas, as well as wind, solar, geothermal, ocean thermal and wave energy) have a skewed cost structure with respect to those exhibited by fossil fuel energy generating technologies. They are marked by relatively high up-front costs, low or zero fuel costs, and low operating costs; as compared to the relatively lower capital, and higher fuel and maintenance costs, of fossil fuel generating capacity. Because these higher initial capital costs, and the relative immaturity of renewable technologies, were seen as a barrier to renewables adoption, public policy has been geared towards stimulating demand, in the expectation that technological and process development that will drive down costs. With greater technology development, underwritten by an incentivized and securely growing market, RE system costs were expected to be lowered; renewable energy could thereby become more cost-competitive with conventional energy sources.
This has been clearly demonstrated with solar PV, where per-unit-costs have fallen dramatically as the incentivized market has expanded (BNEF, 2012, Fig 1):


Figure 2. PV Module Experience Curve (module cost per Watt in 2011 US dollars)

But the structure of these subsidies and incentives has naturally shaped the development of the financial and business framework through which solar PV has been deployed.

**RENEWABLE PORTFOLIO STANDARDS (RPS) AND RENEWABLE ENERGY CERTIFICATES (REC)**

One of the most significant policy measures (at the state level) for increasing electricity generation from renewable resources is the adoption of Renewable Portfolio Standards (RPS). These require utility companies to supply a minimum share of their electricity from designated renewable resources. Twenty-nine states, plus Washington DC and Puerto Rico have adopted an RPS, with a further eight states planning to do so (North Dakota, South Dakota, Utah, Oklahoma, Indiana, Virginia, West Virginia, Vermont).

A common feature of these state RPS programs is the use of renewable electricity credits (REC). These are tradable credits provided to renewable energy generators, which commonly form the currency of REC trading systems. Such trading markets are structured to minimize the costs of RPS compliance. Ultimately, RECs are intended to incentivize carbon-neutral renewable energy, by providing a production subsidy to electricity generated from renewable sources.

Utilities meet these solar target by either earning solar RECs (SRECs) from solar UOG, or purchasing SRECs from third parties, often in the form of PPAs. A penalty (the Solar Alternative Compliance Payment (SACP)) is levied on utilities if they are unable to generate or buy SRECs at mandated yearly amounts.

Because SRECs have a value to the utility (for the avoidance of penalties), and are tradable, solar generation capacity owners are able to earn income from SREC sales, in addition to the direct sale of generated electricity. This has been one of the main drivers for IPP investment in delivering solar generation capacity in SREC-enabled states, by substantially boosting returns on investment for third-party raisers of capital.
There are additional incentives relevant to solar PV generation, which IPPs have been able to take advantage of. These include:

- **Federal Business Energy Investment Tax Credit (ITC)** – This is a corporate investment tax credit, claimable against expenditures for the equipment and facilities that produce electricity from PV (and other renewable sources). For solar, the rate claimable is 30% of total expenditure, unlimited by size of project or by the the expenditure involved. Initially IOUs were excluded from claiming these; this changed in 2008.

- **Federal Renewable Energy Investment Grant** – The ARRA established a grant program for investors that cannot claim the ITC, which covers PV. Again a rate of 30% is allowed for, claimable once 5% of expenditure on work of a ‘significant nature’ has occurred.

- **State Financial Incentives** – Many states subsidize the installation of renewable energy equipment through a variety of measures, including specific grants, rebates, and tax credits.

- **Feed in Tariffs (FITs)** – These are programs where guaranteed rates are paid out by utilities, for a fixed term, for the supply of RE sourced electricity, such as PV. The capacity eligible for FIT rates is rationed in fixed parcels of supply capacity. These fixed FIT rates typically vary by the nameplate capacity of projects, and are often restricted to smaller generators. FIT schemes are less commonly found at state-level than REC schemes.

Some of these incentives are now becoming available to regulated utilities, as Troutman Sanders (2009) have pointed out:

> Last year, for the first time, the 30% ITC for solar property became available with respect to property that is owned in the regulated business of an electric utility. This ITC is now available for facilities placed in service through 2016, providing for the first-time a long enough window of certainty to develop larger utility-scale solar facilities and be assured of credit qualification.”

This has led to an increasing interest by utilities in UOG solar PV, and to a new balance between the pros and cons of these two models. These will be more fully explored below.

**INDEPENDENT POWER PRODUCERS AND POWER PURCHASE AGREEMENTS**

The PPA model utilizes a third-party supplier (the IPP) to produce the solar PV power to be fed to the grid. In this approach, the IOU negotiates with the third-party owner to supply power according to an agreed cost schedule – the power purchase agreement (PPA). The IPP finances the PV system itself, and recovers its installation and capital costs through the agreed PPA rate, charged to the utility. Third-party suppliers are usually Limited Liability Companies, organized to return a profit to investors, though they may also be not-for-profit entities. The utility recovers its costs incurred through the PPA via a rate assessment through the PUC.

Because IPPs are invariably set up as taxable entities, they fully qualify for the range of benefits, tax credits and incentives, introduced at both the federal and state levels to speed renewable investment and deployment. This includes tax credits, the sale of RECs (or the locked-in Feed-In-Tariff rates where appropriate). They can be viewed as vehicles set up primarily to monetize the federal and state benefits supplied to stimulate the solar PV market, and return them to their investors, at heightened rates of return.

**Example PPA: Kalaeloa, Hawaii**

Solar energy purchase under PPA model offers a fixed-escalator scheme with electricity price that increases at a predetermined rate, usually 2–5% for the first 10 years. For example, the Hawaii Public Utilities Commission (PUC) recently agreed to a PPA contract with SunPower, who are to sell power to Hawaiian Electric Company. This will be generated from a 5 MW solar PV facility on Kalaeloa, and will come in at a fixed rate of just under 20 cents per kwh. This rate will escalate according to a fixed schedule for the first 10 years of the PPA, when a price reduction is schedule for the second half of the 20 year contract. (SunPower, 2011)
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ELABORATION OF POSITION

It is technically feasible that regulated utilities could continue to meet their RPS obligations without owning solar PV generating capacity, as the regulatory and economic framework for procurement through PPAs is already in place. But is this model for deployment the most appropriate, when judged in the context of the wider long-term interests of society, which include both cost effectiveness and the preservation of the public service role of the utility?

COST COMPARISON BETWEEN UTILITY-OWNED (OUG) AND THIRD-PARTY GENERATION (IPP)

The impact of financing on LCOE of solar PV

The calculation of the levelized cost of electricity (LCOE) distributes the cost of a given energy system over the systems predicted output. It takes into account factors such the installed system price, and associated costs, such as financing, land, insurance, transmission, operation and maintenance. LCOE is commonly used to compare the energy costs of various renewable and non-renewable energy sources, with their widely divergent cost structures. LCOE can also be viewed as a surrogate for calculating a fair PPA rate, and to compare to the fair rate to be charged to ratepayers, for that component of energy generation.

Utility-scale solar PV will generally require financing to fund the project. Given that upfront capital costs are the major component of overall cost of generation for solar PV, finance costs play an important factor in determining the LCOE – and so ultimately the rate paid by consumers.

This has been illustrated by LCOE sensitivity analysis to various factors by Lazard (2009, pp9):

“A key issue facing Alternative Energy generation technologies in the currently disrupted capital markets environment is the reduced availability, and increased cost, of capital; these dynamics have a greater relative impact on Alternative Energy generation technologies, whose costs reflect essentially only return on, and of, the capital investment required to build them”

Their calculations found that PV showed approximately a 9% sensitivity to a 100 basis point (where one basis point is a 1/100th of one per cent) move in finance rates:

<table>
<thead>
<tr>
<th>Weighted Average Cost of Capital (WACC)</th>
<th>C Si Solar (LCOE $/Mwh) (% change)</th>
<th>TF Solar (LCOE $/Mwh)</th>
<th>Nuclear (LCOE $/Mwh)</th>
<th>CCGT (LCOE $/Mwh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2%</td>
<td>140</td>
<td>120</td>
<td>90</td>
<td>75</td>
</tr>
<tr>
<td>9.2%</td>
<td>177 (+27%)</td>
<td>151 (+26%)</td>
<td>124 (+38%)</td>
<td>79 (+5%)</td>
</tr>
</tbody>
</table>

Table 1: Sensitivity of LCOE to cost of capital by generating technology (from data in Lazard (2009, pp9))

This sensitivity is of major bearing in considering the relative merits of UOG and PPA solar PV approaches; IOUs and IPPs will often have access to different qualities of capital, with different finance rates.

In general, utilities have Investment Grade credit ratings, with 74% of IOUs rated BBB or higher by S&P in 2010 (Ceres, 2012, Fig5). The risk premium paid over the risk-free interest rate for a BBB-rated utility bonds ranged between 1% and 2% (100 bp to 200 bp) in 2011.
In contrast, IPPs supplying solar PV capacity rely heavily on Tax Equity-based financing for raising their capital. The expected rates of returns for lenders supplying funds through such channels has been placed (Mintz Levin, 2010, Fig V-1) at between 9% and 13% for unlevered funds (those without debt financing) and between 13% and 20% for levered funds (those with debt financing).

On this basis, it seems likely that IOUs holding a reasonable credit rating are will be able realize a significantly lower finance cost component to the LCOE of a solar PV project. However, while many utilities may have better access to lower cost debt than many renewable IPP developers, they may find they are already committed to capital expenditure programs. Equally, as Troutman Sanders (2009) have stated, in order to improve their balance sheet, utilities may prefer to conserve capital. In those cases, PPAs can usefully minimizes the capital demands on utilities.

The impact of other costs

There may be a perceived advantage to PPAs where the high costs for skilled personnel can also be avoided. Personnel that can install, operate, and maintain renewable energy technologies may not exist in large numbers with the utility workforce. This is will not be the case for IPPs, for whom solar PV is a core business.

However, bearing in mind the criticality for the utility of being able to adapt and manage the high penetration rates of renewables envisaged, any cost saving here will ultimately prove a false economy. IOUs need to rapidly gain expertise across the breadth of renewable energy technologies; out-sourcing expertise is likely to increase strategic risks of failure in the switch to RE.

Finding appropriate sites for installing renewables can add to project costs. These costs have the potential to be unbounded on the upside, when the unlimited litigation opportunities for stakeholders in the permitting process are taken into account (NREL, 2012, pp23). However, IOUs may have greater flexibility in finding low-cost sites, and avoid this cost risk, than IPPs. They can do so by choosing from pre-zoned sites, those already home to IOU energy or industrial facilities. Finally, utilities may be able to access lower cost insurance for PV installations than IPPs.

Return on investment for IOUs

Although federal tax provisions previously left utilities at a significant disadvantage relative to other developers (with generating property owned by IOUs not eligible for ITC ), that has changed . ITC has been claimable by utilities for their owned solar PV generation since 2008, with the passing of the Emergency Economic Stabilization Act (Division A of Pub.L. 110-343, 122 Stat. 3765).

Additionally, owning solar PV presents an opportunity for public utilities to earn a return on their invested capital, which is foregone through PPAs. Troutman Sanders, (2009) found that direct ownership is considerably more attractive than a fuel adjustment clause (FAC) pass-through, because a FAC, utilized through a PPA, provides no financial return on the utility’s investment.

<table>
<thead>
<tr>
<th>Additional Yield (basis points) over Treasuries for Corporate Bonds (S&amp;P credit ratings)</th>
<th>'A' Utility</th>
<th>'BBB' Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Y</td>
<td>90</td>
<td>108</td>
</tr>
<tr>
<td>10Y</td>
<td>155</td>
<td>190</td>
</tr>
<tr>
<td>20Y</td>
<td>130</td>
<td>180</td>
</tr>
</tbody>
</table>

Table 2: Utility risk premium by term (from data in Raymond James (2012), pp2)
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RISK COMPARISON BETWEEN UTILITY-OWNED (OUG) AND THIRD-PARTY GENERATION (IPP)

Advantages of undertaking a solar PV through UOG

Troutman Sanders (2009) also show that utilities may find the PPA option fails to provide them with sufficient control over the operation and management of renewable resources. This could place their ability to deliver on their public service role – secure, reliable and safe electricity, provided with a progressively lower environmental burden – at some risk. Because of the fundamentally novel nature of solar PV power, both in terms of technology and the product (with its inherently variable dispatch characteristics), those risks are far from negligible.

Direct ownership of the solar PV capacity, conversely, places the utility in control of factors such as site placement, operation and aspects of transmission; this would help utilities to mitigate the operational and management risks springing from novel technology deployment. It also allows for potential optimizing of projects, as Troutman Sanders (2009, pp5) have found:

“the utility maintains operational control of the renewable resource and can integrate the resource into its system in a manner that maximizes the value of the asset and is complimentary to the utility’s other generation. A utility will be much less likely to achieve these objective under the PPA option where the IPP has little to no incentive to operate the renewable resource in a manner that effectuates a reduction in the overall cost of purchased and self-generated power by the utility.

This may be particularly problematic for utilities that operate under state-imposed least-cost operations requirements that may be difficult or impossible to meet if third-party IPPs control a renewable resource.”

However, Troutman Sanders (2009) also considers that there is a certain regulatory risk associated with self-build. The state’s public utility commission (PUC) may deem the addition of new resource as requiring a review of the certificate of public necessity. This could then “put the utility at risk for under-recovery of its development and construction expenditures.” (Troutman Sanders, 2009, pp.9)

Equally, IPPs can face uncertainty in the regulatory framework in some states. Laws and regulations do not always clearly distinguish how IPPs fit in to the existing system, leading to uncertainty as to whether IPP’s need to be regulated by state utility regulators or not.

ADVANTAGES OF UNDERTAKING A SOLAR PV PPA FROM AN IPP

Conversely, a PPA can be seen to lower the risk to the utility (and consequently the ratepayers), in a number of ways. Firstly, all of the development, construction and finance risks are borne by the IPP. Under the terms of the PPA, power is supplied at a fixed cost, irrespective of cost overruns experienced by the IPP. However, such risk factors will often incorporated as a risk premium by the PPA developer.

The IOU can also avoid possible policy instability by dealing with an IPP. This could be an important and immediate factor, with several federal tax grants set to expire by the end of 2012 – including the ITC and the 1603 Treasury Grant. By undertaking a PPA, that risk is born by the IPP, not the IOU.

Regulatory risk can also be reduced by choosing a PPA over OUG. For regulated utilities, where revenue is tied to regulatory scrutiny, the interpretation given by the PUC is critical. If utilities are allowed to recover their PPA renewable energy costs from a fuel adjustment clause (FAC), they may avoid involved scrutiny from the PUC. A utility that builds its own renewable energy may be subject to a certificate of public necessity; this may risk the ability to recover costs, and so curtail the prospects for the UOG project.
The impact of accounting treatments of IOUs

One consequence of the way IOUs are regulated is that they must ensure that any tax benefits or depreciation of assets is spread over the full lifetime of a project. This ‘normalization’ is applied on the basis that all customers (including those of the future) should share in any benefits. But because LCOE works from projected cash flows that are discounted, benefits spread further out in time are worth less now, which impacts indirectly on the fair prices that can be charged.

Because IPPs can accelerate their depreciation, and front load their benefits, they benefit under an LCOE assessment, and can offer lower prices. This can affect the ability of regulated IOUs to deploy their own PV generation (Scharfenberger, P., 2011):

“IOU investment generally has to pass a test of “prudency” before cost recovery is allowed. If contracting with an IPP of RE will result in lower electricity rates than direct ownership of RE projects, chances are slim that an IOU will be able to justify the purchase of a RE project to a regulator.”

Legislation to lift the need to treat such benefits according to ‘normalization’ was introduced to the Congress in 2010 (H.R. 4599 – 111th Congress: Renewable Energy Expansion Act of 2010. (2010)), but failed to make it out of the House Committee (Wickless, A., 2010).

Another consequence of accounting treatment, that makes PPAs less than favorable to the utility, is the equivalence of PPA obligations to debt. For an IOU that has undertaken PPAs, the future payments of the IPPs are considered as a debt, in accounting terms. As such, the debt negatively constrains the IOU, by reducing their ability to raise their own capital for investment – instead they must raise equity to reduce their debt: equity ratio (GTM Research, Kann, S., 2010):

“PPAs are treated as imputed debt on utility balance sheets. Though they are not actual debt instruments, PPAs create a long-term financial obligation to the utility that appear as debt on a balance sheet. […] they have the effect of increasing a utility’s debt-to-equity ratio. This negatively impacts a utility’s credit rating and forces it to rebalance this ratio by adding equity.”

This in itself results in more expensive PPA prices, as the IOU has to factor in the cost of debt-to-equity re-balancing when negotiating the PPA price.

INNOVATIVE BUSINESS APPROACHES – A CASE FROM NEW JERSEY

A number of new business models have emerged in the last 3 years and for utilities they offer promising alternatives for future development of renewable resources such as PV. Such proposals for the utility financing of PV deployment have included shareholder funding of utility solar loans, and treatment of all or part of the loan funds as regulatory assets (such utility capital investments can then be included in ratebase and earn a return for utility shareholders) (SEPA, 2008, pp 8).

Another example can be found in New Jersey, which is considered to have one of the most aggressive renewable energy policies. PSE&G is the state’s largest utility, and through its initiatives is providing capital resources to support the governmental clean energy commitment.

PSE&G has advanced it a ratebase funded program known as Solar 4 All program, to invest in several solar projects. This initiative was accepted in July 2009, by the New Jersey Board of Public Utilities, allowing PSE&G to invest $515 million in solar projects. Under the program 80-megawatt of solar PV is being installed across New Jersey, divided equally between two site types – centralized installations and pole-attached solar units.
PSE&G (2012) have presented that, as of January 2012, 58 megawatts of PSE&G owned solar power has been deployed into service. All revenue PSE&G receives from the sale of its solar electricity, revenue from the sale of its SRECs, plus the federal investment tax credit is returned to ratepayers, thereby offsetting the overall cost of Solar 4 All. The installations costs are passed through the customers, but in 2011, the program’s impact on the average residential customer’s bill was 29 cents per month (PSE&G, 2012, pp 8). Produced solar power is grid-connected to PSE&G’s distribution system, and the power sold onto the PJM wholesale power grid.

For its centralized solar facilities PSE&G is installing large-scale solar on IOU property, as well as customer sites through negotiated lease arrangements. PSE&G has now installed three solar farms on former brown field sites, where the lessor receives lease-payments from space otherwise not in use.

Besides Solar 4 All program, PSE&G has developed a utility-financed loan program for progressing solar PV deployment. It has advanced $247 million towards a solar loan program, which offers loans for both commercial and residential solar systems installations, paid in part by the SRECs that the system generates. The PSE&G Solar Loan Program establishes a floor value for the SRECs over the 10-to-15-year terms of the loan, a necessary feature in the local market, where SREC prices declined significantly in 2011. The Solar Loan Program allows for smaller projects to compete with large projects that can take advantage of economies of scale. (PSE&G, 2012, pp8).

The PSE&G case illustrates how innovative business approaches can serve utility business interests, and at the same time motivate utilities to accelerate renewable energy deployments.

**RECOMMENDED ACTIONS**

Federal: The reintroduction of legislation (incorporating part or all of H.R. 4599 – 111th Congress: Renewable Energy Expansion Act of 2010. (2010)) to remodel the accounting treatment of IOUs, to favor OUG, would be a significant step towards liberating IOUs, allowing them to bring their the capital resources to bear on raising solar PV capacity.

**CONCLUSION**

The dynamics of the renewable industry – and the solar industry in particular – have been significantly shaped by policy incentives, which have initially favored the development of IPP generation solutions. This facilitated the liberalization of the renewable energy market, allowing the private sector capital to invest and operate where the public energy utilities were initially limited or reluctant to do so. This has been beneficial in the initial phase of the clean energy transformation.

However, the provision of new generation capacity, such as PV, solely through IPPs, may no longer make sense when seen from the perspective of minimizing costs and risks ongoing. Both the utility and wider society may benefit by an opening up of renewable distributed generation ownership, to include utility-owned, and hybrid ownership models.

Ultimately, each utility must assess its context-specific company, regulatory, and policy frameworks to determine its optimal solar business model strategy.
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