Utility solar business models

Mike Taylor, Solar Electric Power Association, Washington, DC, USA

This paper first appeared in the seventh print edition of *Photovoltaics International* journal.

ABSTRACT

U.S. electric utilities are beginning to explore participating in the U.S. solar markets in new and unique ways, including utility ownership of solar projects, innovative program designs that purchase solar energy from customers or third-party providers, and providing financing for customer or third-party projects. Known as *Utility Solar Business Models*, these utility innovations are expanding and diversifying the market in new and unique ways, driving hundreds of megawatts of new business, but how these new projects and programs impact the solar value chain and what is driving the change varies from utility to utility. This article lays out the evolving nature of utility engagement with solar markets, defines utility solar business models generally, and explores some of the specific program that utilities are proposing.

To date, the United States' photovoltaic markets have largely been driven by net-metered residential and commercial customer projects, in large part due to federal, state, and utility incentives (see Fig. 1). The rapid growth of the commercial market in particular can almost entirely be attributed to the development of the well-known 'solar-services' business model, also known as the solar performance or the third-party solar model, which began in the early 2000s. In short, the commercial solar market surpassed the residential sector, and in 2008 represented only 10% of the number of installations but well over two-thirds of the annual grid-connected megawatts in the U.S. PV market [1]. This article will provide background information on the U.S. solar markets, and define what a utility solar business model is and the drivers of different model types.

Under the new business model, third-party solar companies own and operate rooftop photovoltaic systems on commercial rooftops and sell the output to the building owners at a long-term, fixed price that is lower than the local electric utility's rates. The customer now pays a portion of their bill to the utility and a portion to the solar company, and over the long-term, hedges the presumed rise in utility electricity rates for the portion that is offset by solar. The solar company uses economies of scale in financing, purchasing, and incentives to drive down costs and provide a packaged solar product at very low risk and up-front cost to the customer.

The traditional customer-ownership model was turned on its head by the new third-party business model, and in the process, the market expanded significantly. In a similar fashion, utility solar business models (USBMs), where utilities become drivers of significant PV developments, are poised to add an additional layer of maturity to the evolving and expanding solar markets. Utility ownership of PV assets is one of the clearest examples of a USBM, with hundreds of new megawatts of PV project deployment having been announced by utilities, but there are a number of other types of models in this emerging market area.

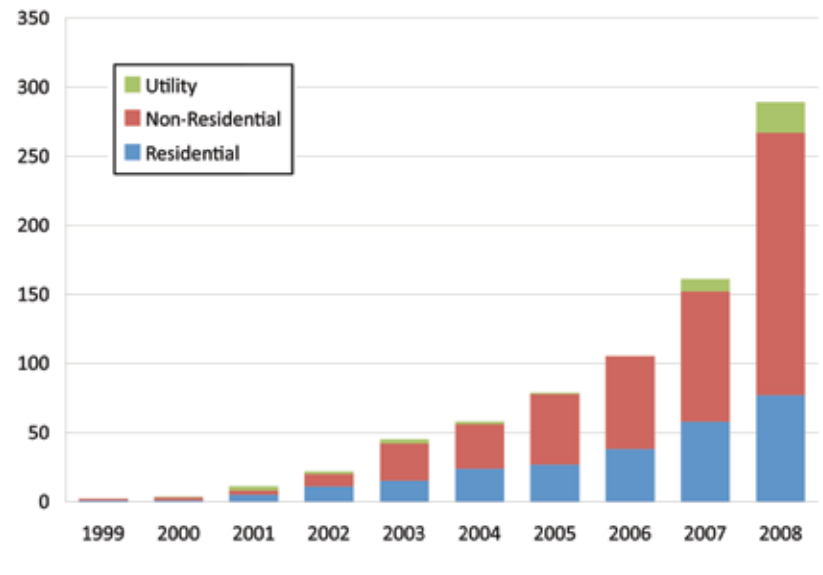

Figure 1. Annual installed grid-connected PV capacity by sector in the United States (1999-2008) [1].

The Solar Electric Power Association (SEPA), a non-profit educational association in the U.S., has been researching and tracking USBMs since 2007 and disseminating the information in a series of reports, webinars, articles, and conference sessions. By educating the solar industry, utilities, policy makers, and stakeholders about these developments, ultimately the industry as a whole can benefit from a better, more proactive relationship with utilities.

Evolving utility engagement in solar markets

It is important to understand the evolving nature of utilities' engagement with solar technologies and markets. SEPA has developed a five-stage framework for categorizing utility solar engagement, which ranges from no engagement to managing customers to utility solar business models (Table 1).

Most utilities have little to no experience with solar, which flows from the heavy concentration of solar market activity in a small number of states (Stage 1). These utilities are located in less active solar states that include some combination of no incentives, no formal solar or renewable policies, and/or low electricity costs. However, as these three disincentive factors change over time more utilities will begin to see inquiries and interest from customers, beginning with residential, small business, educational, or non-profit organizations that are seeking to install a PV system. The utility, sometimes in isolation and at other times in concert with regulators or other stakeholders, develops a basic process for managing these customers (Stage 2). Many utilities spend and lose an inordinate amount of political capital in dealing with individual consumer requests and/or the development of these basic procedures. The stereotype of 'solar versus the utility' often surfaces here as these proceedings are fleshed out.

	Stage	Description	Comments
1	None	No solar market activity exists.	Majority of utilities; generally states with no incentives, solar or renewable policies, low electricity costs, and/or smaller utilities.
2	Managing customers	Managing residential and commercial interconnection requests.	Net metering and interconnection procedures and contracts.
3	Facilitating customers	Developing programs or procedures that reduce customer costs, stream line processes, educate consumers, or other methods.	Examples include developing incentives programs or adopting procedural or contractual interconnection best practices.
4	Meeting solar goals or requirements	Internal or external goal or policy requirement, such as renewable portfolio standard.	Utility develops and implements strategic plan for meeting target, often with new focus on utility-scale projects.
5	Developing utility solar business models	Utility adds value to solar markets by reducing costs, minimizing customer burdens, expanding solar access, and/or improving efficiency and integration, through activities that create sustainable, long-term returns for IOU investors and POU communities.	Utility adds value to solar markets by reducing costs, minimizing customer burdens, expanding solar access, and/or improving efficiency and integration, through activities that create sustainable, long-term returns for IOU investors and POU communities.

Table 1. Five stages of U.S. utility solar engagement.

A certain number of utilities will continue to the next stage, where through the leadership of utility management, the dedication of committed employees, or pressure from outside stakeholders or new state policies, the relationship moves from managing customer needs to facilitating customer interests (Stage 3). This could involve the development of a utility incentive program, or the improvement of net metering or interconnection procedures toward industry best practices. At this point, utilities often begin to recognize that solar markets entail long-term impacts that need to be managed more effectively, through a wide variety of possible mechanisms, if for no other reason than to manage utility resources and customer relations.

The next stage – meeting solar goals or requirements, Stage 4 – is triggered by a change in policy, either internally at the utility or externally through state policy or regulations, that moves the utility toward more formalized solar strategies. This occurs most often because of a legislatively mandated renewable portfolio standard (RPS) or similar requirement, sometimes including a specific percentage or quantity requirement for solar resources. A utility will develop a comprehensive portfolio strategy to reach the target, which can include expanding the customer facilitation stage, but also includes the addition of utility-directed solar procurement.

Procurement can take various forms but is most commonly done through traditional requests for proposals (RFPs) and bilateral project negotiations. However, a handful of utilities are also beginning to utilize standard purchase contracts or feed-in tariffs. The formalization of utility activities on both the customer and utility side of the meter to achieve the renewable- or solar-specific goal is a first step in a long-term process that can directly and significantly expand the regional solar market.

The last stage of utility engagement is the development of utility solar business models (Stage 5), which involve innovations that reduce costs, minimize customer burdens, expand solar access, and/or improve efficiency and integration, often within the framework of a solar goal or requirement. To the extent that such innovations add distinctive value in the solar supply chain, utilities should be able to capture some share of that value for their customers and, in the case of investor-owned utilities, for their investors. However, utilities operate in different regulatory environments, under different cost structures, at different sizes and with different resources, and they have diverse internal cultures. Individual utilities therefore approach new technology – the change it represents, and the new opportunities it offers – very differently.

It is worth noting a few things about the progression of utilities through these stages. **First**, each new stage generally expands the market, much like the new opportunities created when the third-party ownership business model emerged. These changes add layers, but do not replace the local solar market. As markets begin to expand, utility staff interacting with solar in some way expands across and up the utility employment structure.

Second, it must be noted that not all utilities will move at the same pace. The diversity of utilities and their business environments ensures a wide continuum of approaches and timeframes for solar engagement. **Third**, while the progression stages reflect past patterns, utilities will not necessarily move from one stage to the next in precisely this order. Florida utilities are an interesting example of this distinction. The customer-based PV market is relatively thin (Stage 2 and 3) and there is no state RPS requirement, but a number of large, centralized projects have been announced and are beginning to be implemented (Stage 4), some of which are utility-owned (Stage 5). The particulars of the political environment, utility decisions, and many other factors can circumvent what could be thought of as an orderly progression.

Fourth, the stages can occur in parallel, e.g., customer activities need not be abandoned in favour of policy-driven procurements or emerging business models. **Finally**, the stages can begin to develop and move quickly, often in response to policy changes that cause ripple effects up and down the progression. There is often, but not always, a lag between policy enactment, utility implementation strategies, and market impacts. A new RPS strategy may include customer, procurement, and business model activities simultaneously, developed in relatively short order, depending on the policy schedule and pre-existing market conditions.

Defining utility solar business models

There are almost 3,300 retail-serving electric utilities in the U.S., consisting of a wide mixture of regulated investor-owned and public power utilities, which include cooperatives, municipals, and utility districts. For example, there are 210 investor-owned utilities – a little over 6% of the total number – but they serve 71% of the retail consumers [2]. In the context of this article, a utility is a retail electric load-serving entity. Holding companies and unregulated subsidiaries of investor-owned utilities may have an associated name and arm's length relationship with the load-serving entity, but their market activities are similar to other competitive entrants into the solar business landscape. Their presence may not be welcomed by solar incumbents, but they are largely free to compete in the market (though usually subject to affiliate transaction rules, and sometimes with significantly greater resources).

A traditional utility, on the other hand, is subject to a significant amount of regulation within a defined service territory by a combination of federal law

and regulation, state law, and for investor-owned utilities, by state regulatory commissions. Unlike other businesses, utilities need to balance the interests not only of shareholders or investors (for IOUs), but also those of multiple classes of customers, and of society as a whole. This ongoing process of balancing stakeholder interests puts utilities in a unique business environment, and it is this group of traditional utilities that are the subject of the 'utility' in USBMs under study.

A USBM is a utility's business plan for playing a more integral role in the solar value chain and benefitting its constituents as a result. More specifically it answers questions such as:

- How will the utility create meaningful value in the solar marketplace?
- How can the utility benefit by capturing a share of that value?
- How can the utility sustain its solar business over time?

The utility needs to define how it can reduce costs, minimize customer burdens, improve efficiency, expand access and/or generate profits within the solar value chain – in short, how it can create value. In the early stages of this exploration, this is often done within the context of fulfilling a policy requirement. Later on in the process as solar costs, technology risk, and other factors change, utilities will begin to explore the boundaries beyond what law and policy require, and will see entrepreneurial and profitable avenues for project or program development. The value also needs to be meaningful. High profitability over low gross revenues is not an attractive proposition. Ultimately, the value needs to be sustainable over time or the investment is not worth the effort.

> "High profitability over low gross revenues is not an attractive proposition."

These three business model questions are not necessarily profound. Remove 'utility' and 'solar' and they can be applied to any company looking to develop or expand their business. But while these are apparent to conventional businesses, regulated utilities are both unique due to their regulatory structures and historically less inclined toward entrepreneurial action as a result. However, pressures from industry restructuring, new technologies, and other changes in the modern economy are beginning to implement change in this regard. If distributed solar is wildly successful, it could have a significant impact on utility finances and grid operations. Seeking out cost savings, efficiencies and expanded services today, as well as new opportunities and profits tomorrow, will begin to position savvy utilities for the future, which will simultaneously boost segments of the solar industry with new programs and projects.

In order to be successful, a business model project needs to provide a win-win-win scenario for the utility's owners (i.e. shareholders or citizens), customers (ratepayers), and society (everyone). In the short term, the economic equations may not make sense. Solar's internalized costs may be higher than other generation options for some applications, but in the context of a renewable portfolio standard, legislation can neutralize some cost concerns while markets develop and costs decline. Even if solar costs are greater than other renewable technologies, diversifying the utility's RPS portfolio may have other benefits that lower the risk of non-compliance. Centralized solar projects may be along different transmissions paths, have different siting and permitting issues, or have different overall market delays. Distributed projects can be deployed faster more widely; can buy time and reach customers that larger renewables projects may not; and diversification away from wind-only renewables may have important benefits beyond cost alone.

Many utilities will take a traditional path for compliance by providing incentives to customers and/or issuing RFPs for projects. But these options offer little value for utilities. The costs are passed through to ratepayers and society benefits from the economic and/or environmental components of new technology deployment, but there are no clear paths for utilities to benefit. However, successful utility solar business models offer a 'carrot' or incentive for the utility, which can complement and introduce efficiencies beyond the conventional 'stick' approach. In this way, the models bring new and scaled-up opportunities to the solar industry, benefiting ratepayers and society in the process.

It is also important to point out that although business models often develop in response to policy requirements, other motivators can be at least as powerful. Customer satisfaction, long-term business development, competitive technology costs and other non-regulatory motivations can drive new future USBM opportunities.

Nevertheless, achieving a win-win-win for all key stakeholders is not easy. Developing 'outside-the-box' ideas by utilities, receiving approvals from decision-makers, and working through various issues with stakeholders can be complicated. Diverse utility types, market structures and regulatory environments can limit peer-to-peer transfer and applicability. Over the last two years, SEPA has been working to categorize and track a number of new utility initiatives in this emerging and nascent area.

Utility solar business models

SEPA categorizes and tracks utility solar business models in three areas:

Utility Ownership of solar assets

Utility Energy Purchases from customers or third parties

Utility Financing for customer or third-party projects.

Utility ownership

Utility ownership of solar assets is the most direct change in the engagement of utilities with solar markets in certain states. For investor-owned utilities, owning a physical asset, solar or otherwise, is how utilities make profits as they earn a regulated rate of return on the capital investment. In contrast, purchasing the solar energy from a third party involves only recovering the costs of the purchase from ratepayers.

> "Ownership is most prevalent among investor-owned utilities due to tax incentive structures."

However, some utilities are beginning to explore, have announced plans for, and are implementing owning and operating solar projects directly. Ownership is most prevalent among investor-owned utilities due to tax incentive structures. As municipal, cooperative and other public power utilities cannot utilize tax credits or depreciation directly and relative to third-party ownership, ratepayers would pay increased costs in this instance. There are a number of positive and negative drivers for this recent trend.

Positive drivers

- Earning a regulated rate of return on owning the capital asset
- Utility eligibility for the federal investment tax credit
- Interest in diversifying the risk of RPS non-compliance from delays or cancellations by non-utility project developers
- 'Imputed debt' from power purchase agreements, which may negatively impact a utility's financial balance sheets
- Decreases in solar costs making it a more reasonable investment option
- Different and available tax equity sources than are prevalent in third-party financing models
- Lower costs of capital for financing relative to some third-party options
- Potential to capture value from tax benefits that might otherwise be lost through 'flip' structures that transfer

Utility	Size	State	Status	Description
Arizona Public Service	1.5MW	AZ	Regulatory process	Distributed projects: customer and community sites as demonstration on same distribution feeder; integrating with Smart Grid initiative; participating customers offered 20-year fixed price solar tariff.
Consolidated Edison	1.8MW	NY	On-hold	
Duke Energy	10MW	NC	Implementing	Distributed projects: miscellaneous customer sites; originally proposed as 20MW.
Florida Power & Light	110MW	FL	Implementing	Centralized projects: 25MW PV, 10MW PV, 75MW CSP.
Pacific Gas & Electric	250MW	CA	Regulatory process	Distributed projects.
Public Service Electric & Gas	120MW	NJ	Implementing	Miscellaneous projects: 35MW centralized, 40MW distributed, 43MW community, 2MW low-income.
San Diego Gas & Electric	26MW	CA	Regulatory process	Distributed projects: miscellaneous utility and customer sites; originally proposed as 52MW; additional non-utility-owned project component.
Southern California Edison	250MW	CA	Implementing	Distributed projects: 50MW/yr for five years of 1-2MW PV systems on customer rooftops; additional 250MW non-utility owned projects to be bid out in similar increments.
Tucson Electric Power	10-15MW	AZ	Regulatory process	Distributed projects: 'several' 1-4MW utility or customer sited systems; coupled with fixed-price solar tariff.
Western Massachusetts Electric Company	6MW	MA	Implementing	Distributed projects: miscellaneous utility and non-utility sites; additional future expansions proposed.

Table 2. Sample of utility ownership programs and announcements.

ownership from non-utility investors to utilities after tax benefits have been utilized.

Negative drivers

- Requires approval from regulators; potential negative stakeholder reactions
- 'Normalization' of the federal investment tax credit over the life of the asset, rather than on an accelerated basis (available to competing non-utility developers)
- Regulatory changes to allow non-physical assets, such as energy purchases or financing, to be treated as equivalent to capital investments eligible to earn a return
- For certain utilities, lack of tax appetite to utilize tax credits
- Specific state laws or regulatory environments that prohibit utility ownership of generation
- Utility or regulator assessments that discourage ownership because of real or perceived technology, performance or other risks.

Source: Mike Taylor, SEPA.

Figure 2. Southern California Edison's first utility-owned rooftop project in Ontario, Canada.

Utility	Size	State	Status	Description
Gainesville Regional Utilities	4 MW/yr	FL	Implementing	Distributed projects: customer ownership through a 32 cents/kWh utility feed-in tariff as an alternative to the existing rebate program.
Hawaiian Electric Company and Utilities	16 MW	HI	Regulatory process	Distributed projects: third-party ownership; utility will affiliated lease rooftops for projects and purchase power.
Portland General Electric	TBD	OR	Implementing	Distributed projects: third-party ownership with utility ownership through a 'flip-model' at a later date after incentives are utilized.
Public Service Electric & Gas	30 MW	NJ	Implementing	Distributed projects: customer ownership with utility providing financing to qualified participants; utility earns a rate of return on investment as if a capital asset.
Sacramento Municipal Utility District	1 MW	CA	Completed	Community project: third-party ownership with utility energy purchase; customers can purchase 'shares' of output as 'virtual net metering'; similar programs with other smaller municipal utilities.

Table 3. Sample of energy purchases or financing programs and announcements.

Utilities in a number of states (Hawaii, California, Arizona, Florida, North Carolina, New Jersey, Maryland, Massachusetts, Michigan, Ohio and Illinois) have announced intentions to acquire or now own hundreds of megawatts of photovoltaic systems. These include aggregated distributed systems on the utility side of the meter, and medium-sized centralized systems less than 25MW in size. However, centralized project ownership is very likely as solar system costs decline and ownership risk (technology, performance, operations and maintenance, etc.) is better understood.

Utility ownership represents a significant change to the solar industry. Upstream companies likely view this as a new and expanding market opportunity and may welcome the change. However, downstream companies may perceive a threat to their existing ownership business models. Utilities need to anticipate and structure business model design to manage 'blowback' issues that could arise. The few utility commission proceedings on utility ownership that have been completed have brought up cost and rate impacts, as well as anti-competitive or monopoly concerns from various stakeholders. Commissions need to ensure that competition remains open and fair, but also that utility ownership serves the economic interests of ratepayers, where third-party ownership could be a lower-cost option. Ensuring competitive utility pricing relative to third-party projects can actually effect downward price pressure on both sectors, which is a win for ratepayers regardless of ownership.

Utility energy purchases & financing

Both energy purchases and financing business models have generally been met with less concern from stakeholders, perhaps because the models are more likely to involve direct partnerships with customers or solar companies, but also because they are less numerous. Although less numerous, the models are increasingly diverse, as outlined in the points below.

- Community net metering or tariff projects, where the utility develops a larger-sized system and essentially sells 'shares' in the project that allow customers to offset their consumption directly or pay a fixed-priced tariff based on the output of their share
- Feed-in tariffs that are based on time-of-use or market rates, or that offer more compelling business opportunities relative to a traditional rebate program
- A flip-model between the utility, an investment bank, and site owners; ownership is transferred to the utility after the tax benefits are fully utilized
- Project financing for residential and commercial net metering customers that uses renewable energy credits to repay the loan, and earns the utility a return on its loan investment
- Competitive bidding or auctions for third-party-owned projects that are sited in strategically valuable locations for grid support, smart grid testing, or peak generation benefits.

> "USBMs should be seen as an expanded market opportunity, not a replacement of existing market sectors."

Conclusions

Residential and commercial photovoltaic projects will continue to be important as market segments, but the solar industry is diversifying away from rooftop net-metered projects as its primary economic model. Utilities are beginning to play a part in this diversification. USBMs are very nascent and are being explored through the various social, political and regulatory processes under which utilities operate. In many cases, the projects need to be structured so as to provide involvement with and synergies within the existing solar industry. For many facets of the solar industry, USBMs should be seen as an expanded market opportunity, not a replacement of existing market sectors. While this change is complex, solar companies that see these developments as new opportunities for growth may be the ones that are best adapted to absorbing and profiting from the change.

Acknowledgements

The author would like to recognize the significant contributions of **John Nimmons**, President of John Nimmons and Associates, who has worked with SEPA and its utility members since 2007 on the Utility Solar Business Models project and whose research provides much of the foundation for this article.

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About the Author

Mike Taylor is the Director of Research and Education for the Solar Electric Power Association (SEPA), a non-profit, utility-focused solar membership association with more than 800 utility, solar industry, and stakeholder members. Prior to joining SEPA in 2006, Mike was a Program Administrator for the Minnesota State Energy Office, managing renewable energy programs and projects, including the development and operation of the Minnesota Solar Electric Rebate Program. Mike has a Master's degree in science, technology, and environmental policy from the University of Minnesota and a Bachelor's degree in environmental biology from Saint Mary's University of Minnesota.

Enquiries

Email: mtaylor@solarelectricpower.org