Servicizing Solar Panels

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Abstract

Packaging products as services can create financial opportunities for suppliers and can create the economies of scale which help environmentally preferable products (EPP) achieve their maximum effectiveness. For suppliers, offering product service systems (PSS) broadens their market to reach customers who are only interested in purchasing a financed or valued-added version of the product. Environmentally, PSS consolidates ownership of capital stock, facilitating product upgrades and proper maintenance, and can also be used to finance EPP with higher upfront costs and long payback times. Photovoltaic solar panels are a prime example of a product which can benefit from being serviced. This paper makes a business case study of an American company, Soltage Inc., which markets photovoltaics as a PSS.

Keywords: Product Service Systems, photovoltaics, solar panels, servicizing.

1. Introduction

1.1. Economics of photovoltaics in the US

Photovoltaic (PV) panel systems require large up-front costs but thereafter have predictable and low maintenance costs and typically carry manufacturer warrantees guaranteeing steady electricity production for 20-40 years. In the US PV panels are subsidized both by federal and state governments using a complex mixture of market instruments. These instruments include direct subsidies, rebates, tax credits, and renewable power certificate markets.

To date, even in the locales with the best confluence of state and federal incentives PV panels have still been too expensive for mainstream adoption, requiring long payback periods. Recently the state of New Jersey adopted stringent renewable energy requirements and established a lucrative renewable power certificate market. The state has mandated utilities to produce or source a certain percentage of renewable power, and has established a market for utilities to buy green electricity credits from renewable power stations.

With this policy in place, New Jersey is now the only state in which solar electricity can be produced for less per KWh than it is sold by utilities. However even though PV is economical in theory, adoption is still slow. Securing all the necessary subsidies and credits, and finding proper financing, remains a serious challenge for most would-be PV customers. To help overcome these challenges and to exploit the profitability of PV panels in New Jersey, two companies have recently formed. Their business is essentially to erect PV panels and share the resulting profits – the spread between the cheaper PV generated electricity and the more expensive retail electricity – with customers.

1.2. Background on Soltage Inc.

Soltage is one of two recently formed companies marketing servicized solar in New Jersey. Soltage and rival SunEdison have similar offerings and differentiate by approaching different customer bases. Soltage markets to small and midsize industrial real estate landlords interested in the financial benefits of low-cost solar electricity. SunEdison is currently approaching brand name big box retailers interested in both the financial and PR benefits of solar power. (See section 2.1 for more discussion on how Soltage identified its target customers.) Both companies create value by bringing legal and tax expertise to capture all the complex

necessary government subsidies, and bring the capital required to erect a PV installation.

Soltage executes projects by first identifying a customer who would like to use PV electricity. Soltage leases the customer's rooftop area and installs a mini PV power station. Soltage secures a contract with the customer binding them to first buy discounted electricity from Soltage's rooftop solar plant. If the panels supply too little power for the customer, a computerized load balancer seamlessly switches to buying extra electricity from the grid, and if the panels generate surplus power it is sold by Soltage back to the grid. Soltage owns and finances the solar plant installation, operation, and maintenance. The end user notices no difference in their electrical supply and needs no interaction with the rooftop plant.

Soltage thus operates as a distributed micro electricity generator. The company would prefer to operate PV plants on its own, but many of the necessary subsidies are tied to existing electrical customers and depend on their location and historical electricity usage. Customers benefit by enjoying cheaper, renewable electricity, and Soltage benefits by selling competitively priced electricity.

1.3. Servicizing Solar

The concept of "servicizing" – reselling fractional access to a product through some mechanism such as a timeshare, lease, rent, license, fee-for-use; frequently combined with some valued added component – has been around for decades, if not hundreds of years. The modern dry cleaner is but one example, where one dedicated firm owns and operates a capital intensive product and sells usage of the product both on a time basis (washing clothes) and offers a value-added service as well (folding, ironing, etc.). In the past decade the concept of servicizing – widened into the larger concept of a *product-service system* (PSS) – has been adopted by researchers and businesses interested in using the model to bring capital-intensive environmentally favorable products to market (Tukker 2006, Mont 2001, 2006). The company studied in this case study, Soltage Inc., is marketing photovoltaic panels using the PSS approach. This paper explores the business model for servicizing solar.

2. Reaching new customers

2.1. Identifying target customers

PV-generated electricity has two key benefits: PR benefits and lower cost. For some customers there are PR and marketing benefits to being able to advertise their use of renewable low-carbon energy. Additionally, in some cases B2B customers who supply to larger firms with green purchasing policies may be able to get a larger market share by utilizing renewable energy. SunEdison targets customers who have interest in PV panels beyond the immediate financial benefits. SunEdison targets big brand retailers who are interested both in the financial savings and in the marketing and reputational benefits of being able to say they use green electricity.

Soltage targets small and midsize businesses, and markets primarily the lower cost and secondarily the green energy PR benefits of PV power. Soltage is able to offer the typical customer a 10-20% discount on electricity. For landlords and low-margin warehouse based businesses energy costs can be a significant part of their bottom line, and such a significant savings is very attractive. Both companies will seek customers with favorable roof area-to-power consumption ratios, where a rooftop PV plant can meet close to 100% of the customer's energy demand.

2.2. Financing

A core component of Soltage's value proposition is turnkey financing of the PV panels. Soltage (or more precisely, its creditors) will finance the PV installation and pay all operation and maintenance costs. Soltage then bills its customers for the solar electricity it sells them. Customers must sign a multi-year contract with Soltage binding them to prefer purchasing Soltage's power before electricity from the utility, but in this contract Soltage fixes the price of the PV power at a floating discount (up to 20%) off the prevailing grid electricity price.

This arrangement ensures that Soltage customers are exposed to virtually no financial risk from the PV panels. Most often they will simply buy electricity from Soltage at a guaranteed discount, and in the worse case that Soltage reneges for any reason on the contract they will be able to return seamlessly to purchasing all the power they need from the grid.

3. Making EPP profitable

PV panels are a fairly typical case of an EPP (environmentally preferable products). The product service system (PSS) framework is especially effective at bringing EPP to market. When a dedicated firm can servicize an EPP to a large customer base, they can bring very high

leverage to bear on the modest profit margin the EPP can offer.

EPP are typified by high initial costs and long payback times. Additionally, EPP are technologically advanced and typically require some expertise in their installation, operation, and maintenance in order to achieve the best performance. PV panels have all these characteristics. PV panels require a large upfront cost because they utilize leading edge technology. Soltage will be able to always purchase the most advanced product available for each new installation (or possibly even upgrade existing panels with newer ones if the improved performance of the new product makes this option financially attractive for Soltage.) Like many EPP, PV panels have long payback times. This is because their marginally superior resource efficiency per unit of service versus competing technologies is slow to pay off. Finally, Soltage makes PV panels profitable by bringing together financial and technical expertise in order to finance, install, and operate the product. This role having a firm be a dedicate specialist in an EPP is critical to effectively servicizing an EPP.

Packaging EPP is a highly effective way to bring them to market. Dedicated firms with access to capital and necessary expertise ensure the new technology is installed and operated at the lowest possible cost. And bringing EPP to market as a service lets customers bypasses the obstacles of high capital costs and the complexities of owning what is often a technologically advanced product requiring some expertise in its operation and maintenance.

The PSS model is particularly well suited for exploiting small profit margins offered by marginally more cost-effective EPP. This conclusion has received some debate in the literature (for a review see Heiskanen 2003). Some early PSS advocates optimistically assumed that a servicized model could lead to radical improvements in eco-efficiency. However it appears more likely that PSS is very well suited for introducing marginal eco-efficiency improvements in products, while products with truly radical eco-efficiency (and concomitant economic) benefits are more likely to see adoption without PSS support. A clear example of this is TDI vehicles. TDI diesel engines are an EPP which offer nearly twice the fuel economy of a petrol engine. With such a huge obvious financial savings end customers could fairly easily evaluate petrol and diesel options, because the amount of fuel savings over the lifetime of the car made it easily worthwhile for them to compare the two products

In ecological terms (particularly in a carbon perspective) PV panels may be a radical improvement over grid electricity. However in current market terms they are only marginally more attractive than grid electricity. An individual customer or end user may not be highly motivated to go seek a 10-20% cost savings by installing PV panels themselves. But when this savings is packaged as a service, with almost no effort required by the final customer, it becomes much more attractive. Dedicates firms can bring in expertise, efficient financing, and exploit economies of scale in order to extract a tempting profit from even only marginally profitable EPP.

4. Conclusion

4.1. Limitations of PSS

Not all customers are interested in servicized versions of products. When a customer buys a service they accrue benefits from being able to use the product, but they do not accrue equity as they do when they purchase a product. Some products–including PV panels–continue to provide benefits even after they have been fully depreciated. PV panels may be able to pay for themselves in savings within 5-7 years, but will continue generating electricity for up to 40 years. This fact obviously benefits Soltage – they will see 30+ years of profit from each installation – and Soltage will have to be continuously in negotiation with customers regarding how to share the lifetime profits from the panels. Some customers will prefer to operate their own PV installations.

Another way of looking at this issue is to consider the customer company as an entity which comprises several links in a value chain stringing from primary resource extraction all the way to final consumption. Companies must identify their core competencies – where in the value chain they have the greatest comparative advantage – and then outsource to others all aspects of their operations in which they have no advantage. The difficulty of setting up a new PV installation (both the high financial costs and the formidable complications of securing all the necessary subsidies) makes it likely that most Soltage customers will benefit by outsourcing the PV operation to Soltage. However some customers, such as large commercial realtors, may realize they have sufficient resources in-house to operate PV panels and will demand more favorable contracts with Soltage or begin operating their own PV installations.

This case study has looked at industrial customers who have a very clear idea of their core competencies and where PSS can bring them value. PSS marketed to consumers are functionally the same, but individuals are often less articulate about the economics of their lives than are corporations. Even the smallest company operates an accounting department, but in the household the accounting staff is typically a part time unpaid conscript at best. This fact poses a risk to consumers. Individuals may purchase PSS instead of actual products because they prefer the ease of use. But if they are not able to make this new expense pay for itself by improving their earning power consumers will end up net losers. When an individual buys a product which costs more than it provides in monetary benefits, at least the consumer has a product which they can sell second hand. But when purchasing a service the consumer spends money and gets nothing tangible in return. Some may be concerned that the wide-scale substitution of products with PSS would put consumers at greater risk of stumbling into unrecoverable debt: in an economy gripped by a consumerist ethos, the liquidity of secondhand goods provides a modest buffer against unchecked spending.

That consumers buy more risk when they buy a service over a product is seen in two markets which have been proposed to be servicized. One is university textbooks. Selling textbooks online on a per-semester access basis is a huge victory for content producers, because they will loose no revenue to the secondhand book market as they currently do. At least one company (Aplia Inc, www.aplia.com) has begun selling textbook content on this model. Students who must buy content every year and cannot choose to buy older secondhand content loose out. The counterargument, however, is that students actually benefit because they will always see the freshest content and will be able to use new online features – in short, they will buy a better product.

To take another case, Mont and colleagues (2006) explored a business case for servicizing baby prams. There is understandably an environmental benefit to shrinking the secondhand pram market and to having a dedicated firm remanufacture prams. Given that a leased pram provides nearly identical utility to parents as a new one, consumers will only benefit if the lifetime cost of a rented pram is less than their out of pocket expense from buying a new pram and selling it secondhand later on. To hazard a slight generalization, servicizing a product moves that product up market, and while consumers may get more utility per dollar for a service than a product, it is easy for them to not grasp when they are actually paying more.

4.2. Concluding remarks

This paper has has looked into the economics of PV panels and has explored in some depth the business opportunities for marketing PV panels as a PSS. A detailed case study of one company, Soltage Inc., showed how a firm could add value and broaden the market for PV panels by selling solar as a service. The paper also looked at PV panels as an instance of a typical EPP. Like many EPP's, PV panels offer only a slim profit margin and thus individual customers may not be attracted to purchase them. But a dedicated supplier firm is able to bring enough leverage to bear to exploit that profit margin. The PSS approach is thus well suited for bringing to the market EPP with only slim profit margins. EPP with more radical financial benefits (e.g. high efficiency TDI diesel engines) don't need PSS to reach customers as much as low-margin EPP. If solar panels offered dramatic cost savings there would be less demand for a value-added servicizing company. Finally, the paper offered an analysis of the limitations of PSS, exploring how servicizing a product effectively moves it up market. This can simultaneously benefit customers, when they get more useful goods, but also can expose consumers to more risk, since they have no secondhand market to fall back on if they want to get rid of a product.

The important conclusions reached in this paper are threefold. First, the case study of Soltage suggests that PV panels are an excellent candidate for the PSS model. Selling solar as a service makes sense. Secondly, the experience of PV panels as a marginally profitable EPP (vs. TDI engines, for example) suggests that the PSS model is more aptly suited for broadening the market for marginally profitable EPP. Finally, the third part of the paper argued the while PSS makes sense for many products, it is not perfect and does not make sense for all customers. Sometimes customers may inadvertently loose out in the name of eco-efficiency. The ultimate test of whether servicizing PV electricity makes sense will be to see in one or two years' time whether Soltage and SunEdison are thriving. If they are, these companies have identified a profit opportunity exposed by the PSS approach, and will have successfully introduced an environmentally preferable product to the market.

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