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The business models powering solar's next phase in Europe

Europe | With the decline of solar subsidies in Europe, the industry is under pressure to find new routes to market. SolarPower Europe policy adviser Sonia Dunlop looks at some of the innovative new business models being developed to help ensure solar has a sustainable future

There is much innovation going on across Europe and beyond in new and different business models for solar PV. Over the last 10 years the PV market in Europe has been largely policy-driven – and usually the main business model was dictated by the support scheme in place. Revenues were often guaranteed by the state and therefore low risk, which then opened the door to low-cost finance.

Over the next 10 years, public subsidy will probably play less of a role. The regulatory framework will of course continue to be critical, but this will be driven less by support schemes and more by new and innovative business models and sources of financing.

In this article we will outline some of the work we have doing at SolarPower Europe, much of it part of the EU-funded PV Financing project, to identify what are the existing business models and what are the most interesting variants of these that are likely to make the cut in the next phase of solar PV development.

We recognise however that we will never operate in a political vacuum in the electricity sector and our industry will always remain a highly regulated space. Therefore we also need to put these potential future business models in the context of what existing legislation will actually allow. That is why the PV Financing project has, for seven European countries, published detailed policy

Innovation in business models will be vital in underpinning solar's future growth in Europe

advisory papers setting out what the government needs to do at national level to spur solar deployment [1]. And on top of that there are a number of quick wins at EU level that we need to be pushing for – more details on that below.

But first to the two core business models for solar in Europe: self-consumption (with self-ownership) and power purchase agreements. How do we define them and how can they be tweaked to increase profitability?

Self-consumed electricity is cheaper electricity

Four out of five Europeans live in a region where, in theory, the solar electricity they could generate on their roofs is cheaper

than the electricity they buy in from the grid. And that's not even mentioning commercial and industrial applications of self-consumption solar.

Of course in reality it's not as simple as that. How many people are lucky enough to have €6,000 (US\$6,533) lying around in their bank account? And how many people don't own their own home?

There are different definitions of self-consumption, but for the purposes of PV we think the most useful is where the power consumer, main investor and plant operator are the same entity. To put it simply, the power consumer owns the system, even if he/she/it had to borrow the money from elsewhere to meet the up-front costs.

This is almost always roof-mounted solar, and we found the most common financing schemes for self-consumption are self-funding, debt and leasing.

Things get interesting when we start playing around with the self-consumption model, for example, applying it to buildings that have more than one power consumer: an apartment block, a shopping mall or a big office block perhaps. This is collective self-consumption. Austria is in the process of bringing in a new set of rules that will allow the occupiers of apartments to self-consume power from an installation on their common roof. This is still in the process of being confirmed, and will probably be conditional on the occupants owning at least a symbolic share of the PV system. France will soon allow collective self-consumption as long as the different occupants form a cooperative or other 'legal entity'.

To help the industry standardise deployment and reduce legal costs the PV Financing project has produced a series of free, publicly available template legal contracts for the most interesting business models in France, Germany, Italy, Spain, Austria, Turkey and the UK. We encourage all who work in solar to have a look and make use of these – they can be downloaded on the website [2].

Being smarter about how we use self-generated power

In the residential segment, it is key that we use new digital technologies to increase self-consumption rates. On average this reaches just 35% across most of Europe – which means two-thirds of the electricity generated by the PV system is being fed into the grid for a (low) export price. The

digitalisation of energy and the integration of solar within smart buildings are key opportunities to significantly increase self-consumption rates. Storage, the use of heat pumps and the electrification of heating, flexible demand response and smart appliances, electric vehicles and smart building energy management systems are all catalyst technologies for PV. (See box below on digitalisation.)

But before you can start thinking about 'smart solar' technology combinations, we have to get the basics right.

It is absolutely critical that within the ongoing Clean Energy for All Europeans package, currently under discussion by the European Parliament and the Council of Ministers, we ensure that all EU member states have at least a framework in place for prosumers to pursue self-consumption.

At present Bulgaria, the Czech Republic, Estonia, Finland, Ireland, Luxembourg, Romania and Slovakia do not have a legal framework for self-generating electricity. Consumers should be allowed to become prosumers, and grid charges cannot be designed in a way that disincentivises this. Consumers should also not be forced to become electricity traders or suppliers in order to sell their excess electricity back to the grid, as is the case for some systems in Spain. And prosumers should get at least the market value for the electricity they feed into the grid.

Power purchase agreements: the business of selling solar power

At its essence a power purchase agreement (PPA) is simply a contract between an electricity generator and an off-taker that specifies how much power will be

sold at what price for anything between five and 20 years. PPAs can be set with a fixed price for the duration of the contract, a tracker price which applies a pre-agreed discount on the retail or wholesale price or a dynamic discount price where the higher market prices go, the bigger the discount.

PPAs are generally financed with debt, equity or crowdfunding, and the key thing is that the investment decision is shifted to a third party that usually has a longer-term investment horizon than the power consumer.

PPAs cover both roof- and ground-mounted systems. The defining characteristic of a PPA business model is that the owner of the system is different to the power consumer. So a power consumer can consume electricity generated on-site on his building but if the PV system is owned by a third party and the electricity is sold through a contract this is a PPA and not a self-consumption business model.

Residual or top-up electricity can be provided through a second electricity supply contract – which still needs to be expressly permitted at EU level for both domestic and commercial consumers – or through a bundled solar plus balancing contract.

The classic PPA is the wholesale PPA – typically a solar farm injecting into the grid and getting wholesale power prices in return. But there are teams of lawyers all over Europe if not the world dreaming up new and innovative variants of PPAs, some of which allow a generator such as a solar farm to sell to power consumers without any direct link between the two.

The main categories of PPA are on-site private wire PPAs, sleeved off-site PPAs,

The Solar & Digitalisation Task Force at SolarPower Europe

Professor Bernd Engel, SMA Solar Technology

Late last year SolarPower Europe, the European solar PV association, set up a new task force to look at the broad topic of digitalisation of energy and assess how this will impact both existing and new solar PV installations. On behalf of SMA Solar Technology, I am leading the members of our association in this work.

We have already had three meetings to scope out the main opportunities and challenges and are planning on publishing three main pieces of work over the course of the next year.

The first, which we hope to launch at Intersolar, will be a set of commitments from the solar industry on digitalisation. These will cover topics such as interoperability, data protection and working with network operators to provide grid services.

The second will be a set of regulatory asks on solar and digitalisation, which is scheduled for publication at the SolarPower Europe Midsummer Celebration in Brussels on 21 June. This will be a call to action for governments, setting out what policy changes are required in order to implement new digitalised solar business models and revenue streams. This will cover peer-to-peer electricity trading, blockchain and aggregators among other things.

Finally in October we plan to publish a major report on the market opportunities for solar PV within the digitalisation of the electricity ecosystem. Working with our members and specialist consultants, we will tease out where are the key opportunities to deploy more PV, increase revenues for existing installations and make sure that solar is done in a 'smarter' way.

If you are a member of SolarPower Europe, or would like to become one, feel free to get in touch to find out more and get involved in this work.

synthetic PPAs and mini-utility PPAs. Sleeved PPAs are back-to-back PPAs at the meter point from generator to corporate consumer to sleeving utility and then back to corporate consumer. Synthetic PPAs involve the corporate consumer and the generator agreeing a fixed price and hedging against rising electricity prices. In the mini-utility model the corporate consumer sets up its own utility and cuts out the middle man. (More information on all of these is available in the full PV Financing report [3].)

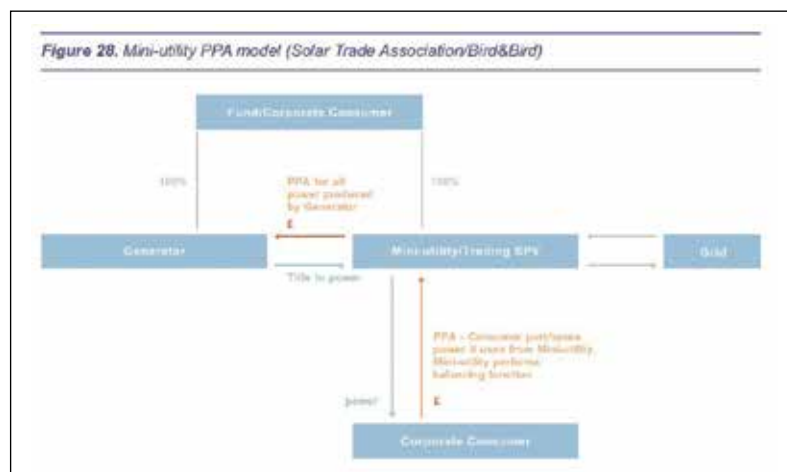
Should all big businesses become mini-utilities?

The mini-utility model is one that requires particular attention from policy makers, both at EU and national level. This is where the generator sells power to a licensed supplier or 'trading SPV' that is wholly owned by the corporate consumer. In this model Google, Unilever or Nestle would set up their own utility to buy power from solar farms and sell it back to themselves. This model is currently in use in Ireland in the wind sector and in the United States.

Regulatory authorities should make it easier and cheaper for mini-utilities who only supply a single corporate entity to get a supply licence and trade on the market.

Even more innovative could be the advent of peer-to-peer electricity trading platforms. Just as Airbnb allows us to sell our spare rooms to each other, and Blablacar allows us to charge each other for rides in our cars, a new platform could allow me to "SellMySolar" to my neighbour. This would be selling via a PPA – the neighbour would buy power at a set price – but you could imagine a day when these PPA contracts were done as automated 'smart contracts' on a blockchain system

Figure 1. A PPA model for a mini-utility. Source: Solar Trade Association/Bird & Bird



that bought and sold power based on pre-defined parameters.

The StromDAO outfit in Germany is an example of a blockchain-based peer-to-peer selling platform where consumers can invest in a share of a neighbour's solar PV system and then either 'virtually self-consume' or sell on the excess power. And such a nanogrid, which could be expanded to bigger and bigger regions, could potentially self-balance, thanks to much more accurate accounting of supply and demand.

The many shapes and sizes of solar roofs

PV is a highly modular technology. When we talk about the solar market, it is in fact at least nine or 10 different markets: owner-occupied single family residential homes, rented single family homes, multi-family apartment blocks, social housing, new buildings, single occupancy commercial and industrial buildings, multi-occupancy buildings – and finally of course ground-mounted, utility-scale solar farms.

Figure 2. The different types of debt financing in solar PV

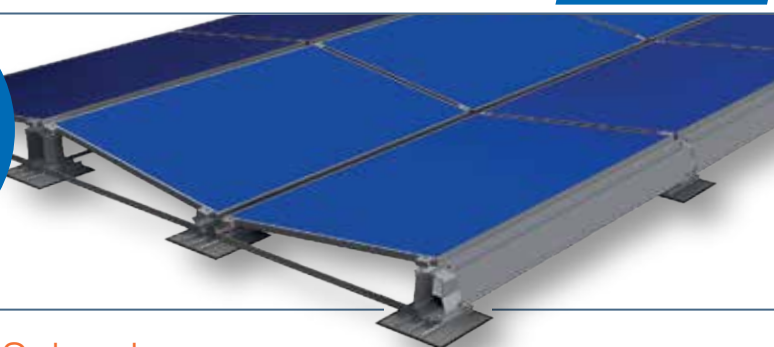


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Each 'application segment' has its own advantages and disadvantages, and needs to be approached in a different way.

The rented building segment is one of segments that has so far been 'hard to reach' in most European markets. That includes both commercial and residential buildings

It is estimated that 150 million people across the EU are tenants, and there the landlord-tenant dilemma often means that neither party has the incentive to invest in PV. The leasing model, where a third party invests in the system and the tenant pays a monthly fee for the use of the system, is one way to overcome this. Mini domestic on-site PPAs are also a way to allow tenants to use solar electricity and save money on bills – this is something that has been used in multi-apartment blocks in Germany within the *Mieterstrom* model. This should be spread elsewhere in Europe too.

And rules that say that the power consumer and system owner have to be the same entity in order to receive beneficial treatment need to be abolished – this is out of date regulation that has failed to keep up with the latest innovations in how PV projects are structured. Getting rid of this barrier will help both the rented segment and multi-occupancy buildings.

Of equal frustration to many solar developers are rules limiting a single solar PV installation from supplying more than one power consumer. The good news here is that Austria is moving to get rid of this, with the introduction of the shared generation facility model where a commonly owned PV system on an apartment block will be allowed to use the wires and cables in the building to sell electricity to the occupiers without being subject to grid charges.

The stages of utility-scale ground-mount solar PV and corresponding sources of financing

Both here and in the similar German model, smart metering is the essential catalyst: both the PV installation and each individual consumer have to have smart meters installed to properly measure and bill for the power flows.

Money, money, money

Over the last two years of work within the PV Financing project, we have identified all the various sources of finance for solar projects in Europe. Much of this won't be news to readers of *PV Tech Power*. The top level options are self-funding, debt, equity, mezzanine financing, leasing and crowd-funding.

The interesting types to delve into further are debt and crowdfunding. There are many different types of debt, including project finance, on-balance-sheet loans, revolving credit facilities and green bonds. What is particularly interesting is how the type of debt involved in a utility-scale project evolves throughout the lifetime of the project, from high-risk private equity and hedge funds at the development stage to low-risk pension funds and green bonds at the mid-life operational phase.

Crowdfunding equally comes in many forms, even though cooperatives are often the go-to model here. Mini-bonds and peer-to-peer *lending* platforms are becoming more common. The latter shows yet again how digitalisation is a key driver for solar.

Cash flow models to get new entrants started

Another great resource that has come out of this European Commission-funded project is the cash flow model, which has been built for both self-consumption and PPA projects for each of the seven countries covered [4]. This is available both in a simple web-based format destined for the end-consumer, and in a more advanced Excel form for the industry. All the key variables can be inputted into the model, which also produces sensitivity analyses for the key determining factors such as irradiation and cost of capital.

Change on the horizon

The next years are going to see a lot of exciting change and growth in our sector. New industry leaders are emerging, storage is going to be a key partner and trade wars will wax and wane depending on the mood of our elected officials.

For a more detailed insight into the mechanics of next-generation PPAs, turn to p.47

But what will be really fascinating is how we will apply our minds to selling solar electricity to new and different customers, in new and different ways. They could be corporates like Google and Unilever looking to source power through off-site PPAs, to Mrs. Jones in a social housing block who is struggling to pay her bills.

The PV Financing project has been a useful first step to assess the different business models available in six EU countries plus Turkey. This will evolve further as the industry becomes more experienced and tries new – perhaps more digital – models and find solutions to what have in the past been unsurmountable barriers. We at SolarPower Europe certainly look forward to it. ■

Authors

Sonia Dunlop is a policy adviser at SolarPower Europe, where she is responsible for finance, digitalisation and state-aid issues. She is leading the association's work on the EU-funded PV Financing project, which is looking at the best solar business models and sources of financing going forwards across Europe. She previously worked as the communications and public affairs manager at the UK's Solar Trade Association and on EU renewable energy policy in the European Parliament in Brussels.



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