The solar leaders getting ahead in the storage game

Solar-plus-storage | Leading US firms SolarCity and SunPower have taken an early position in the fledgling residential energy storage market. Andy Colthorpe investigates how their involvement could shape their own fortunes and that of storage itself

Source: SolarCity.

For some time now, solar installers have been offering storage with PV mainly for what SolarCity's head of grid integration Eric Carlson calls "off-grid, cabin-in-the-woods type battery backup" focused on lead acid battery chemistries. But recently launched products offered by SolarCity and fellow US industry heavyweight, SunPower, offer the promise of a lithium-ion based, grid-interactive future for residential storage on an altogether bigger scale.

Both companies have taken an early lead in initiating residential storage pilot programmes in California (SolarCity has also already rolled out some commercial systems), as well as in a handful of other carefully selected markets, where policy, regulatory and economic conditions have combined to provide them with the opportunity to test out what SolarCity says represents a "new paradigm" for the generation, transmission and distribution of electricity.

"We're very excited about how these battery systems can both enhance the value of the PV system by offering firmer energy, but also, these battery systems can provide value to the grid operators, both to the distribution and transmission utilities but also to the wholesale market," says Carlson. "There's a whole list of services that can be provided."

Meanwhile, SunPower's chief executive, Tom Werner, tells *PV Tech Power* that not only does he see storage as a natural fit with solar, strong comparisons can also be drawn with solar's early developmental stages.

"If you look back 10 years ago at the size of the market in solar and how fast it grew, we think that storage could have a similar trajectory," Werner says. "Storage and solar go hand in hand because you can overproduce [solar energy] during the sunny part of the day and then store it and use it during the other parts of the day. And as the cost of solar comes down it makes more and more sense to do that, and when the cost of storage comes down, then it really makes sense to do that."

SolarCity has taken an early lead among big-name solar companies in looking for ways to incorporate storage into its PV systems.

The waiting game

The pilots launched by the two companies may be relatively small, in the hundreds rather than thousands of homes, and only limited in scope, but the significance of these two leading players taking an early lead in residential storage can be explained by taking a longer-term view.

Chris Edgette of the California Energy Storage Alliance (CESA), a trade body with around 80 member companies, works closely with the California Public Utilities' Commission (CPUC), the regulator for Califor-

nia's utilities. He explains that there are three distinctly different scenarios for the use of residential storage going forward.

In the short term, there is the basic advantage of offering battery backup to customers, while in some parts of the world including California, there are also time-of-use charges for electricity, which storage can hedge against. In the medium term, changes in regulation and technology could allow for the aggregation of electricity from combining the storage capabilities of many systems, while a much longer-term outlook offers the possibility of storage units being used for self-consumption of PV-generated electricity onsite.

So far SolarCity's residential storage systems offer backup and load shifting for avoiding peak use charges, while SunPower's storage systems are set up to provide backup only. However it is the medium-term possibilities that really appeal to companies like SolarCity and SunPower, according to Edgette. He says both companies have launched products with future-proofing in mind, preparing for a day when technology and regulation align to allow storage to do more than just backup and a limited amount of load shifting.

"A lot of the systems are being put in to allow emergency backup capabilities for the customer but they're being set up so that when the rules allow them to do distributed aggregation, where they can basically take many storage units on a thousand customers' homes and then sell the capabilities of all those systems together into the market, they'll be able to do that. So basically they're developing and rolling out the systems now for policies that are coming."

Werner agrees that from his company's point of view, aggregation is the most overtly attractive future business opportunity that could be offered by solar-plus-storage. He says companies could sell the aggregated energy into the demand response market, or alternatively "you could just sell it to your neighbour". "Of course that's policy driven, but SunPower is absolutely working toward those different revenue streams including demand response," Werner explains.

Eric Carlson of SolarCity also cites the future possibility of aggregating systems as the "primary reason" for SolarCity's early investment in storage.

The challenges of scaling up

But running a couple of pilots is one thing. Scaling up is something altogether different and brings a whole host of challenges with it. How ready are the two companies to scale up their activities in storage?

In SunPower's case, its pilot programme includes a deal with a production homebuilder, KB Homes, about which Werner says "expect more later". Werner quotes statistics that put KB Homes in the top 10 of production home building companies in the USA, which between them build 80% of new homes. For SolarCity, the company's links with Tesla will provide it with access to the output from the electric vehicle maker's forthcoming 'gigafactory', expected to open next year and aiming to produce 500,000 battery packs annually by 2020. In other words the two companies may well be ready to start looking at the medium-term scenario sooner rather than later.

But standing in the way of that are two major obstacles. The first is in the regulatory space – specifically the fact that customer-sited storage is so new a concept that it has barely been discussed by policymakers.

Edgette offers a succinct explanation for the complicated policy problem solar-plus-storage faces in the US, a problem likely to be faced in other developed regions where the electricity market revolves around the use of a grid for transmission and distribution: "Storage can be at various times generation, load and it can help transmission and distribution. And those areas of the grid are very siloed in the US system. In some cases there's a firm regulatory wall. So when you have a resource that can help with all four of those things, you end up with policy and regulatory challenges."

Werner says companies need to be active in the regulatory space to not only keep up to speed or ahead of developments, but also for the chance to have some input in the discussions themselves.

"As a company we believe in free markets, but on the other hand energy is a regulated industry so having the regulations that allow competition with solar and storage is really our goal. So yes, we are very active in policy."

To be sure, SunPower has employees in some key positions – its director for market development and policy, Oliver Schaeffer, is chairman of the European Photovoltaic Industry Association (EPIA), while the vice-chairman of the American Solar Electricity Industries' Association (SEIA) is Tom Starrs, SunPower's vice president of market strategy and policy. "In terms of future-looking policy, we want to be aware of things that are developing. The degree to which we influence things – I don't want to overstate that. Our goal is to educate the legislators, so they can make good decisions," Werner says.

Companies will continue to seek out the areas – like California – where this kind of discussion is already at a more advanced stage than others, Werner adds.

"We're doing pilots in Australia, California, and, in the first half of next year, Germany. And the reason why we're doing those is that the policy environment is favourable and of course the idea is to create scale, and with scale you can get costs down, and perfect your solution. Then as you perfect the solution you can take it forward into other markets, and that's exactly what we've done with photovoltaics," he says.

The big standardisation question

The second big challenge is the need for greater standardisation of the relatively new technology involved. Carlson says that a uniformity of understanding of technical

SunPower and SolarCity's storage pilots

SunPower launched its storage pilot earlier this year with KB Home in the Californian communities of Irvine, El Dorado Hills and San Diego. The company is also conducting a residential pilot in Australia, and a commercial equivalent could be launched as soon as 2015. SunPower is also preparing to launch a residential scheme in Germany, where subsidies already exist for residential lithium-ion based storage systems. According to Tom Werner, the pilot will happen in the first half of next year.

SolarCity has rolled out pilot storage programmes for residential customers in California, Massachusetts and Connecticut. The systems in California are subsidised by the state's Self Generation Incentive Programme, which pays for around one-third of the cost of the systems. These were joined in December 2013 by the rollout of DemandLogic, a storage product for businesses that can offset peak demand charges.

'If you look back 10 years ago at the size of the market in solar and how fast it grew, we think storage could have a similar trajectory'

SunPower CEO Tom Werner believes storage could follow the same rapid deployment trajectory as solar.

SunPower is eyeing the long-term possibilities offered by storage of aggregation.

Source: SunPower

standards is lacking at present, making it harder for the industry to cut costs and perhaps even to attract funding. Yet he thinks lessons can be learned from solar.

"The energy storage industry is in many ways where the PV industry was 10 years ago in terms of power electronics and warranties and standardisation of product specification. The good thing is that I think the energy storage industry is going to learn very fast from the example of the PV industry. Those lessons are going to be learned much more quickly in partnership with the upstream equipment suppliers and so it's not going to take us a decade to get to the same place, but right now there's a whole lot to learn," Carlson says.

Another standardisation challenge that needs to be overcome is in the battery itself. "From the perspective of a system integrator, another challenge is that there's limited standardisation in how the products are categorised and specified," says Carlson. "Really basic things, like the energy that's stored in a battery – is that a DC value or an AC value?

"I can buy a crystalline-silicon solar panel rated for 250W and I have a pretty good idea without running any testing what conditions the product will operate in. With batteries if a device is rated at 20kWh it takes some time in the lab to understand exactly what that means in terms of operation in the field."

Carlson thinks California's history as a pioneering solar state could stand it in good stead for trialling some of these technical aspects of storage and finding agreement across different stakeholders.

"The California market really led the standardisation of some of the ratings of solar panels and inverters, and so through the incentive programmes that are operating in California for storage, there's an opportunity to drive that early stage of the industry. Through those incentive programmes that standardisation is naturally happening, through the fact that the products are being sold between vendors and project developers, so that's encouraging and very important."

PV energy providers

Both SunPower and more recently SolarCity, with its acquisition of Silevo, have both been pursuing integrated business models in which they operate as manufacturer and installer – so-called PV energy providers. Through storage and its furthest imagined step, aggregation, both companies would be taking integration to another level. Werner says that the recognition of the value of storage could have a dramatic effect on the company's overall competitiveness.

"I've been CEO of SunPower for 11 years. We've gone from being a solar cell producer to a module producer to a system company. Over the last few years we've introduced PPAs and leases so that we sell energy, and essentially the relative economic metric is levelised cost of energy (LCOE). As you add storage, then you can do things that will look at the total economic equation, not just the cost of generation."

Edgette explains that although ultimately the successful companies in storage could come from a variety of backgrounds as long as the execution is right, as experienced residential installers and leasing companies, SolarCity and SunPower are in an opportune position to step into this new arena.

"A lot of the costs of doing solar [in the US] aren't even in the installation; they're in the permitting, the sales, the customer acquisition. So if you can share those costs with a solar and storage system and then potentially share the same equipment – so that the same inverter's dealing with storage as dealing with the solar – there's kind of a natural fit to doing those two things together. They're already financing a system. So they can roll it into their existing financing package, they can roll it into seamless leasing arrangements, so the customer just sees one value proposition." ■

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