Is California dreaming? Energy storage's role in reaching 100% renewables

Policy & markets | This year's Solar Power International trade show dedicated what seemed like almost as much space to energy storage as solar. As Andy Colthorpe reports, this is likely a strong indication of the way the world is adopting renewable energy, particularly California, where storage looks set to play a key role in helping the Golden State realise its green ambitions

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It's likely a strong indication of the way the world is adopting renewable energy rapidly that in September, one of the best-established trade shows for solar in the US featured what seemed like almost as much space dedicated to national and international energy storage companies and technologies, as it did for solar.

Solar Power International, which was held this year in Anaheim, California, is co-located with Energy Storage International, but you could almost say that the show as a whole is almost like a solar-plus-storage show in many ways. Sure, the module manufacturers you read about on PV Tech were there, and there's still clearly markets for 'standalone solar' all over the US. But it has become so inevitable that storage – mainly in the form of batteries – will play a huge role coupled with renewables that several conference speakers and sources I spoke to said that it could even be just a handful of years before we no longer talk of solar without storage at all in the US, perhaps excepting a few specific applications or business cases.

"Storage has always been on the horizon for the solar industry but today with time-of-use shifts, the movement of the more valuable electricity to later in the day, makes storage able to provide a uniquely attractive value proposition to the solar industry, to the solar customer, now," Alan Russo of Stem Inc says.

One of the leaders in providing smart storage systems to commercial and industrial (C&I) operations that want to lower their peak energy costs, Stem has made its first-ever foray into adding solar to its offerings in a rare example of storage industry folk coming to solar rather than the other way around. Russo said Stem believes the combined offering can provide value in several directions too.

"The solar only marketplace is becoming more competitive, the value of solar is dropping as rates are shifting to later in the day," Russo says.

"When you add storage you increase the gross margin for the engineering, procurement and construction (EPC) partner, you increase customer returns and then you provide utilities with the value they're seeking by shifting those rates. Rate shifts are designed to change consumer behaviour, [but] we allow customers to operate how they want to, and everyone benefits from the improved economics."

Peaking Duck

The venue for the show changes every year. Previously it was held in Vegas, which seemed like an interesting choice for an industry priding itself on sustainability but then again Nevada as a state is increasingly favourable to renewables – and storage. Next year it'll be Salt Lake City, Utah, but this year it was California, which of course was the cradle of much of the early solar industry and is now host to Silicon Valley's tech bros and wizards, many of whom are now turning their attention to smart energy.

And only weeks ago, California as a state also set aggressive renewable energy targets, committing to a complete transition to 100% of retail electricity to be carbon-free by 2045. That's in addition to regulatory and policy measures such as the SGIP (Self-generation Incentive Programme), which offers support for solar-plus-storage purchases, AB2514, through which utilities are mandated to procure over 1.3GW of behind-the-meter storage by the early 2020s and the addition of energy storage into utilities' long-term Integrated Resource Planning (IRP).

Mukesh Sethi, general manager for solar

and storage at Panasonic Eco Solutions America, said he was excited by SB100, but even more excited by the race to reach the interim target of 50% by 2030, which would be a big leap from the current level between 5% and 10%.

"It's a long way to go in a short period of time and if California can do it, that'll lead the way for the rest of the country. Initiatives like this are very important, they're what keeps us going, if we're to be completely independent of fossil fuels," Sethi said.

While batteries will be vital for meeting SB100's goals, there's also other sectors to think about, namely transport – which will be pretty well covered given the growing popularity of electric vehicles – and heat. We met with representatives of Ice Energy, which makes a sort of thermal cooling battery for air conditioning units, essentially converting electrical energy from PV and other sources and storing it for release as cooled air using fairly simple components and materials like copper.

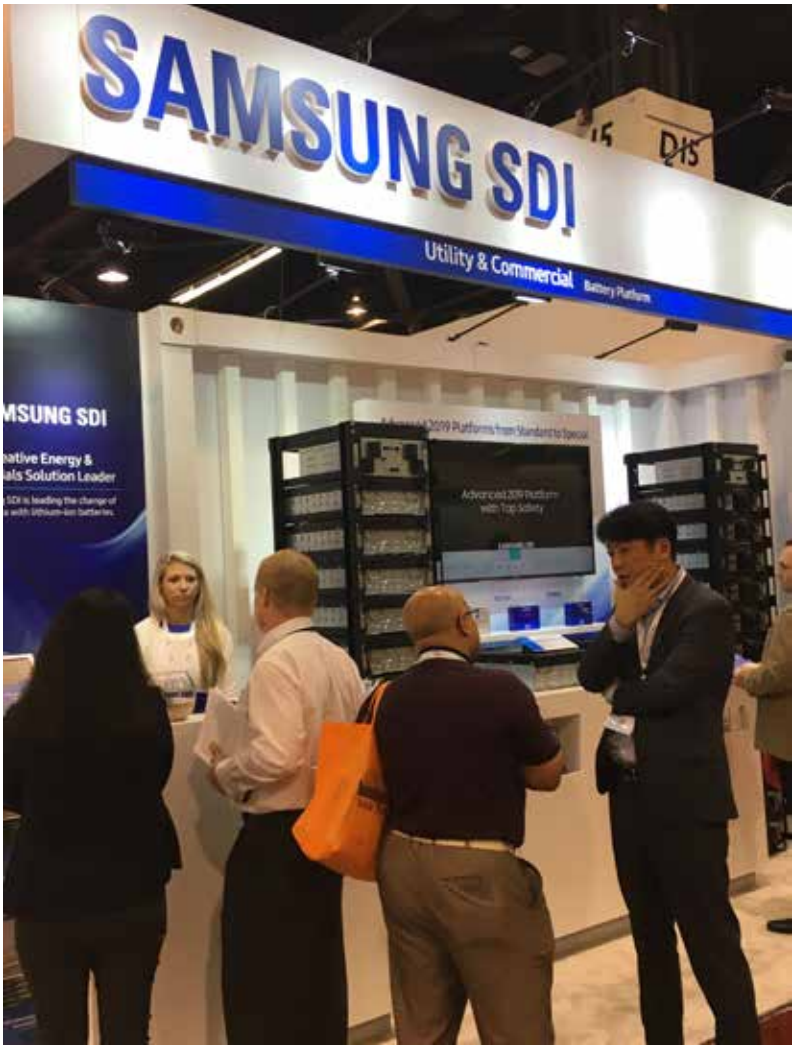
California's famous 'duck curve' of solar production versus demand is what has kept grid operators awake at night for many years and foretells what might be in store for many other parts of the world. Solar generation goes up in the morning and then comes down in the afternoon and evening, just as demand starts to really kick in. That's it in a nutshell.

If the peak load in California is around 50GW, air conditioning could be as much as 30% of that, argued Ice Energy's VP for marketing and sales Greg Miller, with air conditioning technology having barely moved forward in decades from an efficiency standpoint. One largely unreported detail of Elon Musk's recent controversial appearance on Joe Rogan's podcast was that the Tesla man referred to exactly this, teasing the possibility Tesla would move into AC units (well, he can't announce it on Twitter any more). Far from being fearful, Ice Energy said they would welcome the competition, because it would raise awareness and help set industry benchmarks. While there are others such as Calmac putting thermal storage into large-scale industrial settings, Ice Energy remains the only provider in the US of thermal energy storage for residential air conditioning.

Houses are the new power plants

Frankly, it's a little flippant to say houses will replace power plants and it most likely isn't true. Greg Smith says that the idea of defecting entirely from the grid is not a good one, while there will of course still be a need for commercial and large-scale – hopefully renewable – facilities.

SPI in Anaheim this year was a solar-plus-storage event in many ways



Credit: Andy Colthorpe

The legislation also sets in motion a goal for all new homes in California to be net zero energy from 2020, a goal matched by similar policy at national level in Japan. Many people I spoke to said that the homebuilding industry will be a big driver of solar and storage and firms are already proactively engaging with architects, construction and housing companies and possible financiers.

Furthermore, net metering policies appear to be on their way out, increased application of time-of-use rates, which put dollar values on electrons relative to supply and demand and therefore to peaks, are on their way in. While we don't yet know exactly what their values will be, lots of residential energy storage companies at Energy Storage International were excited to be bringing something resembling a business case as well as the offer of energy independence and ecology.

Generating, then storing power and using it when grid power becomes expensive will make more financial sense than injecting the power into the grid for diminishing returns. Then there's the opportunity to use the batteries to do something else entirely, such as grid services. To use the shorthand term, aggregating virtual power plants (VPP) from connected home storage systems can be done in many ways. Pooling together the capabilities of many systems offers several ways forward, both economically and from the viewpoint of energy reliability.

"[In] California you have the infamous duck curve, and it's a real issue," Greg Smith, technical training manager for installers at Sonnen, said, pointing to one of the company's new home automation units, which includes smart thermostat control.

"This can intelligently take care of that. The crest [of the duck curve], the peak is that 'end of level boss' for us, to use a gaming term. The solution is the VPP, but we've already done it in Germany, it's old hat for us."

Hawaii is another big leader in US

renewables ambitions, and Ensync Energy's Dan Nordloh said a project his company is executing on the islands demonstrates how a community or closed network can maximise the benefit of having their own rooftop and canopy solar generation. After 30 or so projects creating intelligent energy networks for commercial and industrial customers, Ensync is putting solar-plus-storage into around 300 affordable housing units for a planned development, all running through a common DC link.

"It's a true peer-to-peer (P2P) exchange, so we've created that transactional marketplace. Each of these units can buy, sell, trade amongst themselves and they're acting as an aggregated independent power provider, using grid as secondary or a backup source for electricity."

However, as with Sonnen's 2900-home project with Mandalay Homes in Arizona, not only the homebuilders but the utility will have to be involved, with most states of the US operating highly regulated markets for electricity.

"The utility was heavily involved [in the Mandalay project]. The architects and homebuilders all engaged to pull this off – but a lot of it was about the utility coming to us and saying: this is the platform they wanted to use."

Actually, a Sonnen representative later reached out and explained that Greg Smith had misspoken a little - while it is true that the utility partnership was key to the project's development, as Sonnen executives based in the company's home territory of Germany had told Energy-Storage.news at the time the Arizona plan got underway, it was more the case that the solution was developed by Sonnen and Mandalay, according to tariff and rate structures put out by APS.

Credit: Andy Colthorpe

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"While APS, the local utility, was not involved at the outset of the project, sonnen and Mandalay Homes were able to take advantage of its rate tariff program when planning the development. However, we are now collaborating directly with APS on the future of the Mandalay Homes sonnenCommunity," the representative said via email.

Joining the dots back to SB100, Greg Smith said he thought California could succeed, but "utilities are going to have to be key to that".

"Those guys will have to catch up, it'll be a bit of a challenge but they want to do it. They understand this will be important."

And it won't just be California that transforms itself, targets or no targets. On a national level, the Federal Energy Regulatory Commission (FERC), has ordered the restructuring of wholesale markets to allow energy storage resources to participate. Believe it or not, this means even Ice Energy's Ice Bear units could be earning money for providing capacity or energy services to the grid.

"FERC Order 841 will drive change in all the FERC jurisdictional ISOs (independent system operator) and RTOs (regional transmission organisation)," Janice Lin, head of the California Energy Storage Alliance and national and international energy storage expert consultant, said.

"[The order will] really force, from the top down, a focus on developing the appropriate tariffs and market structures to allow even very small storage to participate."

So, whether California is a leader to follow, or whether states will find their own way, energy storage and solar-plus-storage is going to be a big part of reaching aggressive decarbonisation targets and frankly modernising systems and networks long due for modernisation. On a national level the picture looks varied and ever-more exciting, NEC Energy Solutions CEO Steve Fludder said.

"The US really is one of the leading markets for the storage business in the world. Here in the western part of the US with such aggressive renewable portfolio standard targets, California is on a path to perhaps 100% renewables in less than 30 years.

"There's a lot of activity in Arizona too. So the western part of the US continues to blaze a trail towards much longer duration, bulk energy storage and shifting, from daytime to early evening peak.

"[But] We're [also] beginning to see the same developments in the eastern part of the US, in Massachusetts, in New York State, which has some pretty aggressive aspirations in this area.

Another interesting thing is that in addition to solar and onshore wind there's a tremendous amount of offshore wind activity in the north-east US, which was virtually unheard of a few years ago. We're on this inexorable march towards very high percentages of renewables in the system and we are an enabler of that transformation."