

Vic Shao: 'You'll soon be able to have unlimited energy price packages for your home'



*Back in August, when a solar eclipse darkened parts of the US for a couple of minutes during daytime, many power utilities had to [put into action](#) their prepared plans, switching from solar to natural gas-fired power and hydroelectric plants or importing energy from other states. The event highlighted a fact about energy: it is largely produced and consumed in real time. Up until very recently the idea of storing energy was inexistent. The only thing that came close to energy storage was hydroelectric power, because dams store water to produce electricity on demand. The development and upgrade of lithium ion batteries is now changing this situation, and promises to propel the market for renewable energy. 'You'll soon be able to have unlimited energy price packages for your home', says Vic Shao, founder and CEO of Green Charge, which produces energy storage units for businesses, households and utilities. He spoke with LSE Business Review's managing editor, **Helena Vieira**, on 7 November during Web Summit, in Lisbon.*

What does Green Charge do?

We deploy stationary energy storage systems across the country in the US and we're starting to do international projects as well. Stationary energy storage means a couple of car parking spots worth of equipment, typically in the 500 Kilowatt Hours (Kwh) to 1000 Megawatt Hours (Mwh) range. As you know, the problem with solar and wind generation is that it's intermittent. It's only when the sun is shining, only when the wind is blowing. The battery is there to firm up that output, so that the output is consistent. That has been the biggest complaint on clean energy up to date, compared to coal, which is a base-load output product, meaning that it's always consistent, always the same. The same is true for nuclear. Renewable energy doesn't mirror that style of generation output. But now, with the coupling of energy storage and renewables, you have a final output product that is comparable to the traditional fossil fuel generation.

Why haven't producers been storing the energy they produce, because of some technological difficulty?

Technological difficulty. The idea for storage is not a new one, it's been around for decades. In geography areas where you can do it, the most prevalent being pumped hydro, which means you send water up the hill and then you let it come back down at night time, so that's a form of energy storage, if you will, that only works where the geography allows. For any other part of the energy infrastructure, storage is really not all that possible, and it's too expensive. Energy, traditionally speaking, has never been stored very much, other than pumped hydro, whereas grain, money, water, there's always a storage mechanism for any type of commodity that you can think of. Except for electricity, which is generated and consumed in real time. That has been a challenge for energy production for a very long time. Recently what has happened is that the cost for batteries, lithium ion batteries, has been coming down dramatically and that has led to a big focus now on the storage of electricity through batteries to firm up the energy output.

Is there a number for the amount of energy produced every year, including how much of it is stored and how much is lost?

That's a good question. I would hazard a guess that it's probably well under 5 per cent that is actually stored. Because, again, there isn't all that many geographies in the country where we can do it. It's really pumped hydro being the most prevalent storage that's available today. There's really no other means of doing it. Lithium ion batteries are an up and coming technology that's allowing that to happen, but that's really I would say only in the last couple of years that it's becoming a viable solution.

This market has a huge growth potential, then...

Yes, completely. Solar energy penetration in the US, rooftop solar, is 2 per cent. It's tiny. In Australia it's 12 per cent, a lot higher. I don't know what it would be in Europe. I would guess that's even less than 2 per cent. So, there's already a growth trajectory ahead for solar even though it's been in the news quite a lot, right? In the last five to ten years... Storage is even more nascent than that. But what we're finding is that with the new solar and wind projects that we're running into, a lot of project developers are asking for storage, to have a storage component in those projects, because storing is becoming economically viable.

If we can store energy from any kind of source, clean or not, how is storage per se good for the environment?

A lot of the dirtiest power generation happens during peak hours. Peak hours in California is typically in late afternoon-early evening hours, when the sun goes down and all of a sudden the solar generation disappears from the grid. In late afternoon-early evening is when people get off work, come home, turn on the air conditioner in the summer time, and you have a steep ramp-up of demand. The term is peaker plants, gas-fired CHP power plants that get used maybe 50 hours in a given year. Only 50-100 hours in a given year, and they get turned on. Number 1, they're the most expensive energy that you can use, and number 2, they often use the dirtiest type of energy production. Storage, then, is there to handle those 50 hours in the year when pricing often times is the most expensive. And they also do it economically because it's storing energy from solar or wind and deploying it when the grid needs it.

Can you explain a little more about how it's stored? You said batteries, right?

The types of systems that we deploy are... You can think of a lithium ion battery cell, but multiply that by a thousand. Typically it takes up an area the size of a couple of parking spots that we deploy, for instance, for a high school, for a small city building, wineries or hospitals. For a hospital, instead of two parking spots, maybe it's four. That's the range of the scale that we deploy for commercial/industrial customers. For small utilities the size would be more in the 10 mw/h range. Maybe we would be talking about 20 parking spots. Finally for a large investor-owned utility, it would be in the range of hundreds of Mwh, so in that scenario, then, it would be a whole bunch of shipping containers, deployed in one or two acres.

Do you think that with storage solutions at hand, solar energy adoption rates will increase?

The two really go hand in hand. We're starting to see that now in places like Germany and Japan. In Japan, for example, homeowners are starting to purchase energy storage systems just like they would place a refrigerator inside their homes, they're likely to purchase an energy storage unit. The rationale behind it is that not only could it be economical, but also a solution in case power goes out, in case the grid fails. In Japan you have earthquakes, right? And that's a big driver for adoption. In the last three months around the world, we've seen a hurricane in the Caribbean, flooding in Houston and wildfires in California. In all three cases the grid was significantly impacted. If you have solar and storage in combination, you wouldn't be offline. In Puerto Rico, they had a 100% power outage. So if you start to deploy solar and wind storage, then Puerto Rico, instead of a 100% outage, maybe 25% would have gone out and it would have been brought back on quicker. Not only is renewable energy starting to become economical, it's actually a lot more reliable and resilient than centralised generation and distribution of energy.

I heard that the city of Rome offers tax discounts to people who install solar panels on their roofs if they allow the excess energy to go to the municipal grid. I assume that with this storage solution, this programme would make even more sense...

Yes, in the US there's a similar scenario. It's called ITC, incentive tax credit, in which the federal government offers business or residential owners a 30% tax credit for deploying solar energy and accessories to solar, and storage counts as an accessory in this case. So in the US you can deploy solar and energy storage and the whole system gets a 30% tax credit.

Is finance a challenge for the storage industry?

It was a challenge up until a few years ago. I think there's general recognition now in the financing community that storage is coming. And they need to get experimenting with storage, just like getting finance for solar is no big deal. Everybody offers financing for solar. And that community is recognising that storage is absolutely coming fast and they need to get educated. The biggest challenge for storage, I would say, is like solar ten years ago. It's just at the beginning of that ramp-up curve. There's still a lot of education that needs to be done in the industry. There's no standard contract yet for storage, like there is for solar. The performance guarantees and warranty from manufacturers, all those things will take a little bit more time to get ironed out and standardised. But I would say that it's coming very soon.

Will artificial intelligence help your industry?

Yes, and my company is also on the very frontier of that, of using AI in what we do. In California, the model for deploying solar and storage, the storage system is there to offset what is called demand charges. For commercial industrial user in California, there's two parts of their energy bill, one is Kwh usage, and that's just energy that it consumes. The other part is called demand charges. These charges are the highest 15 minutes of usage in a given month. So the economical way to deploy in California is to reduce those demand charges because often times that portion of the bill is rising the fastest for C&I (commercial and industrial) customers, including private businesses, grocery stores, hospitals, public school systems, etc. So that's where the software and the artificial intelligence come in, to make an educated guess on what time of the day, or the day of the week, are likely for that customer to hit the peak. We have to constantly guess, I mean the algorithm is constantly guessing, what is the highest peak that this building is experiencing, and dispatching the energy from the storage bank exactly at the right time to offset that peak.

Has the fact that the US has withdrawn from the Paris Agreement made it more difficult for an industry like yours?

You would think that it would have a bigger impact than it actually has, and the reason is because in the US the states set the policies, not the federal government. We have a handful of states in the US that are being very progressive at the moment. California, Massachusetts, Hawaii, they're being very progressive in promoting renewable energy. It hasn't been a problem for us at all. Secondly, big businesses in the US are recognising that clean energy is ultimately going to be the most economical solution for energy production. The reality is that solar energy, the latest number I've heard is below 2 cents a Kwh. Wind is even cheaper than solar right now, well below 2 cents a Kwh. Comparing that with a coal power plant (forget about the capital cost to build this plant from 20 years ago), even processing lumps of coal costs you more than 2 cents a Kwh. Comparing that to building a brand new solar farm, and offering energy at less than 2 cents, I mean.. Clean energy is actually the lowest cost of energy going forward in the future, and my personal belief is that we're going to get to a point in the industry where, just like you pay for unlimited voice, unlimited data on your cellular bill, you're going to be able to pay a flat fee for unlimited energy. All the energy you can possibly consume. You just pay a flat monthly fee and be done with it. The reality is that energy is getting to a point where it's almost too cheap to meter. Why bother? The marginal cost for energy production in solar and wind is virtually zero.

So businesses have a leadership role in fighting climate change...

Yes, businesses as well as the more progressive states. They're the ones driving thought leadership in clean energy right now. Not so much the federal government in the US. They're just making themselves irrelevant, unfortunately.



- *This Q&A is part of a series of interviews during the [Web Summit](#) conference in Lisbon, 6-9 November 2017. The conversation was edited for clarity.*
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