

To boldly go

Storage policy | Parallels are frequently drawn between the nascent energy storage business and PV 10 years ago – that it needs strong policy direction to take off. Andy Colthorpe profiles some of the areas that emerging as the world pioneers in supporting the deployment of storage

Storage now is in roughly the same position solar was in a decade ago: almost everyone can see its potential, the technology is pretty much there, but the costs are still too high to allow the mass penetration that PV is now starting to see. What is needed is a push from a group of bold policy makers to prove the concept and then let the market do what it does in driving out cost.

Well, some parts of the world are beginning to take the initiative. It's happening at different scales, led by both national and local authorities, but the first generation of storage leaders is beginning to emerge. We look at some of the areas embracing storage.

California: Progressive beacon?

Almost all the talk when it comes to solar-rich California has been centred around Assembly Bill 2514, the mandate that orders the state's investor-owned utilities to put 1.3GW of energy storage to the grid by 2020. This includes behind the meter storage. So in addition to a growing commercial market for

demand charge reduction, the state seems well motivated to keep installing batteries. Along with pilot schemes in residential launched by some of the solar industry's big-hitters (see p.68), the state is likely to see continued activity across several segments including the scaling up of those pilots.

Yet the USA is a deeply market-oriented culture and regulators and utilities alike are still only just getting to grips with how to look at storage. Many of the problems stem from how to compensate storage when it can perform so many tasks across the electricity network and some of these questions are being tackled first in California. Chris Edgette of the California Energy Storage Alliance (CESA) tells *PV Tech Power* that to some extent the state's industry is lucky to have progressive legislators and a progressive regulator, the California Public Utilities' Commission (CPUC), which issued AB 2514 in the middle of last year. According to Edgette, his organisation was among those which worked with CPUC to launch AB 2514.

Storage requires a policy push at both national and regional levels to gain momentum.

CESA is currently also looking at the potential for storage to supply demand-side response, perhaps aggregated from a number of behind-the-meter systems capable of responding to requests from the grid to ramp up or absorb demand. As one of the trendy electric vehicle (EV) capitals of the world, California is home to Tesla, which supplies SolarCity with its battery packs. It will be interesting to see what impact an upturn in EV sales of the kind Tesla is hoping for could have on the wider battery market in California and beyond, although Tesla's battery production itself will take place at the forthcoming Gigafactory in Nevada.

New York: Anything you can do I can do bigger

New York is also developing as one of the USA's storage-hungriest states and like California has some forward-thinking policies and people in high places that are helping move the sector along. Audrey Zibelman, the chair of the New York Public Service Commission, the state's equivalent to CPUC, was one of the founders of Viridity Energy, one of the first companies in the US to execute aggregated demand response. As a densely packed urban hub on the Atlantic coast rather than a mixture of cities, towns and desert, New York sees wildly contrasting drivers for storage deployment to California. John Cerveny, vice president of NY-BEST, which he describes as part technical trade association, part economic development agency, says that New York is more concerned with easing the burden on its ageing and complex infrastructure than the need to "keep the lights on." Programmes like the NY SUN Initiative for large-scale solar may change that in future, Cerveny says, but this is still some way off. While investor-owned utilities in the USA are often seen as resistant to change, one is taking the lead in New York on storage. Seeking to offset the forthcoming loss of a 2,000MW nuclear plant 100 miles up the Hudson River from New York City, ConEdison, which serves most of New York City, has put out a request for 125MW of storage – 25MW of combined heat and



Source: Portland General Electric.

Xtreme Power's storage facility on Lanai, Hawaii, is used to double the output of solar and control ramp rate.



Source: DOE/Sandia National Laboratories.

power and demand reduction in the order of 100MW. Put out in conjunction with New York State Energy Research Development Authority (NYSERDA) in February this year, the requirement could and probably will be met to some extent with large-scale storage. ConEdison is also looking to defer costly investment in grid infrastructure using storage and cited that it is seeking to stave off the need to upgrade a substation which could cost around US\$1 billion. "When they have 60 [substations] in their territory, the costs are daunting," says John Cerveny. "In New York as soon as you open up the street, you don't know what you have. So if you can leave the existing infrastructure in place but use it more efficiently, it's a much better use of dollars than accidentally opening up a gas line no one knew about." NY BEST was itself started up through policy support,

with US\$25 million of investment, most of which came through NYSERDA. Meanwhile, residential storage for self-consumption is not yet on the agenda in the Big Apple, nor in California. For the most part, net metering, which is in place in 43 US states, is considered a fair enough compensation mechanism, for the time being. Meanwhile power outages are less of a concern in New York than California, so backup power is also less of a market driver there.

Hawaii: Island power

While California and New York get many of the headlines, Hawaii's storage is notable, particularly to the solar community, as one of the first tests of the limits of renewables integration. With their geographical isolation and tropical climate the islands have a high penetration of solar. More than one in ten

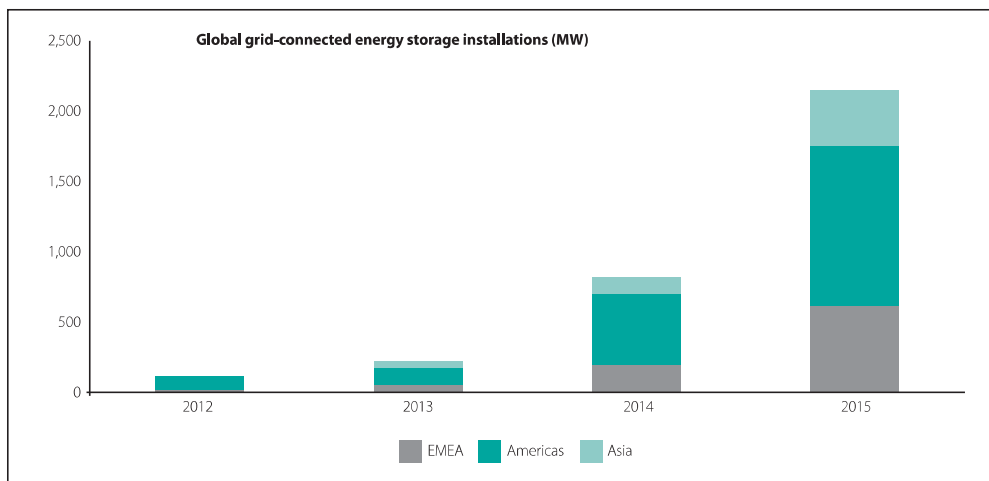
customers of one utility, Maui Electric, are estimated to have rooftop solar.

In May Maui Electric's parent company Hawaiian Electric Company (HECO) issued a request for proposal for 60MW to 200MW of energy storage across one or more systems with 30 minutes of storage capacity. This was followed in late August by HECO's proposal to meet 65% of the island's energy needs with renewables by 2030, an ambitious plan that the utility says will require energy storage, along with a tripling of the state's distributed solar resources. In the state that burns more oil than any other in the USA, this makes solar-plus-storage an attractive enough proposition that HECO has pledged its grid upgrades, distributed solar and energy storage will cut customers' energy bills by around 20%.

Germany: House proud

Germany is at present sporting a solar-plus-storage market driven almost entirely to serve the residential sector. One of the earliest countries to recognise the importance of kick-starting a solar industry is also trying to live the dream of using your own electricity onsite, albeit to a limited extent.

Policy is moving to enable that, but domestic manufacturers including Sonnenbatterie and ASD Sonnenspeicher claim that uptake directly driven by subsidies introduced by the government in 2013 remains limited. A Sonnenbatterie spokesman said that while the subsidies had led to greater standardisation and raised awareness, it had



Source: IHS Research

often slowed down the process of getting a system into a customer's house who would have bought a system anyway, rather than enticing new market entrants.

Indeed, the market even for residential systems remains fairly modest for now, with only around 4,000 sold in the first year of subsidies, according to federal industry association BSW Solar. When you consider the average system is probably around 5kW, that doesn't add up to a lot of megawatts, but analysts EU PD Research predicts total sales to double this year, rise to just over 12,000 in 2015 and keep going.

At much larger scales, activity has been limited to a handful of pilots, with one notable exception being a 5MW/5MWh 'battery park' for grid stabilisation, installed in an area of northern Germany with a high penetration of renewables. Battery specialist younicos, which constructed the facility, claims it is capable of competing with a 50MW gas turbine in frequency regulation markets. Despite this, German think tank Agora Energiewende argued in a recent report that in the next 10 to 20 years, the use of energy storage is not likely to be a more effective integrator of renewable energy technology in Germany than a mixture of other options aimed at giving energy systems more added flexibility, such as energy trading with close neighbours.

Japan: 1.4GW by 2017?

The explosive growth in PV capacity in Japan in the past two and a half years has among its unwanted consequences spawned problems with adequate grid connection

Germany's first commercial battery park, which recently opened, aims to compete with gas in frequency markets.



Source: Younicos.

and a rise in consumer electricity bills. Measures taken to solve these problems are expected to be contributing factors toward 100MW of storage installations this year. Peak shaving is also a driver at commercial level, in a market largely created this year and the last by lithium-ion subsidies that also compensate up to one third of the cost of residential battery systems. Earlier this year, Sam Wilkinson, research manager at IHS, predicted that, also driven by subsidies, 100MW of storage will be installed in 2014, contributing to a total 1.4GW of totalled installed storage capacity in Japan by 2017.

Faced with a high number of utility-scale projects unable to get connection, Japan is also trialling the world's largest battery to date, a 60MWh vanadium redox flow system built by Sumitomo Industries on the northern island of Hokkaido. The country's approach at grid scale has been mostly to put money into a handful of one-off pilots, mainly through the Ministry of Energy. The project has been commissioned by the Ministry of Economy, Trade and Industry (METI), which has also expressed an interest in commercialising the technology if successful. The pilot will be joined by a 20MWh lithium-ion system in Sendai to the north of the mainland, and two similar projects on islands in the south.

Yet most of the energy storage activity this year will be in the residential space, according to Yoshiyuki Ohhashi of Tokyo-based solar industry analysis firm RTS PV. In Japan, where people buy land and build new houses if possible, one homebuilding firm, Sekisui Heim, claims to have installed 10,000

units so far, Ohhashi says.

Government budget has gone into research into smart communities too. Backup power in the event of earthquakes and other emergencies is also a serious concern in Japan, driving demand for storage at public facilities like schools and shelters. Next year, Ohhashi says, the requested budget for the lithium-ion subsidy, to be approved, will be around ¥7 billion (US\$64.4 million).

Puerto Rico: Paradise renewed

Faced with similar creaking grid problems to Hawaii, and fluctuating power, Puerto Rico, has put a mandate in place that almost sounds like the whole thing could have been invented as a technical study in renewable integration. Puerto Rico's only utility, transmission, distribution, generation and regulation authority, Autoridad de Energia Electrica (AEE), ruled that every new renewable energy projects must provide the equivalent to 30% of its nameplate capacity in storage for frequency regulation over a 10-minute duration. They must also provide 45% of the equivalent to the system's nameplate, for one-minute ramping. The high power nature of the MTR means there may be space for supercapacitors and flywheels as well as batteries, according to Dean Frankel of Lux Research. AEE plans to sign PPAs with developers of 600MW of renewable energy projects, boosting the islands' share from renewables by 5%. ■

Noteworthy others

Ontario Aided by a decent amount of hydroelectric, Ontario has given itself ambitious renewable energy targets and to match that has kicked off a long-term energy plan this year by seeking to add 50MW of energy storage. Five projects were selected in July totalling 33.5MW, including a flow battery for solar.

India India has a long history of coupling solar with batteries, albeit of the lead acid kind. Now that the recently incoming government of Narendra Modi has promised measures to bring electricity to the 300 million Indian citizens that do not have access within three to five years that will include the building of over 1,000 micro-grids, of which storage and solar will be a key part.

Rest of the USA At a national level, the IRS has recognised the value of energy storage and provides a modest tax break for storage in combination with solar, while commercial storage is sold for peak shaving across the States.

Rest of the world The UK and Italy are trialling large scale systems and cautiously spending here and there on pilot projects and smart energy management. Meanwhile, in rural and remote areas, there will always be a compelling argument for energy storage, for economic as well as development reasons. From using storage to refrigerate food to sell, to micro grids for rural electrification and saving money by replacing diesel at Australian mining operations, the use cases for storage look very different in remote environments than they do in built-up areas. Then again, as we've seen, from the many examples, almost every region of the world has its different possible and actual uses, values and understanding of storage.

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