100% Renewable UK

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How new independent companies are leading the way in promoting innovations in grid storage and balancing

Now, the National Grid is pursuing various new policies to improve the ability of the grid to balance through a range of new services and initiatives. You can see some of those through the website of the National Grid Electricity System Operator (NGESO) at https://www.nationalgrideso.com/research-publications/future-balancing-services, also https://www.nationalgrideso.com/future-energy/innovation and on smart charging electric vehicles at http://powerresponsive.com/how-smart-charging-can-help/

However, the most important powerhouse of change comes through bottom up initiatives – these occur through civic mobilisations (environmental groups, consumer groups etc pushing for change and advocating new technologies and the necessary regulatory changes to allow system flexibility and new technologies), and, crucially, new companies with exciting innovations. Here I focus on some such company initiatives.

Balancing the grid through Demand side response and storage

If supply side sources – wind, solar etc are naturally variable it makes sense to control demand more so that it will fit in with this variable supply. One increasingly used technique to manage demand is called 'demand side response' which as it says on the can means that demand for energy from machines of a wide variety of types respond up and down to the availability of supply.

For example, refrigeration equipment in factories has a tolerance range of temperatures, and use of energy to keep refrigeration temperatures to a certain level can be varied in the short term. Companies like Flexitricity organise responses by industrial and commercial companies of various types so that those companies can make money, and help the nation balance out its electricity needs with supply. See https://www.flexitricity.com/case-studies/norish-cold-storage/. Flexitricity has recently taken on management of one of Europe's largest batteries in order to increase grid flexibility through demand response operations. See https://www.businessgreen.com/news/4015257/flexitricity-bags-deal-manage-europe-largest-battery-storage-site.

Changes to the electricity balancing mechanism are planned so that 'half hour metering' can improve the prospects for introducing time-of-use charging in the domestic sector. This will greatly widen the possibilities for demand side response at

the domestic level. Octopus Electricity, for example, already offer a level of time-of-use charging, but half hour metering will allow the demand response market to expand far beyond the industrial sector. This can then be linked seamlessly to domestic storage and solar pv systems and also use of the batteries in electric vehicles to balance the electricity grid.

Three independent-led developments that herald the way towards the renewable-energy-storage revolution

In recent times three types of developments, epitomised by three named companies discussed here herald the beginning of the renewables-plus-storage revolution in the UK. Slowly but surely companies using battery technology are edging forward towards what will be a means of balancing very high levels of renewable energy generation without the need of fossil fuel reserve. But it is independent companies that are leading the way in this - with the big companies and utilities issuing little more than PR gestures while their business model is gradually undermined.

One development has been the installation of subsidy free solar plus battery projects by the independent sustainable energy company **Gridserve**. Second is the opening up, by OFGEM, of the electricity balancing market to 'aggregators' who can put together solar pv and battery units in houses to provide balancing services. This sallow companies like **Social Energy** to use digital technology to link together home solar energy and storage systems to provide not only energy but services that will be equivalent to capacity to increasing portions of the electricity market. The third development is the initiatives to build storage systems to substitute for electricity distribution upgrades to provide power for bus depots, again, something being done by an independent company. This is being done by **Zenobe**. All these developments will not only reduce the need for extra grid and distribution capacity, but also they will reduce the need for peak generating capacity.

Already storage systems are providing increasing amounts of short term 'frequency response' services to balance the grid. But now Ofgem has allowed aggregators to enter the balancing mechanism without registering as a full blown energy supplier. The amount of storage, while limited at the moment, is going to grow very quickly from three sources: home based storage, distribution based storage and electric vehicles through their batteries.

This opens to door for storage and renewables to reach much further into the electricity markets and pave the way for peak electricity generating capacity to be replaced by renewables - plus storage. By this I mean a third of our electrical generating capacity (20 GW out of 60) is peak, so potentially we could dispense with most of that peak with storage. Peaks occur. typically (in the UK) at morning and in evening. The peak lasts for 2 hours. So in order to provide storage to cover for this

we need, say, 2(hours) xs by 20GW gives you a need of 40GWh storage to avoid 20 GW peak capacity for each peak time session.

Well, for example, each Nissan Leaf has 24kWh storage, so if you used only half of that and there were 10 million cars with equivalent batteries, you'd have that's 10 million xs 12kWh storage or 100 GWh. - And you can have home based or industrially based batteries to do the same and more. In other words the potential is massive.

We're already, admittedly still near the start, on the way forward to being able to cut peak demand spikes by large amounts with developments like Zenobe's https://zenobe.co.uk/wp-content/uploads/2019/02/Zenobe-Press-Release_19.02.19.pdf. What is needed is to expand storage with the right incentives and regulations and link that and other growing markets like car batteries with the right software. A lot of it isn't written yet, but it can be.

Whether we have windless and/or sunless days doesn't matter to the task of reducing demand peaks through storage - but of course having more storage helps integrate variable renewables and increases their effective penetration without the need to 'constrain' them. Installing large scale heat pumps to provide district heating systems with energy so they can provide heating (and store heat in hot water tanks) is another element in the pattern.

Renewable energy is rapidly eating up the electricity generation market. Already in 2018 a third of UK electricity was supplied by renewable energy. This week the Government has announced how offshore wind will supply a further 35 per cent by 2030. More should come on top of this of course.

What we need is the system to change to balance these supplies using and growing the increasing energy storage options. In fact the big companies, in the main, just issue press releases and spend large amounts of consumers' money on installing so-called 'smart meters' that do little to help. They do not, in practice, deliver the balancing services we ought to be getting, especially allied to storage.

But the big electricity companies are being supplanted by innovative information technology age companies based on providing renewable energy and storage. The dinosaurs will go out of business. The only question is: how quickly?

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