Solar plus storage goes large

The combination of storage technology with larger scale solar projects is an emerging science. Andy Colthorpe speaks to PV power plant pioneers, Belectric, about a project completed at the end of 2014 to install battery storage at a utility-scale solar installation in Brandenburg

When coupled directly with solar, energy storage has obvious benefits – the opportunity to increase self-consumption of PV-generated electricity, as well as adding uninterruptible backup power supply, especially at smaller scales. However, the use of larger scale storage to contribute to grid stability offers an interesting 'twofer' (two-for-one) driver for PV and other renewable energy that is being explored at a 67.8MW solar farm in Germany by PV power plant specialist, Belectric.

First, and most important from a bigger picture point of view, it can help render arguments against the variable nature of PV somewhat redundant, as stable grids can accommodate greater penetrations of renewable energy. Second, as in the case of the latest project from BELECTRIC, grid storage batteries could provide additional revenue streams, from playing in the market for ancillary services to the grid, such as frequency regulation.

The solar farm itself, Alt Daber, was completed on a former military airfield in Brandenburg, in the north of Germany. Alt Daber has a nameplate capacity of 67.8MW, to which the addition of the 2,000kWh lead-acid battery system, Energy Buffer Unit, was announced in February last year. Connection of the battery system was marked with a ribbon-cutting ceremony in November.

Belectric's UK managing director Duncan Bott and Tim Mueller, chief executive of Belectric's solar research and innovation subsidiary, Adensis, spoke to PV Tech Power about the project.

PV Tech Power: Alt Daber is a pretty big solar project. Can you tell us about some of the thinking behind the installation of a 2,000kWh energy storage facility once the solar portion of the project was completed?

Tim Mueller: We started Alt Daber as a PV power plant and began building in 2011 and it was also completed that year. We were thinking it would be very nice to add a storage system to this power plant. We came to this idea because the Transmission Network Operator (TNO) which was connecting the Alt Daber PV plant was having a lot of problems getting the energy away from this PV plant.

We were thinking – how could we aid this problem, how could we help? The first idea was always storage systems and we had started maybe three years before with the design of a storage system which would be suitable for PV power plants in stationary applications. So we were thinking, why not apply it to our power plant in Alt Daber?

PV Tech Power: When it comes to solar coupled directly with storage, a lot of the talk we have heard has centred on 'load shifting' applications, often conferring the direct benefit or value on to the owner of the PV system rather than using the batteries for grid stabilising. Why is the Alt Daber project more concerned with using storage for grid stability?

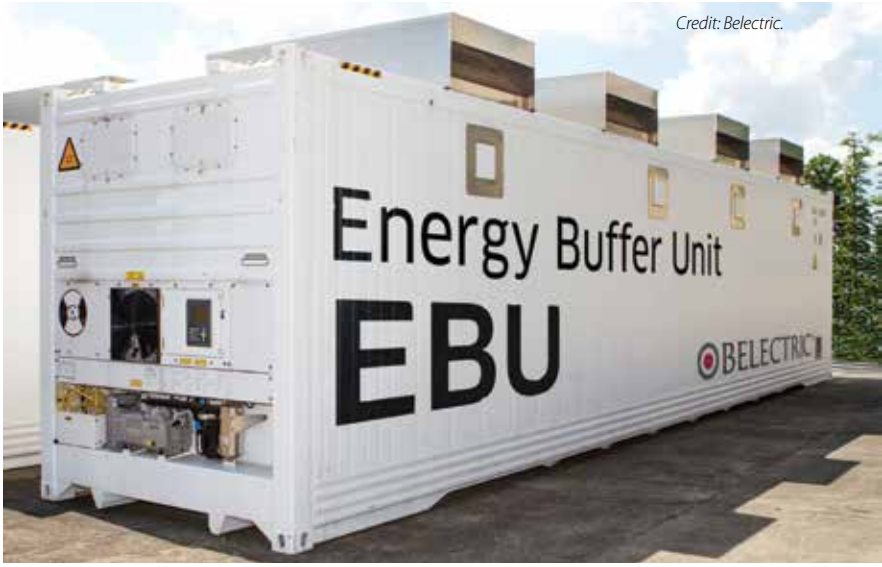
TM: The more we got involved in [looking at storage for Alt Daber], the more we found out that to store energy to shift it from one hour to another, or to shave the peak, would be a nice idea but would not be profitable. So it's not the time yet to do that – for business models to shift energy from one hour to another, using electrical storage systems. But in the end we thought, well, it should be something we have to do, or have to construct within the next couple of decades, otherwise we will not have a higher penetration of renewable systems at some point. We were thinking, what would be possible commercially and what would also be necessary?

We found out that for the moment the biggest problem is not to shift energy, rather to stabilise the grid; this is something that is a bit ahead but we will need that in the next couple of decades or even the next few years.

PV Tech Power: That's the technical side – what are some of the market drivers for this kind of grid-stabilising project, specific to Germany, which made the Alt Daber project possible?

TM: Frequency regulation is one of the main regulatory possibilities to stabilise the grid. This is done by conventional power plants, which are more and more being pushed out in Germany and Europe. At the same time, we also need grid stabilisation capacity. In order to not stop the trigger for the building of PV power plants we need to replace that grid stabilisation technology; we need to replace conventional power plants wherever they go out of

Credit: Belectric.



Belectric's Energy Buffer Unit allows utility PV power plants to offer grid stabilisation services.

business. So this is what we did in Alt Daber.

We installed the storage system, the battery plant, with the purpose of doing frequency regulation, commercially under the German grid regulation market. There is a weekly tender and you offer your power, your frequency regulation or frequency response power and you are awarded, or not, depending on the price you offer. We have done a lot of talks with National Grid [responsible for the high-voltage transmission network in the UK] and they're doing very similar things.

PV Tech Power: So there were some economical barriers to the addition of peak shaving capabilities, even though you say the technology can already do it. What has the regulatory response and support been like to the development of such battery systems in Germany?

TM: In Germany, we feel ready now, on the side of the government, on the whole because they've deregulated the German energy market over the last five years; they opened up possibilities for newcomers to enter this market, be it production of energy, be it transmission of energy or grid regulation.

There are still a lot of barriers, like the regulation market was custom tailored for fossil fuel power plants; it was never meant for batteries to be part of it. For example, for somebody awarded frequency regulation for one week's time, it is assumed you are able to deliver regulation services, where you deliver energy into the grid, for the whole period of the tender. That means in theory one week, 24 hours a day, you shall be able to deliver. In reality in frequency regulation that's never the case because you either deliver or you draw out of the grid. In practice, a battery is perfectly suited for this job, because it delivers and it takes out energy, it's always discharge and charge so it's pretty perfect.

PV Tech Power: So what needs to change?

TM: It was just two years ago that they accepted a battery to take part in this regulation market, and not with the right conditions [for batteries]; you still need a fossil power plant in the background, [with a long period of delivery] to back up the battery. This is handled by pooling fossil and battery-based frequency response providers. This was one of the main achievements of the deregulation or unbundling of the energy market.

If they were to award this on an hourly basis we could get rid of the backup power plants, we could auction our storage systems for one hour and if it's still full we auction it for one more hour, otherwise we take it out and charge it. We would get rid of the necessity for the backup power plants. On the other hand we could also combine more peoples' services, by let's say shifting load during daytime and doing frequency response at night-time or something. That would enable a lot more business models. For the moment, the art of marketing the battery will, in the near future, be the art of combining different business models. Refinancing the battery with one business model, for example frequency response, will become more difficult because more and more batteries will come onto the market in my belief. So we have to be able to combine different business models.

PV Tech Power: Do you think these kind of devices, storage in combination with solar, could make large-scale solar more attractive to governments and electricity network operators? The theory would suggest it should but as we know, the politics and economics behind these things do not always follow the science and technology as closely as we would hope!

Duncan Bott: The various network operators around the world are starting to progress towards the recognition that, historically, it was thought that renewable energy was disruptive to the network and now that's starting to shift towards a recognition that actually, renewable energy can offer solutions to stabilising the national networks and we are progressing towards recognising how that is achievable.

Belectric is a technology provider, that is what we are positioning ourselves as, and so as subsidies come down in all the various new markets in the world for technologies such as solar, investors and owners of power plants and also developers of solar farms, we all need to realise and learn to innovate. So through the innovation of technologies, we can now add additional business models to what was once just this simple model of produce, export and sell energy.

Using Energy Buffer Units, we can not only do frequency control but also voltage control of the network, and what we're preparing ourselves for is, in the future when new battery technologies come to the market, we will then start doing shifting of energy from one hour to the next.

So I guess what we're doing here is demonstrating that it's not just about the battery in the box. There's a lot more behind the hybridisation of solar and these technologies, and solar and these business models, to enable us to make that step forward in the future into the world of either lesser subsidies or no subsidies. ■

Credit: Belectric.

The Alt Daber power plant in Brandenburg, Germany.