A tipping point for financing large-scale storage?

Storage finance | Storage has an important role to play in the UK's future energy system, but the challenge for investors and developers is to select the right business models and combination of technologies. Maria Connolly and Stuart Urquhart at UK law firm TLT look at how some of the new regulatory and policy developments are helping enhance the bankability of storage

Credit: Renewable Energy Systems

The UK energy sector is undergoing huge transformation and disruption, with the way electricity is produced, distributed, sold and consumed changing rapidly. Global demand for energy is rising and in order to provide low carbon, affordable and secure supplies, the settled order needs to change to a flexible energy system.

New markets, new routes to market, new entrants to markets, technological innovation across the energy value chain and innovative new business models are emerging as the sector makes this transition. The conundrum facing markets, investors and governments alike is which models and combination of technologies will succeed and become the new norm. Which of these are able to meet rising demand, serve our smart homes and smart cities and deliver an acceptable return on investment at an affordable price for consumers?

Energy storage is a key component of the flexible energy system that is needed to meet increasing demand. This includes storage deployed as a stand-alone, grid-connected asset, storage deployed "behind the meter" at a particular source of demand and storage that is co-located with a particular source of electricity generation, such as a solar farm.

Large-scale storage presents opportunities but also bankability challenges for investors

Future energy scenarios

In the latest scenarios modelled by National Grid in its Future Energy Scenarios report (FES) [1] , it highlights the fact that demand for electricity is expected to increase significantly by 2050, driven by increased electrification of transport and heating. The report suggests that there could be as many as 11 million electric vehicles (EVs) by 2030 and 36 million by 2040. If the UK Government's target of 34 million EVs on the road by 2040 is met, it is estimated that an additional 60TWh of electricity every year will be needed. The FES report also estimates that 65% of generation could be local by 2050.

EVs are expected to massively increase demand for electricity by the middle of the century

In scenarios of this kind, National Grid and other local system operators will face a huge challenge in ensuring electricity can be made available at the right places and at the right times to meet demand. While Vehicle to Grid (V2G) and other smart grid technologies will likely play a crucial role in meeting this challenge, there is also likely to be a significantly increased requirement for dedicated storage capacity.

Globally, the energy storage market is expected to double six times in the years to 2030 rising to a total of 125 GW of capacity, according to Bloomberg New Energy Finance (BNEF) [2]. It predicts significant growth in energy storage investments of up to US$103 billion and forecasts that eight countries will lead the market, with 70% of capacity to be installed in the US, China, Japan, India, Germany, the UK, Australia and South Korea.

Energy storage, unlike other grid infrastructure, provides the unique ability to store excess electricity and deliver it when and where it is needed to utilities, industrial and commercial customers, independent power producers and power system operators. In addition, BNEF predicts the cost of utility-scale battery systems will likely decline significantly by 2040, falling from around US$700 per KWh of storage capacity in 2016 to less than US$300 per KWh. This presents opportunities for the storage and EV market and makes energy

Source: National Grid, Future Energy Scenarios Report 2018 storage and co-location of energy storage combined with other technologies increasingly attractive to investors.

The increasing bankability of energy storage

The business model for a storage project is likely to be significantly more complicated and less certain than for the kind of feed-in tariff (FiT) or renewable obligation (RO) subsidised solar farm that many investors will have become familiar with over the last six or seven years. In particular, there is no potential revenue stream that can be compared to the index-linked 20-year subsidy available under the FiT and RO schemes.

In principle, Capacity Market agreements can provide up to 15 years of index-linked revenue. However, even based on 2016 values, Capacity Market revenues would not have been sufficient on their own to underpin an investment in a storage asset. Since then, the introduction of de-rating factors for shorter duration storage combined with a significant reduction in auction clearing prices has further reduced the amount of long-term "contracted" revenue that a storage project could look to secure.

The primary revenue stream that many storage developers will likely be focussing on will be revenue payments from National Grid for provision of balancing services, in particular frequency response services. But there is only a finite amount of frequency response capacity that National Grid will require and contracts have relatively short duration; storage developers therefore need to factor into their model the likelihood of having to participate, either directly or through aggregators, in multiple competitive tender exercises over the life of the project.

Other revenue streams may also be factored into the equation, depending on the configuration of the project. For a number of early projects, revenue from triad-related embedded benefits will likely have been important (see box, below left). For other projects located "behind the meter" with a source of demand, the ability to shift the time of demand away from peak (both triad and red band) periods will likely be a significant source of value. In both cases though, as illustrated by the changes now introduced by Ofgem to triad embedded benefits and, looking ahead, to other changes potentially following on the back of Ofgem's Targeted Charging Review, there is no guarantee that these revenue streams will continue to be available on a long-term basis.

Set against this backdrop, it is perhaps inevitable that there have been some challenges in devising "bankable" storage models that will appeal even to cautious investors. However, there have been a number of interesting developments over the last 12 months that we would treat as being positive in terms of future investment for storage projects:

- Established funders, with a long track record of investment in renewables projects, have closed deals involving storage projects. This includes Santander's financing of a portfolio of battery storage projects developed by Battery Energy Storage Systems and The Renewable Infrastructure Group's acquisition of the Broxburn facility.
- Major solar asset owners, such as Next Energy, have acquired storage projects co-located with solar farms. Even though the size of some of these early acquisitions may not be large, they may lay the foundations for future acquisitions and new developments, in support of new build, subsidy-free projects, by enabling asset managers to become more familiar with the way that storage can be utilised.
- Established players from both the aggregator and renewables PPA markets are working on new products to provide value for operators of storage assets, especially where they are co-located with renewable generation. Alongside revenue from frequency response or other balancing services, project owners may increasingly have the opportunity to secure value through participation in the balancing mechanism and/or through electricity price arbitrage.
- There now seems to be real momentum behind the roll-out of EV charging infrastructure to support the dramatic increase in EV use that is being projected. This points not only to an increased need for storage capability in the system generally, but also more specifically to opportunities for storage to be co-located either with charging infrastructure (to manage periods of peak charging demand) or with generation assets which are contracted to supply EV charging stations.

Even without the potential to lock-in to long-term contracted revenues, the combination of increased demand for flexibility in the system (and so potentially greater confidence in the need for storage as one class of flexibility provider), increased, on-the-ground experience of how storage assets can successfully be operated and an increasing penetration of trusted service providers (whether O&M/asset management or aggregator/PPA providers) may collectively help to unlock investment even from some of the more cautious investors.

Good commercial sense

For early movers, a key benefit of co-locating storage with an existing, grid-connected solar generation asset will have been the opportunity to benefit – through shifting of the time of export to grid – from triad embedded benefit revenue. As noted earlier though, this particular revenue stream is now being effectively phased out as a result of changes introduced by Ofgem.

If the solar asset in question is itself located behind the meter (for example, a rooftop array on a commercial building or, in the future perhaps, a solar farm with a private wire connection to a nearby electric vehicle charging station), there is likely to be scope to generate value through avoidance of peak grid import charges, by allowing the solar generation to be shifted to, say, the early evening period and off-set grid demand at the commercial building or EV charging station during that period. This should be the case for at least for the next couple of years, pending the outcome of Ofgem's Targeted Charging Review. Even if existing network charges are restructured so they are no longer calculated by reference to volumes of demand at peak periods, there may still be potential for using behind-the-meter generation and

Embedded benefits explained

Embedded benefits are savings or payments available to generating stations that are directly connected to distribution networks (commonly referred to as embedded generation or distributed generation). Historically, one of the key embedded benefits has been the benefit associated with the avoidance by licensed electricity suppliers of Transmission Network Use of System (TNUoS) charges. The TNUoS charges are designed to cover certain costs related to the operation of the high voltage transmission system in the UK. In broad terms, licensed electricity suppliers have to pay these charges by reference to the amount of electricity they are treated as supplying during the three peak half hourly periods of electricity demand each winter i.e. the "triad" periods. Electricity that is exported to the grid during triad periods can be netted-off against a supplier's demand for these purposes, resulting in a reduced exposure for the supplier to the relevant TNUoS charges. The value of these avoided costs can then be shared, as an "embedded benefit" payable under a power purchase agreement or similar contract, with the generator (or storage provider) that provided the exported electricity.

storage to reduce a demand customer's peak grid capacity requirements and so reduce its exposure to any future capacity based network charges.

Looking to the future, wholesale electricity prices and in particular balancing system cash-out prices may become increasingly volatile. Having the means through co-location of storage with a solar asset to shift the time of export to (or where co-located with demand, shift the time of import away from) higher price periods is likely to be a further source of value. Unlike the current, passive model of operating a solar farm, new, more active approaches to the management of the solar asset may become the norm and the availability of co-located storage may prove key to maximising the value that can be secured under future "smart" PPAs.

Key considerations for investors

For any storage which is to be co-located with an existing solar asset, the headline consideration is likely to be the impact on the existing solar asset's ongoing eligibility for subsidy support under the FiT or RO schemes.

Uncertainty on this issue has undoubtedly been one of the barriers to investment in projects of this kind to date. However, much of that uncertainty has now been removed through the publication by Ofgem of specific guidance on the issue. This guidance, which was only issued formally a few weeks ago following an earlier consultation, confirms that in principle storage can be added to an existing solar asset without affecting its accreditation under the FiT or RO schemes.

The key practical requirement will be to have the right metering in place, so that FiT payments or ROCs are only claimed on electricity which can be shown to have been generated by the solar asset, as opposed to electricity which may have been imported from the grid by the co-located storage and then subsequently exported. For FiT projects specifically, the addition of co-located storage may – unavoidably – mean a loss of entitlement to claim FiT export tariff payments, but this is unlikely to be viewed as critical for most investors.

More generally, wherever any storage is to be co-located with an existing solar asset, some or all of the following may need to be reviewed and potentially amended, depending on the specific arrangements for the project:

- Lease – does the lease for the existing solar asset allow for the installation and operation of a storage asset?
- Planning – what additional or varied planning permissions will be required?
- Grid connection – will additional grid import or export capacity need to be obtained in order for the storage to work alongside the existing asset? If the storage asset is to be owned/operated by a separate project company, will there be a need for a grid sharing arrangement to be put in place with the solar asset owner?
- PPA/revenue sharing – will any existing PPA in place for the solar asset need to be revised to reflect the operation of the storage asset, including (for example) in relation to forecasting of output? If the storage asset is to be owned by a separate project company, what commercial arrangements will be in place between this company and the solar asset owner for sharing of the value derived from operation of the storage (e.g. frequency response revenues secured by the storage owner or PPA benefits secured by the solar asset owner)?

Co-location of storage and solar is likely to provide a key source of revenue in the future

Other key considerations that will be relevant to any project involving the co-location of storage with a solar asset, whether existing or new include:

- The robustness of the EPC and O&M arrangements, including whether there will be an overall "wrapping" of these arrangements and reduction in the risk of interface issues between different component parts of the project.
- The contractual route to relevant project revenues, including in particular whether the project company will be seeking to participate directly in relevant tender or auction exercises (e.g. a National Grid frequency response tender) or via a third-party aggregator. If the latter, then depending on the size of the project and the identity of the aggregator counterparty, there may need to be some form of security put in place to mitigate the risk of the aggregator counterparty becoming insolvent.

Conclusion

Despite some initial uncertainty, the last 12 months have brought about a steady stream of changes and developments that indicate battery storage and co-location with another renewable energy source has an increasing role to play in the UK energy mix. As the industry continues to develop and demand for flexibility and new technologies grows, this is only going to gather pace. It will be important for investors to understand how these opportunities are changing and, crucially, to position themselves appropriately when they do. ■

Authors

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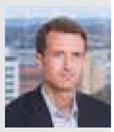

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References

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