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DATA FLOWS IN ENERGY STORAGE:

MINE, MINE, MINE

WELCOME TO THE NEW WORLD

New developments are driving the energy storage market towards colossal computing requirements. Batteries and their control systems, blockchain, aggregation and virtual power plants, and demand-side response all create a huge harvest of data which must be collected and managed.

To draw an allegory for a moment, if shipping containers housing lithium-ion batteries are a heart pumping blood around the nation's energy networks, then two-way flows of data are its nervous system. That data - when interrogated - becomes the stimuli of reflex response; and the memory of performance, pain and rest.

Batteries will play an increasingly embedded role in energy systems, and become an enabling technology in wider, more complex energy ecosystems. When they do, the volume and speed of data flows will increase.

This paper takes a high level look at the value and importance of this data; what it is, what it does, and who it belongs to. We then look beyond who might own or have the right to exploit it, to touch on what might be possible if data were shared and made available to all.

We make no apologies for looking at the utopian scenario, but our clients will be reassured we recognise the commercial and practical realities particularly at a time where financing for storage projects is finding its feet. Nonetheless, pooling data and intelligence to enhance the commercial positions of all involved can be a reality. Indeed, future local networks, grids and smart energy systems will demand it as a right.

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DATA IS THE NEW OIL

The four most valuable listed firms in the world are Apple, Alphabet (Google's parent company), Microsoft and Amazon. All are seeing growing profits. What they have in common is that they deal in data, and for some services which are ostensibly 'free', consumers pay by handing over even more of this precious commodity.

The Economist has suggested that the abundance of data in today's society - produced from TVs, phones, streaming, networking sites and shopping - has "changed the nature of competition." Processing data allows companies to analyse what is working, what is popular and what consumers want, extending the company's scope to compete more fiercely via improved products.

Companies with the finances to buy market data surveillance can use it to predict the popularity of a rival product or company, and make moves to buy them out of the market or quickly concoct a similar product.

These principles apply equally to energy storage data. Developers, manufacturers, customers, financiers and network operators will all want to know what's working, what's popular and what customers want.

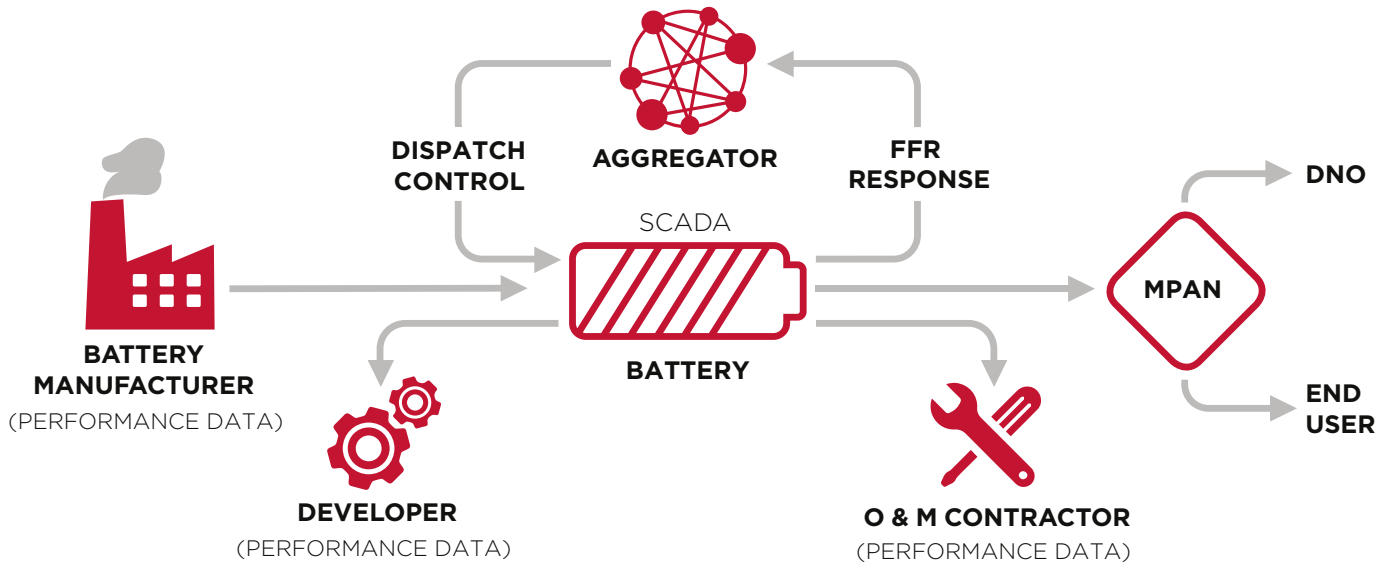
THE RAPID GROWTH OF STORAGE

Energy providers have been offered a golden opportunity by the need to stabilise the grid combined with the declining costs of energy storage batteries. The feverish uptake of energy storage development models has not been cooled by recent Ofgem caution on the potential size of the market. Developer enthusiasm seems to be tracking only marginally ahead of investor appetite, despite the major change in mindset this requires on the financiers' part. Combining solar with storage offers the opportunity to make solar energy more competitive against other energy types which can supply 24/7. Now that it has been confirmed ROC-accredited projects can be combined with a battery without affecting ROC status the viability of retro-fit is increased significantly.

Business is attracted to 'behind the meter' battery storage offerings as an alternative to grid-based electricity supplies during peak hours. Having the ability to switch over to battery power during peak electricity rate times means lower energy bills.

Meanwhile, disruptive factors such as electric vehicles and the new infrastructure required to support them, increasingly intermittent or variable generation, the decommissioning of coal-fired power stations and increasing peak demand and wholesale pricing, all point to a demand for storage solutions which extend way beyond the contract lengths currently offered in the market. Finance providers therefore need to look to the value of the assets, and what they can do.

Exploitation and optimisation of assets based on their collection of and response to data will be vital to building the investment case beyond contract length and payback of capital expenditure - and even beyond the project end-of-life period. One outcome of this is clear: Data is a key value to be unlocked.



A LOOK AT THE DATA FLOWS OF A BATTERY

The simplified model above describes some of the types of data that might be collected when operating the battery asset. Increasingly, asset owners are considering parallel system monitoring and telemetry alongside that installed and monitored by an aggregator or VPP operator. But for now this can serve as a working example. One would anticipate the following types of useable and iterative data to be extracted from this:

- Metering and billing data – essential for building individual and wider use cases
- Battery degradation data - important for energy managers and analytics companies
- Details of types of battery use - important for energy managers and analytics companies, and designers of service requirements
- State-of-charge profiles - important for network operators and aggregators
- More details on awarded DSR contracts - important for energy managers and analytics companies

In essence, though, it comes down to:

What is working? - so products can be improved and efficiencies generated

What is popular? - so network operators can plan for the future, and developers and investors can model their returns to direct their products or their investments

What customers want? - be they behind the meter C&I customers, NGET, domestic householders, local authorities or transport networks... the list of potential demands is long... and valuable.

WHO OWNS ENERGY DATA?

No one necessarily has a 'right' to energy data - although some market players are becoming more alive to the potential in its ownership. These players are starting to take steps to ensure it will be placed in their hands. It is important that the market recognises that there are many benefits to be seen in agreeing on ownership and usage in a sensible and commercial way.

Typically, we might expect the following to "hold" the main intellectual property (IP) rights in data in and around an energy storage installation:

- **Battery degradation data:**
  Installation owners (although some manufacturers and integrators are claiming this in template contracts) and their investors
- **SOC profiles:**
  Installation Owners/Investors
- **System design and specification:**
  Integrators/Owners/Developers
- **More details on awarded DSR contract:**
  National Grid
- **General Market Electricity meter and billing data:**
  DNOs and National Grid

Plenty of other parties will need access to some of this data, for instance:

- **Potential developers** assessing a site or customer proposition will need access to metering data in order to model feasibility, potential revenue or optimisation benefits.
- **Aggregators, PPA providers, and virtual power plant operators** will require access to all of this data to deliver services, generate and pay back revenues to the installation owners, and, dispatch the asset to respond to system requirements.
- **O&M providers** will need performance data and telemetry to identify faults, fix problems and also prove their availability obligations have been met.
- **Manufacturers and system integrators** will want to access performance data to improve their products, and even shape their warranty offer.
- Finally, **end customers** such as charging infrastructure operators will want metering data to know how much they have been provided with and what they need to pay for it. As above, they may even install their own monitoring and control systems in parallel - both to verify the telemetry from other sources, or to provide a backup option in the event the main communications fail.

Whichever way one looks at it, if one party were to jealously guard its data, the system simply wouldn't work. Without its nervous system the body would be limp.

There is, though, a distinction to be drawn between data shared between project partners to maintain the working functions of that project and data shared more widely for intangible, longer-term benefit and market acceleration. The latter is not necessarily a new concept in some circumstances, but next we will look at the potential for industry-wide engagement.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SHARING DATA

While it is expected that data owners would not wish to see their data used more widely than necessary, they are not to be viewed as necessarily secretive. In the shorter term, sharing will occur within groups of friendly partners in order that they can maintain a commercial advantage. Tesla's cars are already sharing data via short video clips between themselves regarding their surrounding environment. The purpose of this is to improve the autopilot feature, ultimately contributing towards Tesla's journey to the creation of a higher-stage autonomous vehicle.

There are arguments for expanding the data-sharing model so as to socialise and open access to the data across the energy network. This would improve the industry at scale and increase the wider social benefit it can deliver. Open source tools could assist market players to deliver competitively to well-understood consumer needs and will underpin a more efficient market in terms of demand-side response. Ofgem has already decided gas and electricity companies working on smart-grid projects must publicly share the data which emerges from them, not simply project learnings. The push for open data from smart grid trials will also represent opportunities for developers of smart technologies.

The benefits could be summarised as follows:

- The Distribution Network Operators (DNOs) and National Grid could benefit from behind-the-meter battery owners sharing system data if a system were to be set up where they can have access to spare capacity for balancing.
- Battery degradation, State of Charge (SOC) profiles, and system use data will enable analytics companies to provide better control services which will optimise the savings or revenue derived from the battery for multiple market players.
- System design and specification could also be useful for analytics companies who can propose a more efficient control regime to current Uninterrupted Power Supplies (UPS) systems or similar.
- Electricity meter and billing data, along with ancillary contract data will help analytics companies accelerate the adoption of storage systems, by finding suitable sites faster.

WHAT MIGHT HAPPEN IF ALL PERFORMANCE AND OPTIMISATION DATA COULD BE SHARED?

We appreciate different businesses have varying approaches to data and IP. And while ultimate ownership and ability to monetise this data may lie with one party or another, there can be little doubt that for smart energy systems to properly function, multiple parties within that project structure will need access to data. There is, however, a potentially wider opportunity here, for the sharing of certain types of data in order to galvanise and accelerate the market. Research organisations such as the University of Sheffield have been testing the performance of two 1MW batteries on a single connection, and will shortly publish their findings, but what might be the wider industry benefits of profit-driven commercial organisations making such data available?

Our report partner, QBots, modelled a utopian scenario in which there is data sharing among energy storage and other flexibility assets (which can include Internet-connected appliances such as commercial freezers or air-conditioning systems, which can be turned up or down remotely to provide stability or additional capacity to the grid network) which enables performance and outputs to be optimised, in a similar way to what happens in a micro-grid or local energy network.

“In that scenario, QBots believe that further savings of up-to £70,000 per annum can be made for every MW of peak capacity. Based on current UK demand, this could equate to savings totalling £4 billion/year or net savings (once the deployment costs of fexibility measures are deducted) of 1.4 - 2.4 billion per year.”

Further details are available at: http://bit.ly/FAEnergyreportA

From a commercial point of view, it is likely that any attempt to enforce data sharing beyond its natural confines of a micro-grid, local network or even Smart City projects could well have an inhibiting factor on the market appetite for building and operating batteries and other flexibility assets. It is, however, worth bearing in mind that there are wider technological drivers for using energy and storage data, and distributed ledger technology such as blockchain is undoubtedly at the forefront.

THE IMPACT OF BLOCKCHAIN

Blockchain is a method of storing and sharing digital data in discrete ‘blocks’ with a high level of security and confidence - without the need for centralised data storage. Digital currency Bitcoin is perhaps its most famous child.

There has recently been a lot of discussion in the energy industry around blockchain and how this could revolutionise the way the industry operates. In particular, this is a game-changer for how data is shared and exploited in the energy sphere.

Grid Singularity in Austria is a start-up using blockchain technology to develop a ‘decentralised energy data exchange platform’ to enable smart grid management, energy trade validation and trading of green certificates, among other potential applications. blockchain could provide a mechanism for the automatic storage of data about “live” assets creating a log of the history of the asset. In the event of equipment failure (e.g. a battery storage facility) the operator will have the ability to go over the history of the asset and identify what caused the failure. It can also change the way consumer billing is done, reducing human error and the associated costs.

We are already seeing scenarios for the energy market in which a distributed ledger or blockchain system can provide game-changing benefits to energy market players and customers, based on massive compound computing power across multiple computer nodes. We explored the potential impact of blockchain in the Energy Sector in our recent briefing, which can be accessed here: **http://bit.ly/FootAnsteyblockchain1**

LEGALISE IT

Aside from blockchain and the need to create algorithms to perform self-completing legal contracts, there is no need for flywheels to be reinvented when it comes to data in energy. Taking one's usual approach to dealing with IP and protecting data inherent in and produced by Energy services and outputs is likely to be fine. The key, however, is awareness; not only of the risk that ownership lies somewhere other than you think or that your rights to access the data you need to perform an obligation are not sufficient, but also awareness of the wider potential to exploit, use or mine that data for benefit. That could be for a particular commercial enterprise or more widely - for a community, market or network.

As a brief overview, it would pay dividends to consider the following issues and make sure these are locked down in your project documents:

- Ensure your agreements have clearly defined what IP is included, what IP each party brings to a project, and what IP is anticipated to be generated by that project. Seek to protect these interests as one ordinarily might
- Carefully check your supplier contracts – everyone is after the data, and you don't want to have to licence use of your own data back from a battery manufacturer (it should be the other way round)
- Identify how data collected is allowed to be used or exploited by another party
- Identify and project any IP and data which is already in your possession before the commencement of services with another party
- Ensure that project partners who need access to data are granted it, but that this grant is on a licence basis and controlled in the way you expect

- Identify who is to be the owner and rights holder of battery IP and any IP generated in the course of service provision, including, importantly, data produced
- Consider the restrictions on sharing of data with third parties and deciding whether or not these are appropriate
- Provide for, and restrict rights to use and exploit data after the agreement has come to an end and ensure that other parties are compelled to give it back at the end of the contractual relationship.

CHECK THAT:

- Anything you draft in IP sections isn't contrary to provisions regarding confidential data
- Ensure that wording in technical schedules drafted by clients or technical advisors doesn't drive a coach and horses through painstakingly-negotiated clauses on data
- Service providers are tested on reliability, back-up provision, disaster recovery, resilience to cybercrime (and adequacy of any cybercrime insurance policies to respond in the event of a crisis) and that liability is apportioned correctly in relation to these obligations (robust dispute resolutions should also be considered).

BUT... as well as drafting protections, restrictions and (no doubt) some tiresome contractual penalties for breaching these, have an eye to collaboration, co-operation and expansion.

Could some data or results be provided to a wider audience? Might there be significant PR or marketing benefits to do so? Rather than restricting data flow to preserve a competitive advantage, might a degree of transparency create customer trust and loyalty and generate great commercial opportunity? The market can be more efficient, generate more savings and preserve its long term growth with just a hint of collaboration.

SOMEONE HAS TO TAKE THE LEAD

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About Foot Anstey:

Top 100 UK Law Firm, Foot Anstey enjoys a reputation as an energetic, proactive firm, combining technical efficiency with a problem solving approach. This is supported by our top band rankings in independent legal directories, Chambers UK and Legal 500. We operate out of seven locations across the South West, South Coast and London and have over 500 staff.

We have one of the fastest growing energy practices in the UK with particular market strength in energy storage. We are passionate about providing innovative legal advice to our clients in respect of generation technologies, demand side response, storage, transmission and clean technology. We advised on some of the very first energy storage projects in England (both in front and behind the meter), and negotiated the first energy storage PPAs and aggregation agreements. Foot Anstey advise storage developers and finance providers, and are actively working on EFR and capacity market projects, as well as large scale FFR-ready installations.

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