



Energy Storage – The New El Dorado?

Energy storage is high on executive agendas, the result of an increasing push toward a decarbonized economy, growth in renewable energy and the development of electric vehicles.

While energy storage technology costs remain high, the pace of technical development is increasing, prices are falling rapidly and there is real momentum in the market (see Figure 1). Regulation to better define and support energy storage is also evolving, albeit slowly, in the right direction.

The sector is attracting ever bigger R&D budgets. Grid-scale battery investment grew tenfold to \$1 billion in the five years leading up to 2015, according to the International Energy Agency, and a recent wave of M&A includes large deals such as Total's \$1.1 billion acquisition of battery manufacturer Saft in May 2016. The market for stationary and mobile storage has also been developing exponentially from a tiny base, growing more than threefold between 2010 and 2015.

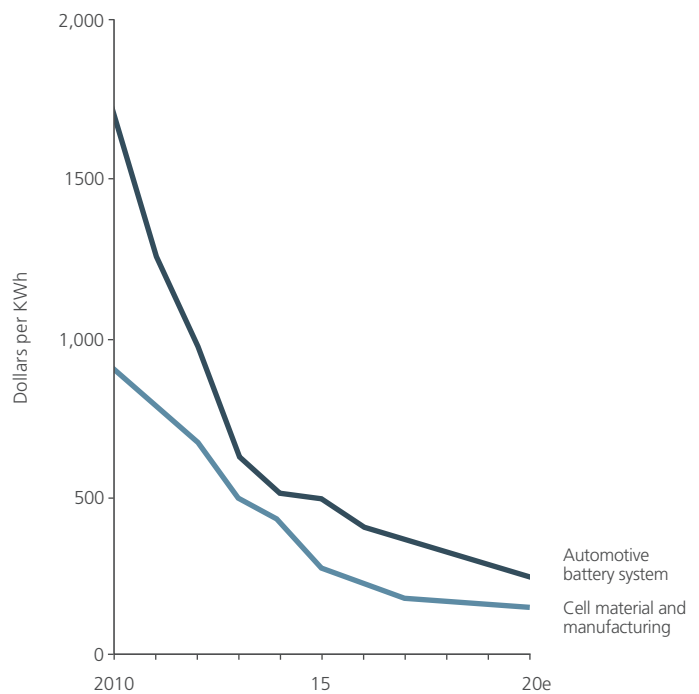
But beyond all the hype, what is the reality? The energy storage revolution has been talked about for a long time and many companies have invested in it, but the financial benefits have proven hard to achieve. Uncertainties linger around how to develop economically sustainable business models, and boards considering market entry are questioning which market segments to target and when.

Energy storage can be a worthwhile and profitable investment today, provided organizations utilize a combination of detailed

analysis to identify new and developing needs, and courage to frame innovative business models.

Based on our experience with corporations, investors and potential participants, we have developed five key considerations for use as a tool to create a successful business in the energy storage sector.

Figure 1
Average cost of lithium-ion batteries (2010-20e)



Source: Deutsche bank (2016), Cairn Era and L.E.K. analysis

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1. One size does not fit all

Energy storage is capable of solving a wide range of issues, including power quality and security of access, energy efficiency, and cost management. Needs differ significantly by customer type, application and local context. As a result, business models should be examined in detail for each target segment to develop a viable business proposition.

In stationary electricity storage, potential applications vary considerably across the value chain. Storage offers decarbonized backup to renewables capacity and smoothing of demand peaks. At the grid level, storage can improve power quality and help stabilize the network. Within the microgrid space, storage will become increasingly important with the development of smart cities. For end users, storage can increase reliability and security of supply, and optimize cost management by arbitrage and avoidance of peak demand charges.

Electric vehicle needs — vehicle autonomy, acceleration and security — may appear to be more homogenous, but there are a wide range of applications and business models, from Tesla's product development to the car-sharing Autolib service, launched in Paris and soon to be rolled out in London.

Business models also need to be adapted to local market characteristics and requirements, including infrastructure penetration and status, regulation and price levels. In emerging regions such as Africa, stationary storage needs are driven by existing electric grids and the development of renewables, and a lack of transportation infrastructure is a catalyst for electric vehicle demand.

Defining the right energy storage solution that is commercially viable for all parties requires a precise and granular approach, focused on finding the right offering for a given target customer group and need that can be monetized easily. Given that the needs and behaviours of current and future users of energy storage are still evolving and unclear, it is important that companies maintain an agile approach to strategy.

2. Understanding customer alternatives is key

Developing the right energy storage value proposition is complex. Potential customers are often traditional in their approach and hesitant to change, especially if economic gains from storage are not perceived to be significant enough. Storage providers need to convince potential customers and stakeholders of the incremental value of their offering versus other options. The alternative is often to stay as is, for example, with fossil fuel backup or traditional internal-combustion-engine vehicles.

To highlight their value, energy storage vendors must understand the barriers to sale, as well as opportunities to differentiate. Given capex and cost levels, energy storage offerings can seem

unattractive, especially if electricity prices are low. In the 2015 UK capacity market auction, battery storage bids lost share to gas and even nuclear as more competitive alternatives.

In contrast, electricity that is difficult to access and expensive can favour storage solutions. On islands where electricity is generated from expensive imported fossil fuels, renewable energy coupled with storage is an attractive model: In Hawaii, eight battery systems are running, with 11 more planned, to maintain a reliable service and increase the efficiency of wind and solar farms.

Energy storage providers should also highlight their other less quantifiable advantages, such as responding to people's desire for more environmentally friendly products and services. Environmental messages on their own, however, are unlikely to change many purchasing decisions, a point demonstrated by Elon Musk's recent decision to develop the cheaper Tesla Model 3 car.

3. New energy storage models are likely to overturn business as usual

The impact of energy storage innovation is set to transform electricity markets. Traditional utility models, where there is a single operator, a single distributor and a single client, are likely to evolve rapidly toward more integrated and flexible structures. Industrial, commercial and residential end users are becoming increasingly active in the energy value chain as "pro-sumers" — producers as well as consumers of energy. Energy storage is likely to accelerate this trend. As residential photovoltaic (PV) offers develop, for instance, widespread consumer storage will provide utilities with smoother demand for energy and will lower their investment requirements as people pay for their solar panels and battery packs.

A challenge presented by widespread storage and production is data management. To control, aggregate and optimize the electric network, an integrated digital solution is required, and this could be provided by a utility, which would operate individual storage as a "network," or by a software provider.

In any event, self-production requires utilities to relinquish part of their core activity. Already this has caused market friction, as seen by the legislative battle in Florida between solar customers and utilities, and the industry can expect to see further similar situations as the storage market develops.

Many utilities are embracing change by providing their own private production solutions: French group EDF, for instance, is launching an integrated solar panel offer for consumers that is managed through proprietary software.

In addition to leveraging the prosumer opportunity, there are many other business models that could be successful in energy storage. Interested companies must review their durability and the time horizon for any first- or early-mover advantage.

Some models with the greatest potential include the following:

- Independent operators / aggregators: Offering a wide range of services, such as frequency, congestion and capacity management. AES is an early leader but others are moving into the space, including GE, ABB and Siemens.
- Pay-as-you-go systems: Mainly for emerging countries. The venture capital fund Total Energy Ventures acquired a small stake in Tanzania's Off Grid Electric in 2016 to provide affordable solar and storage kits to remote areas via a pay-as-you-go mobile platform.
- Rental models: Especially for emerging markets, short-term needs and / or remote locations with containerized equipment readily deployable. A good example of the latter would be a battery pack combined with PV solar units for mining in Australia. These off-sheet balance solutions have financial benefits, not the least of which is avoiding the cost of purchasing the equipment.
- Recycling: The high cost of battery recycling for carmakers, for instance, may incentivize the adoption of rechargeable batteries.

4. Energy storage is driving change in the competitive landscape

As new business models develop, traditional incumbents — utilities, original equipment manufacturers, battery suppliers, car manufacturers and energy OEMs — are evolving along the value chain. Many participants have developed their strategy for energy storage but are unclear about where they will be positioned in ten or even five years, given the industry's rapid evolution.

Threatening the incumbents are ambitious new entrants, including aggressive players like Google and Tesla that are likely to cause significant disruption to the traditional players. There are opportunities for startups too, but they also need to take a robust approach to strategy development; not all new companies have done this so far — leading to failures such as Better Place.

5. The ultimate challenge will be scalability

Achieving scale will be the toughest challenge for many energy storage companies. Most of the organizations we have talked to, whether battery suppliers, systems or other service providers, still struggle with the fragmented nature of their target market. The key is to move from a niche proposition to a broader offering, and this can require significant investment, an extreme example being Tesla's planned Gigafactory for electric vehicle batteries in Nevada. Not all players will have the access to capital or the risk appetite to make this scale of financial commitment. Instead, most energy storage companies are seeking different investment models, including risk sharing through partnership; car manufacturers, for instance, are adopting this approach with other companies in the electric and hybrid model production chain, and many of them are also expanding from mobile to stationary storage.

Strategy for success

Like all new and fast-growing global markets, energy storage presents opportunities and risks, and there will be winners and losers. It will be an industry that develops on the axis of "acquire or be acquired," with successful companies basing their decisions on a robust, disciplined and flexible approach to strategy development, starting with a rigorous analysis of potential markets and customer segments.

Energy storage regulation in Europe

A lack of coherent regulation has hindered development in the European energy storage market. Energy storage systems are currently not seen as a separate, valuable element of the energy system, resulting in their classification as generation and / or consumption across EU member states. One result is that, in several countries, storage facilities pay grid fees as both consumer and producer. Moreover, storage is often neglected in network development and system planning.

The European Association for Storage of Energy has made a number of recommendations for a regulatory framework that supports the energy storage business case, including:

1. Establishing a definition of energy storage as a separate asset class in the EU regulatory framework.
2. Clarifying the rules under which energy storage can access markets — in particular, the perceived inability of transmission system operators and distribution system operators to own and operate energy storage due to unbundling.
3. Eliminating unwarranted / double charging, in particular, the application of final consumption fees to energy storage.

Recent European regulatory moves are going in the right direction, with amendments proposed to the European Electricity Directive in late 2016. However, there is still work to be done. In the meantime, some countries have taken individual actions: Since 2011, TSOs in Italy may own and operate storage systems, and Germany's 2017 Renewable Energy Sources Act eliminated the double surcharge on electricity stored in a storage system.

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