Advanced battery technologies are set to play a major role in the development of the European smart grid, as **Chris Heron** of EUROBAT explains

# Energise the grid

Across 2013, grid-connected energy storage has emerged as a buzz issue for European and national policy makers, electricity providers, and the renewable energy sector in general. In the Commission's own words, "electricity storage is a clear key technology priority for the development of the European power system of 2020 and beyond, in light of the increasing market share of renewable and distributed generation and the growing limitations of the energy grid". To put it bluntly, if member states are to maintain grid stability and flexibility in their efforts to establish a decarbonised power sector, energy storage will have to be harnessed effectively.

This has been firmly recognised in the last six months, with Germany introducing a €25m storage subsidy programme in May 2013, Italy's Transmission and Distribution Service Operators (TSOs and DSOs) investing strongly into large scale storage installations, and the UK Government launching several demonstration projects to test how storage can reduce pressure on the local electricity grid. According to independent projections, these strong political signals are only "the tip of the iceberg"; with (for example) RWTH Aachen projecting not only short-term needs to stabilise the grid but also that an optimised European Electricity system with close to 100% renewable generation will eventually require short-term hourly storage of 2000GWh.

## Building solutions

A wide array of thermal, chemical, electrical, mechanical and electrochemical storage technologies are being developed to fulfil this demand. Whereas before, only large scale Pumped Hydro Storage (PHS) systems were required for demand levelling at transmission level, the integration of Renewable Energy Sources (RES) into all levels of the grid has created new demand for smaller scale and more flexible storage technologies.

**Chris Heron**

**Projects continue on energy storage**

At present, it's no exaggeration to claim that batteries are one of the technologies of choice to be installed in this capacity. A lot of the other (non-PHS) storage technologies being discussed are still in the development phase, while batteries of all technologies – lead, lithium, nickel and sodium – are already available in the market, and are ready to provide a mobile, flexible and scalable solution to answer the specific problems raised by RES integration. For this reason, Germany's storage subsidy programme is specifically directed at lowering the up-front costs of battery systems, Italian TSO Terna has committed to implement 130MW of battery energy storage in the next three years, and the UK is testing the impacts of a single 6MW battery installation (the biggest in Europe) in an £18.7m (€22m) project.

These national commitments demonstrate the already pressing demand for energy storage technologies to be implemented at different levels of the grid, especially in countries where Photo Voltaic (PV) or other renewable energy sources have reached a high penetration level. EUROBAT therefore advocates that a primary aim of EU policies and research and innovation (R&I) initiatives should be to improve the conditions for short-term market introduction of storage technologies into the European grid.

For our battery sector, R&I should be directed as a priority towards improving the performance and cost of existing and commercialised battery technologies: lead-based, lithium-based, nickel-based and sodium-based batteries. This will improve the immediate business case for battery energy storage at the different levels of the electricity grid, and ensure that the demand for storage is able to be met as quickly as possible.

Roughly, we think that around 70% of EU funding for battery energy storage should be directed at technological improvements to existing and commercialised battery technologies, and their integration into different levels of the grid (both cell and systems-level research, including

**Priority areas for battery energy storage research and development:**

- Advanced lead-based batteries: increases to cycle life, charge acceptance and discharge performance. Further reduction of system cost;
- Lithium-ion batteries: increases to energy density, cycle and calendar life. Reduced system cost through economies of scale and process improvement in the manufacturing process;
- Nickel-based batteries: increases to cycle life, extension of temperature range and reduction of self-discharge. Further reduction of system cost; and
- Sodium nickel chloride batteries: increases to specific power, recharge power and cycle life. Reduced system cost through automation and process improvement in the manufacturing process.

demonstration projects). The remaining 30% could then be used for basic materials research into new and untested battery concepts with the aim of further improving the four current technologies and developing new solutions.

Because some of these battery technologies have been around for over 100 years, we often hear that there are no gains to be made from investing into their continued development. This just isn't true – to take the example of lead-based batteries, there is real progress to be made through increasing their cycle life, charge acceptance and discharge performance, but also by evaluating their interactions with other components once integrated into the grid. The same is true for lithium-ion batteries, for sodium nickel chloride batteries and for nickel cadmium batteries. We are confident that each will have an important role to play in tomorrow's smart grid.

## Next steps

Although the projections for Europe's future electricity storage market are large, there is still much to be accomplished to make sure they become reality. Across the next year, it will be crucial for EU regulators to establish a supportive and comprehensive market framework for storage technologies within the electricity sector. For example, due to the liberalisation of the European and national energy markets, we still need to establish energy storage as a separate asset from generation and consumption, and afterwards take decisions on how such an asset should be defined. This will be possible through a combined effort of European industry and regulators in the coming months.


**Lead batteries on display**

In parallel, it's also imperative that European industry is provided with continued opportunities to demonstrate the performance and competitiveness of different storage technologies as a flexibility option within the European grid. Demonstration projects will validate the combination of services that batteries can provide in this capacity, and as well as resulting in faster market deployment, would be valuable in bringing together the range of different stakeholders necessary for their full implementation. EUROBAT members already have several of these projects on-going at EU and national levels, and we're hoping to see even more being implemented over the next five years.

This type of support will optimise European industry's development of new and innovative technologies ahead of international competition. In our industry, competition over the manufacture of advanced battery technologies is already strong, especially from Asian countries such as China, Japan and South Korea. We really believe that the European battery industry can maintain a position of international strength in relation to grid-connected battery energy storage, but quick and decisive movement will be needed from all stakeholders.

Put simply, if political frameworks and industry standards for energy storage can be developed here first, European companies will be best placed to provide the technical solutions – whether in terms of battery cells, power electronics, management systems or other aspects. The foundations have already been built through the combination of ambitious EU climate policies, successfully implemented renewable energy sources across member states, and a shared determination to achieve security of power supply. Going forward, the challenge will be to ensure that energy storage is made into a commercial reality at all levels of the grid.

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