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INSIGHT_E

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How can batteries support the EU electricity network?

Lead Author: *Bo Normark (KIC InnoEnergy)*
Authoring Team: *Aurélie Faure (Ifri)*
Reviewers: *Paul Deane (UCC)*
Steve Pye (UCL)

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EXECUTIVE SUMMARY

The incremental penetration of variable energy production, the growing trade of electricity and new demand patterns indicate that energy storage will play an increasing role in the energy system. Even where benefits are measured against alternative solutions – such as demand-side management, back-up generation and flexible loads, its role is evident in the value chain, from end-user to distribution, transmission, and markets. In particular, batteries offer cost-efficient solutions for innovative models of decentralized energy systems. They can foster the development of micro-grids, while the home storage market combined with PV Solar allows for an increase in self-consumption.

Battery storage could become a game-changer in the electric industry. In the overall battery market, Li-ion (Lithium-ion) technology is increasingly driven by demands in consumer products and electric vehicles. In recent years, there has also been a significant shift towards the Li-ion battery technology for grid applications, not only for small-scale storage but also for large scale application. According to the US Department of Energy (DOE) database, approximately 51.8% of all installed capacity of utility-scale electrochemical storage and 69.3% of planned installations are now based on Li-ion technology. For home storage practically all installations are based on Li-ion technology. Production is expected to grow exponentially, from 30 GWh in 2013 to 105 GWh by 2020. **Lithium batteries have encountered a stronger and faster than expected cost reduction, from over 1000€/kWh in 2010 to approximately 600 €/kWh in 2014. This cost reduction is expected to continue over the next two decades for EVs and home storage batteries, with an expectation of reaching 200€/kWh in 2020**, even though major technological breakthrough is not likely to happen.

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However, most of the production of batteries is in Asia, which raises the question of how the EU can be competitive in the global market. **Because battery storage brings flexibility into the system, and is adaptable to different electrical systems, it could contribute effectively to the achievement of the EU 2020 and 2030 targets.** Battery storage can also interact easily with other storage possibilities, notably thermal storage. Business cases exist for end users in relation to self-consumption, energy arbitrage or peak shaving, but they are strongly driven by regulation.

With the Third Package legislation on Energy and Climate, storage (defined in very general terms without any reference to specific technologies) is recognised as a strategic asset in the integration of intermittent renewable energy to grid infrastructures. However, the development of storage facilities is dependent on Member States. Batteries are especially approached by regulators from the environmental perspective (recycling and environmental efficiency). This report shows that there is room for incorporating battery storage, in conjunction with other smart grid equipment, in the reform of market design models that are likely to improve adequacy of flow (a responsibility of DSOs and TSOs). **In particular, battery storage used as a reserve provider could improve liquidity in the balancing markets, and could play a role through the provision of short term ancillary services.** In future policy developments, battery storage should be included as a credible provider of frequency regulation and voltage support, even though its benefits will be very different depending on each country's electricity mix. Therefore, this report recommends clarification of the regulatory framework defining the responsibilities of storage operators, and, in the longer term, move towards the creation of an Independent Storage Operator.

The future of electrochemical storage in the EU will depend on the evolution of market barriers. It is also important to elaborate guidelines for capacity market development that support the remuneration of battery storage technologies. Home storage, particularly for increased self-consumption, offers a significant market that has become economic without support in selected markets in recent years. Consequently, **it is important to develop regulatory measures to stimulate self-consumption and reduction in power consumption, especially for peak-load considerations. Creating a specific support scheme for batteries, and building a framework for Prosumer[1] Storage based on the German experience should be encouraged.**

Further structural evolutions, such as the integration of batteries in an e-mobility scheme, or the change from conventional drivetrains to electric drivetrains may also change the landscape for battery storage. **With smart charging and eventual "vehicle-to-grid" applications, electric vehicles can provide a positive contribution to the grid**.

Finally, in order to encourage technological breakthroughs, it is worth carrying out further research into demand response, interconnections and technologies which might be competing with storage for some uses (thermal uses mainly), in order to assess the individual potential and the linkages between them. Integrating storage alternatives in strategies for development of the energy and transportation systems will support the large scale development of battery technologies.

[1] Prosumer is a portmanteau made of 'professional' and 'consumer'. In the electricity context, it refers to a consumer producing his own electricity, most of the time from PV panels, and storing it to consume it himself.