

### INDUSTRY, RESEARCH AND ENERGY

## ENERGY STORAGE: WHICH MARKET DESIGNS AND REGULATORY INCENTIVES ARE NEEDED?

### BACKGROUND

The recently published Strategy for a European Energy Union addresses five interrelated objectives:

1. Energy security, solidarity and trust;
2. A fully integrated European energy market;
3. Energy efficiency contributing to moderation of demand;
4. Decarbonising the economy; and,
5. Research, Innovation and competitiveness.

As presented in the study '**Energy Storage: Which Market Designs and Regulatory Incentives Are Needed?**', energy storage is accomplished by various technologies for the release of energy at a later time

and potentially involves conversion from one form of energy to another, both before storage and at the time of release. It may provide flexibility and thus contribute to the objectives listed above.



### STORAGE TECHNOLOGIES

Gas may be stored in bulk for an indefinite period, either in its original form or in a compressed or liquid form. The mostly used option for electricity is the large-scale storage of hydro energy, with nearly 95% of the installed energy storage capacity connected to the electricity grid in Europe. Currently, such well-established, large-scale technologies are the most economic, taking into account cost of investment and use over full lifetime. They have limited future cost reduction potential due to their maturity.

Small to large-scale batteries have the potential for addressing the increasing role of fluctuating renewable energies. The most attractive system to date is Lithium-Ion Batteries (LIB), due to their comparably higher energy density, efficiency and lifetime. LIB are estimated to become cost-effective in 2020-2030. Redox Flow Batteries (RFB) have a high potential for technology improvement and cost reduction, but they still have to prove stable on the long-term and may be suitable only for large scale installations.

Additional R&D investments are devoted *inter alia* to thermal storage technologies, hydrogen storage and power-to-gas technologies.

### CURRENT REGULATION AND FUTURE OPPORTUNITIES

The Gas Directive (2009/73/EC) considers storage as one of the core elements of the gas distribution system. Storage System Operators have to provide for third party access. Their activity must be unbundled from other activities.

Europe has developed a common framework for security of gas supply, including Member State level supply standards to be achieved through a mix of interconnection capacities, storage and production. Gas storage capacities should be sufficient for the regular demand level, but in regions other than North West Europe, the lack of market integration and flexibility calls for stronger intervention in order to ensure sufficient gas storage.

The EU is increasing its share of renewable energy. Member States support renewable energy production by various means. Where such support is based on the actual supply of electricity to the grid (as opposed to capacity), there is no incentive to invest in storage. Furthermore, prosumers (consumers that produce part of their own electricity needs) are playing an increasing role. Balancing supply and demand will require increased flexibility, and storage will facilitate the deployment of "smart grids" that take into account all connected consumers.

The Electricity Directive (2009/72/EC) does not explicitly mention storage. Given the unbundling of Transmission System Operators, Distribution System Operators and the functions of electricity generation and supply, it is unclear which players (private market or regulated operators) are allowed to own and manage electricity storage, which does not incentivise investment in storage. There is however a significant research effort in Europe, privately and publicly funded, mostly focused on batteries.

The development of electric vehicles constitutes an additional storage option for the EU to consider, due to the availability of the vehicles' batteries during parking time (95%).

## RECOMMENDATIONS

1. In order to achieve competitiveness, R&D should be encouraged with a focus on cost competitive storage solutions (e.g. heat pumps), as well as smart grid developments.
2. Gas storage should benefit from more specific requirements regarding stock level and interconnection capacity.
3. There should be a common EU approach on how to make renewable energy producers responsible of contributing to system balancing.
4. Flexibility markets should be technologically neutral so that energy storage solutions can compete with flexible fossil-fuel based generation units.
5. Transmission and grid operators should be allowed to provide energy storage services.
6. Support schemes for renewables should be harmonised to stimulate energy storage at the end-user level while ensuring a reliable and economically sustainable grid.



Scan QR code to access the study

---

### Disclaimer

The content of this document is the sole responsibility of the author and any opinions expressed therein do not necessarily represent the official position of the European Parliament. It is addressed to the Members and staff of the EP for their parliamentary work. Reproduction and translation for non-commercial purposes are authorised, provided the source is acknowledged and the European Parliament is given prior notice and sent a copy.

This document is available on the Internet at: [www.europarl.europa.eu/supporting-analyses](http://www.europarl.europa.eu/supporting-analyses)

Contact: [Poldep-Economy-Science@ep.europa.eu](mailto:Poldep-Economy-Science@ep.europa.eu)