EASE Paper in the framework of the COP21 in Paris

Brussels, December 2015

EASE, promoting the use of energy storage in Europe and worldwide

The European Association for Storage of Energy (EASE) is the voice of the energy storage community, actively promoting the use of energy storage in Europe and worldwide.

EASE actively supports the deployment of energy storage as an indispensable instrument within the framework of the European energy and climate policy to deliver services to, and improve the flexibility of, the European energy system.

EASE seeks to build a European platform for sharing and disseminating energy storage-related information.

EASE supports the transition towards a sustainable, flexible and stable energy system in Europe.

Context

In December 2015, the 21st Conference of the Parties (COP 21) of the United Nations Framework Convention on Climate Change (UNFCCC) takes place in Paris, France.

The international political response to climate change began at the Rio Earth Summit in 1992, where the 'Rio Convention' included the adoption of the UN Framework on Climate Change (UNFCCC). This convention set out a framework for action aimed at stabilising atmospheric concentrations of greenhouse gases (GHGs) to avoid "dangerous anthropogenic interference with the climate system." The UNFCCC which entered into force on 21 March 1994, now has a near-universal membership of 195 parties.

The main objective of the annual Conference of Parties (COP) is to review the Convention's implementation. The 2015 Paris Climate Conference, will, for the first time in over 20 years of UN negotiations, aim to achieve a legally binding and universal agreement on climate, with the aim of keeping global warming below 2°C.[1]

In this framework, EASE would like to present the following paper to highlight the importance of Energy Storage as a Decarbonisation Enabler as well as the challenges ahead of us.

[1] Source: www.cop21paris.org

Energy Storage: a Decarbonisation Enabler

Storage of Energy has long been used by man, from wood and coal piles to heat storage, pumped hydro storage, compressed air energy storage, flywheels, batteries, hydrogen, etc. Currently, a changing energy mix and technological breakthroughs have triggered a new interest in energy storage.

To fully understand how energy storage can contribute to decarbonisation, the energy mix must be considered as a whole. Electricity has indeed a major role to play, but there are also strong interactions with other vectors such as heat/cooling and hydrogen.

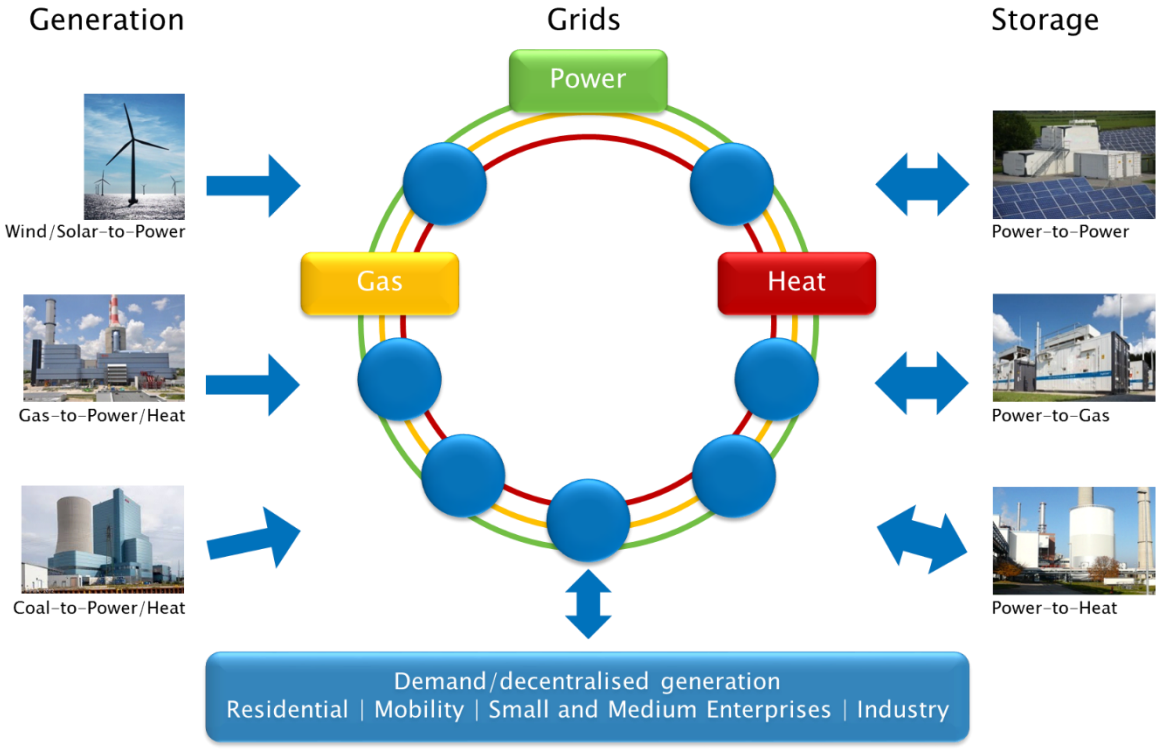


Figure 1: electricity and other vectors (source: EASE)

EASE defines energy storage for the electricity vector as 'any system that is used for the intake and stocking of electricity in different suitable energy forms. The release of this energy, at a controlled time, can be in forms that include electricity, gas, thermal energy and other energy carriers'.

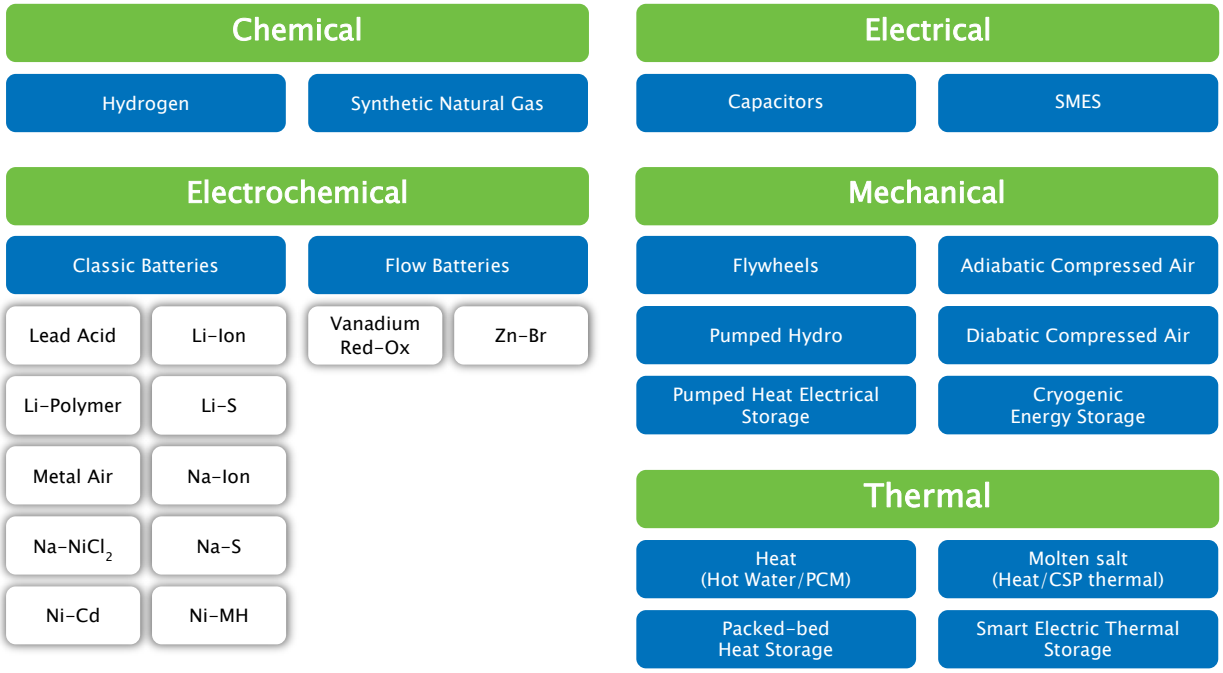
EASE members fully support the COP21 process and the need to decarbonise the energy mix. To do this, high levels of Renewable Energy Sources (RES) must be integrated into the electricity mix – the importance of electricity itself will grow, as decarbonised mobility will be driven by the deployment of electrical and hydrogen powered vehicles. Wind and solar generation in particular will play a key role in the decarbonisation process, and integrating them successfully into the power system is one of the major challenges. This challenge can be met by various enablers today, and storage is one of them.

Storage can be one of the enablers of the world decarbonisation. To reach its full potential, two challenges need to be addressed:

- **The technological challenge**: continued cost reductions in new technologies needs to be pursued to make storage an increasingly important lever.
- **The value challenge:** storage can provide benefits at many levels of the energy systems; it is key to assess and monetise all its benefits to society.

EASE members are strongly committed to these 2 challenges.

Storage Technologies



EASE supports all energy storage technologies and believes that storage must be addressed agnostically. To better deal with the numerous energy storage options, EASE divides them into 5 classes: chemical, electrical, electrochemical, mechanical and thermal.

Regarding the storage of electricity, Pumped Hydro Storage (PHS) has historically been the most deployed technology by far, with more than 140 GW installed worldwide, of which 42 GW is in Europe. This technology remains the reference for bulk electricity storage, while compressed air energy storage and battery-based energy storage could now be deployed as alternatives for PHS in certain circumstances.

Electrochemical batteries have increasingly been deployed over the last several years, and amount to between 1 and 2 GW worldwide today – significant cost reductions have been seen recently and this trend is expected to continue, as existing technologies improve and breakthroughs happen.

Flywheels, hydrogen and heat/cooling technologies have followed similar trends and add to the vast diversity of storage technologies available.

This is why EASE has been actively working to help the storage industry define cost targets and priorities. An example of this is the "European Energy Storage Development Roadmap towards 2030[2]". This document proposes target costs that can be used by the industry to assess future business models – it also proposes concrete research orientations to reach the target.

[2] http://www.ease-storage.eu/tl_files/ease-documents/Events/2013.04.17%20Launch%20EASE_EERA%20Roadmap/Roadmap%20&%20Annex/EASE%20EERA-recommendations-Roadmap-LR.pdf

The value challenge of storage

Energy storage is one of several flexibility options that help integrate increasing shares of renewable electricity supply sources such as wind and solar, along with the alternative flexibility options such as grid extension, demand-side management and flexible generation.

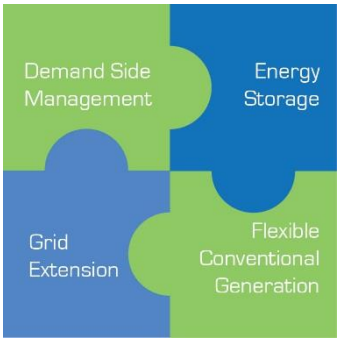


Figure 2 : Flexibility options to improve the hosting capacity of electricity grids

Grid extension allows for improved regional exchange of power flows by removing bottlenecks in the grid. Demand-side management (DSM) allows for the reduction of electricity demand in times of undersupply, and uptake of demand in times of oversupply situations. Flexible generation generally refers to the capability of conventional dispatchable generation (e.g. fossil, nuclear, biomass, etc.) to vary the output in response to demand and generation volatility.

The value/ flexibility benefits of storage for each country can vary significantly according to power system characteristics and assumptions.

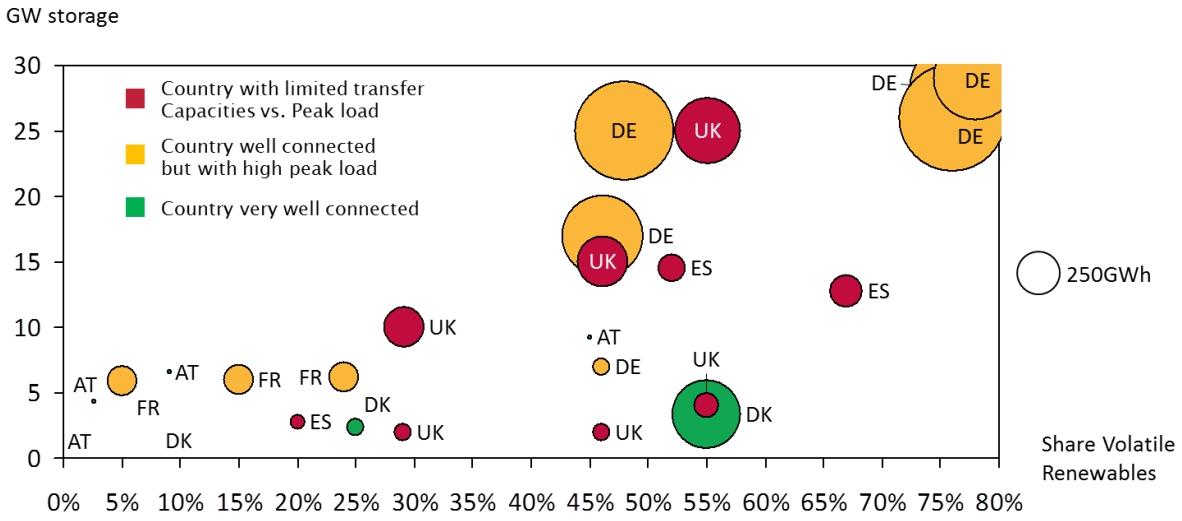


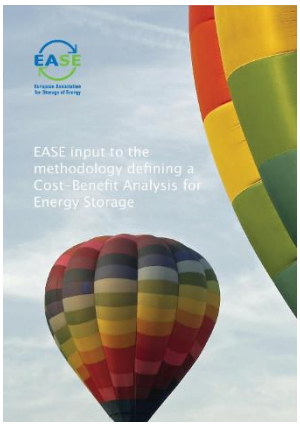
Figure 3 : Storage demand of EU member countries in GW and GWh (bubble size) as a function of the share of wind & solar power generation, as described in various published studies (source: upcoming EASE position paper on storage demand)

Although storage can sometimes, depending on the application, appear costly compared to alternatives, other available flexibility options also face strong challenges:

- Social acceptance for grid extension is more and more limited and additional reinforcements might not always be possible;
- Demand side management could also face acceptance issues and has yet to demonstrate its full potential, leaving many uncertainties on the role it will be able to play;
- Flexible conventional generators rely on fossil fuels such as gas or coal, with unknown costs, security of supply issues and CO_2 and other harmful emissions

Given these elements, EASE strongly believes that a mix of the flexibility options is needed to mitigate the various risks, and energy storage should be a priority for EU policy makers as a cornerstone of a decarbonised European energy system.

To help make this a reality, EASE has been actively contributing to research work aiming at better assessing storage value. An example of this is the "EASE input to the methodology defining a Cost-Benefit Analysis for Energy storage[3]". This document proposes steps to improve the method used by European system operators to assess storage at the EU level – this work contributes to understanding how storage can contribute to decarbonisation of a European energy mix.



[3] http://www.ease-storage.eu/tl_files/ease-documents/Technical%20Documents/EASE%20input%20to%20the%20methodology%20defining%20a%20CBAnalysis%20ES_2013.04.26%20final.pdf

The Road Ahead

EASE will keep raising awareness about energy storage and its contribution to the world's decarbonisation in a changing energy world.

Storage is already a key tool in energy systems, and a strong research effort is currently being pursued to provide as many services as possible with energy storage options. Energy storage's role in global decarbonisation will only continue to grow:

- Storage is a key lever to integrate wind and solar in electrical power systems.
- Energy storage also facilitates RES integration in heating & cooling systems.
- Storage is also an absolute necessity in decarbonising the transportation sector, through the use of batteries or hydrogen fuel cells.

For energy storage to be fully effective several tasks must be tackled, including:

- Working on a European market design that fully values all energy storage options while tackling regulatory obstacles that might prevent the emergence of viable markets.
- Specifying system needs and allowing all options, including energy storage, to compete to serve those needs most effectively. Where necessary, this may require recognising energy storage as an independent, additional element in the energy system alongside generation, transmission, distribution and consumption
- Furthering R&D funding to allow for improvements of existing technologies, and for breakthroughs leading to new technologies
- Helping the industry improve energy storage's integration in the energy system, through financing and worldwide standards
- Investing in infrastructures to allow for the deployment of decarbonised mobility – battery and hydrogen storage have a major role to play in this area, but recharging stations for electricity and hydrogen are needed to make this role a reality

By addressing these issues energy storage will further its importance in energy systems, in the EU and elsewhere, enabling further integration of RES and the required reduction in CO_2 emissions.

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Disclaimer:
This response was elaborated by EASE and reflects a consolidated view of its members from an Energy Storage point of view. Individual EASE members may adopt different positions on certain topics from their corporate standpoint.