Climate, environment and circular economy | Energy storage

ENERGY STORAGE

OVERVIEW AND CHALLENGES

The energy transition targets an increasingly low-carbon economy.

Observation	Problem
• electricity produced on a large scale from renewable sources, primarily wind and solar >> **variable production** • **decentralized** electricity production	• variable production and difficulty balancing electricity supply and demand; risk of disruption to electricity supplies in areas that are not interconnected

To ensure balance in the electricity system, several solutions exist:

- production modulation via flexible, but often CO2-emitting production facilities, such as combustion turbines using methane,
- consumption management as a function of production (Demand side management), with recourse, for example, to load management (whereby consumers are paid to reduce their

demand),
- interconnections between countries,
- variable pricing, based on the peak and off-peak system. In France, this system allows hot water tanks to heat overnight.
- electricity storage, consisting in converting electricity into another vector that can be stored more easily. This solution can be more expensive but it is also the one that delivers the most services, making it possible to:
    - manage surges,
    - and absorb production peaks.

Several challenges need to be overcome to enable the large-scale roll-out of energy storage:

- **life span** of the storage system: target = around thirty years,
- **cost** of the electricity stored and fed back,
- **environmental performance** of the solutions: greenhouse gas assessment, life cycle analysis, safety.

IFPEN is interested in storage technologies that are adapted to the provision of services to electricity grids and areas that are either not or poorly interconnected, as well as technologies that can be used as an energy reserve for electro-intensive industries. We are developing several technologies based on the use of compressed air: high-efficiency energy storage systems using advanced adiabatic compressed air (AA-CAES) or quasi-isothermal compression (I-CAES); heat energy storage systems (Carnot batteries). We are also working on the electric system management and Energy Management Systems (EMS).
Another of IFPEN's R&I themes relates to electrochemical storage technologies for mobility.

Electrochemical storage via redox flow batteries meets the needs of both individual houses (a dozen kW) and eco-districts (several MW). It enables modular storage times ranging from 2 (self-consumption) to 10 hours (electricity distribution).

Developing technologies for the large-scale storage of electricity produced by renewable energies - by their very nature variable - in order to ensure a balance between production and consumption.

Our solutions Our strengths

CONTACT

Yannick Peysson
Program manager

yannick.peysson@ifpen.fr

Energy storage

Link to the web page :