

eStorage

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Grid operators & the constraint of intermittent renewables



Grid operators

- Balance the supply & demand of electricity
- Constantly control grid parameters (voltage, frequency...) to avoid outages.



GRID CHALLENGES

Increase regulation capacity

Faster plant regulation

Store renewable power produced when not enough demand



Solar & wind power

- Intermittent
- No direct storage solution
- Impact grid stability
- Not optimized, often a loss of a free GHG-free power



eStorage



“ Our goal is to **deploy variable speed PSPs across the EU** and to **enhance grid management systems to improve renewable energy management.** ”



A EC-funded consortium

Energy companies

3



ALSTOM
Shaping the future



2

Consulting firms



1

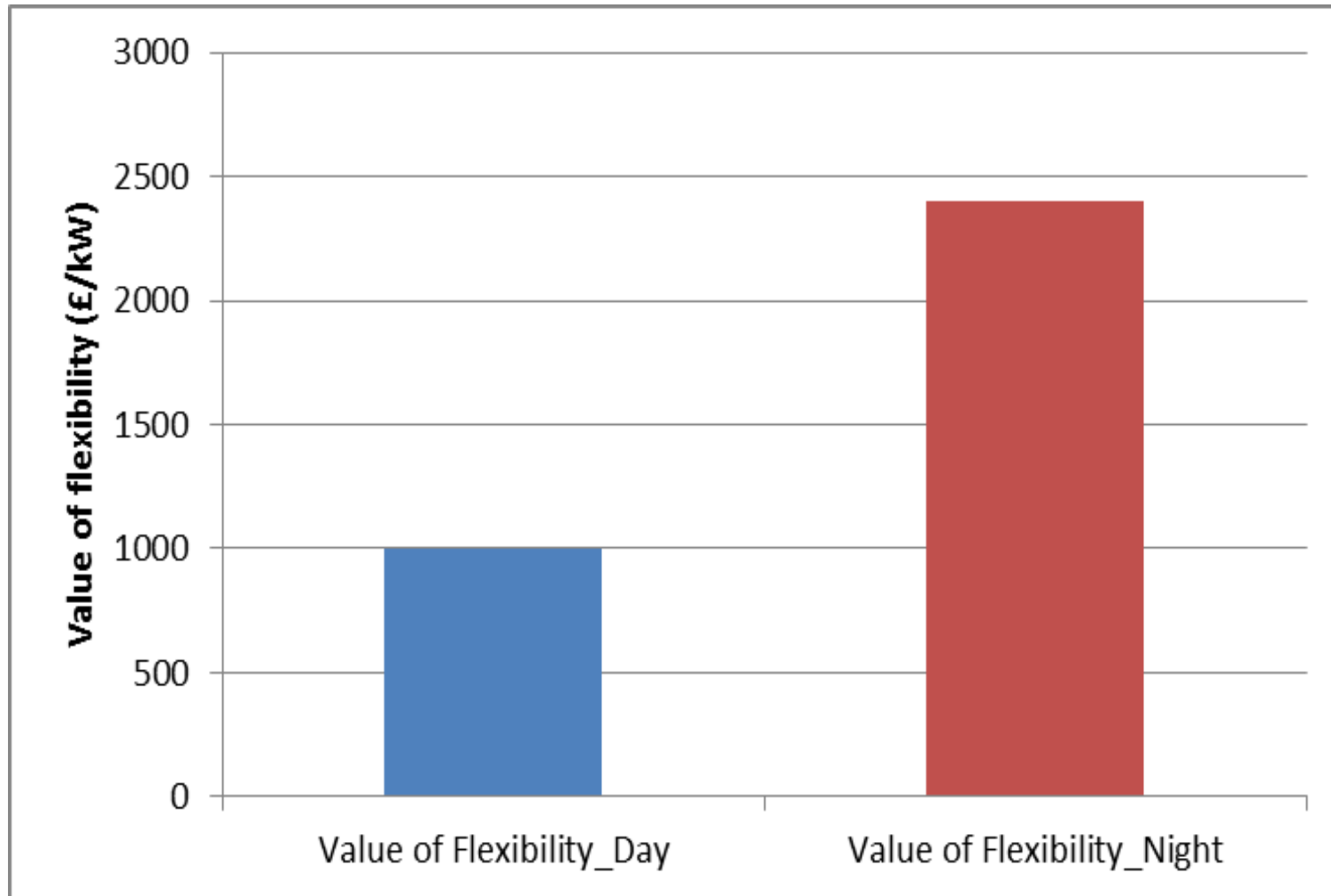
University

Imperial College
London

Value of Flexibility



Exemple from UK

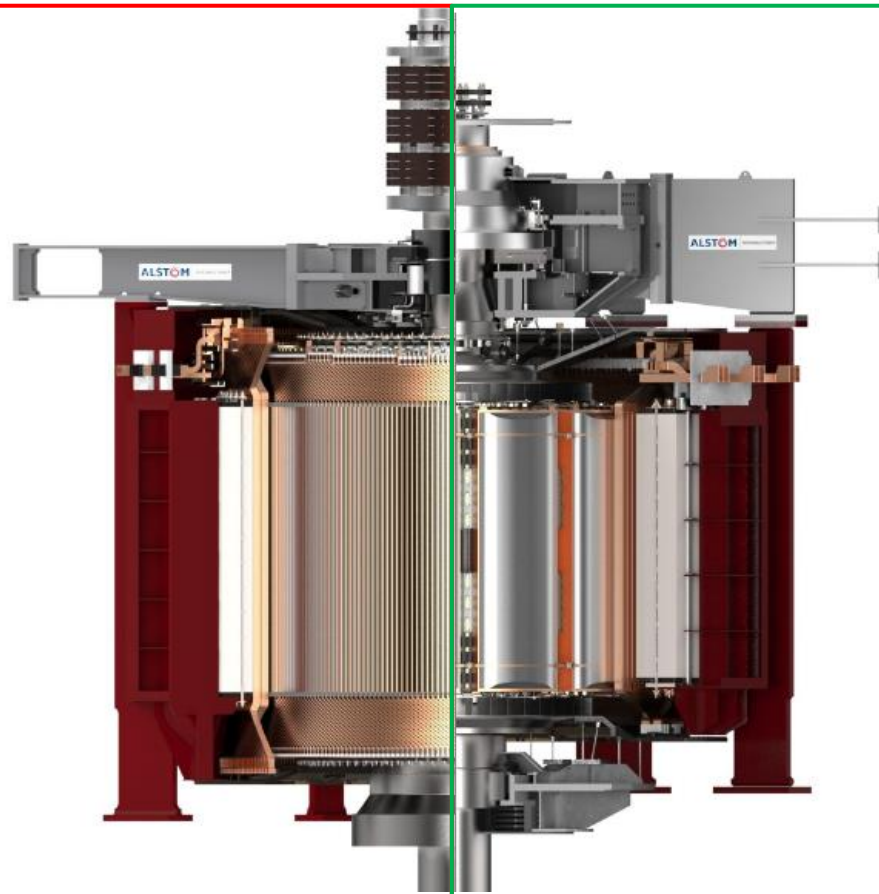


Improving PSPs: Variable speed technology



Variable speed

Fixed speed



Benefits:

- Additional flexibility: frequency regulation possible in both modes
- Increased performance: increased turbine life, higher operation mode

PSP in Europe



199 plants,
48,8 GW turbine capacity
537 machines with a
pumping mode (representing a
turbine capacity of 46,6 GW)

eStorage focus



PSP upgrade to variable speed

Unit test at Le Cheylas, France

Smart energy networks and IT tools

Grid management in line with real time markets



Highlight the value of PSPs to encourage their development

Storage benefits, regulatory framework & market design

Results exploitation

Conversion of 75% of the 40 GW of PSPs installed in the EU to variable speed

Context of the demonstration



Existing le Cheylas power plant

EDF power plant, located in the French Alps

- Commissioned in 1979
- 2 identical 235 MW reversible units

A plant with two purposes :

- Electricity generation (Arc river inflows)
- Electricity storage, on a daily cycle

Conversion of unit 2 to variable speed technology

- Increased efficiency in both turbine and pump mode : increased generation and cycling opportunities
- +/- 40 MW regulation in pumping mode



Current situation of Le Cheylas



Where are we now ?

- Model tests have been performed by Alstom Hydro
- Main issues related to existing plant adaptation have been solved
- Economic valuation has been performed by EDF

Technico economical feasibility of the conversion has been proven

Next step is now the construction phase with implementation in 2017

Conversion of existing PSP to variable speed can be part of the solution in the integration of an important share of intermittent generation in European mix

Conclusion



- The integration of renewable power generation requires large investments for further development of the transmission and distribution infrastructure
- New facilities for production, storage, distribution and consumption must support a higher flexibility of the entire electrical energy system
- Common and clear market rules and associated incentive schemes have to be developed to enable the necessary investments
- In the eStorage project the feasibility of a flexible large-scale energy storage in combination with an innovative market approach will be demonstrated

