Does Energy Storage Contribute to Security of Supply?

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Introduction to EASE

EASE activities & members

- EASE is the leading member-led association representing the energy storage industry in Brussels – the heart of the European Union
- EASE's mission is to support the development & deployment of all energy storage technologies by:
  - ✓ Raising awareness about the benefits of energy storage and its crucial role in supporting the energy transition
  - ✓ Promoting a fair and future oriented energy market design
  - ✓ Serving as a platform for information-sharing and debate on different technologies, applications, and business cases

Challenges of operating the power system

EU Decarbonisation objectives

The EU has one of the most ambitious energy policies in the world

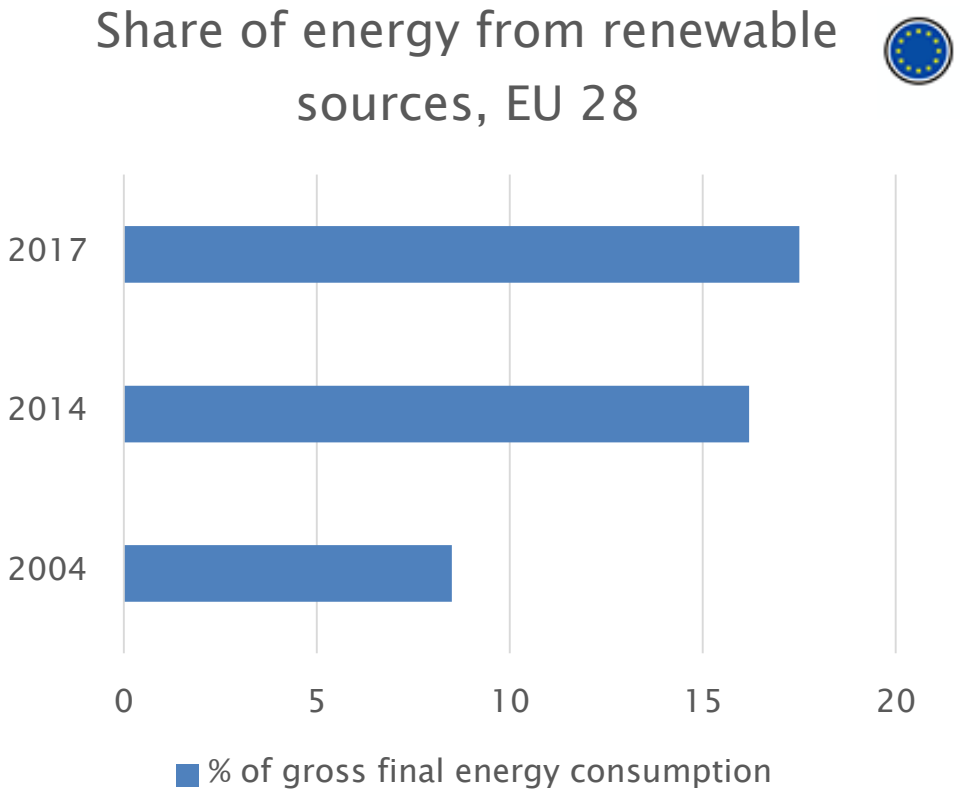
A renewable energy target
of at least 32% by 2030

A climate neutral Europe by 2050

Challenges of operating the power system

From depletable energy sources to renewable ones

- The power system was traditionally centred around dispatchable power generation from depletable energy sources
  - ✓ security of supply: dependent on resource availability and imports
- But more and more indigenous renewable energy sources are now in the mix
  - ✓ This completely upends the traditional model...
  - ✓ ...but it also leads to **new challenges to guarantee security of energy supply**

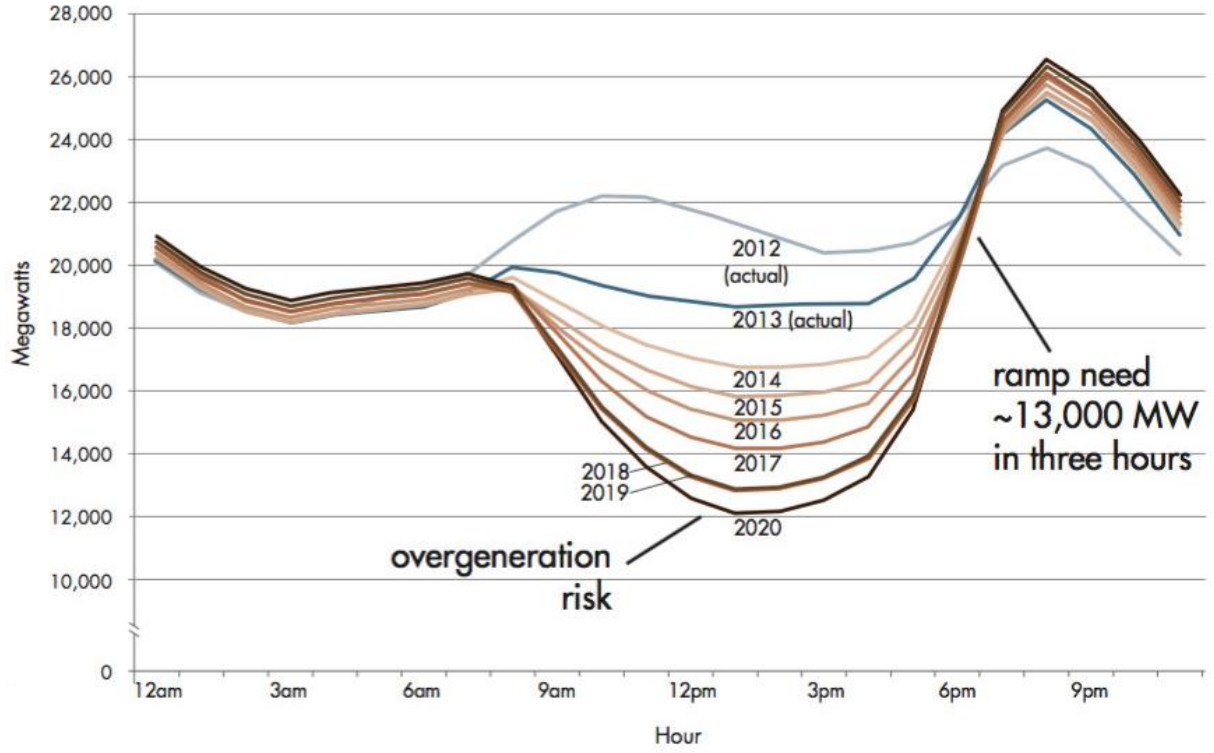


Source: Eurostat

Challenges of operating the power system

Challenges of integrating Renewable Energy Sources

Net load in California – March 31



Renewable Energy Sources alone may not able to meet the required demand in peak hours

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Security of supply is not guaranteed

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Flexibility is necessary

Source: U.S: Department of Energy

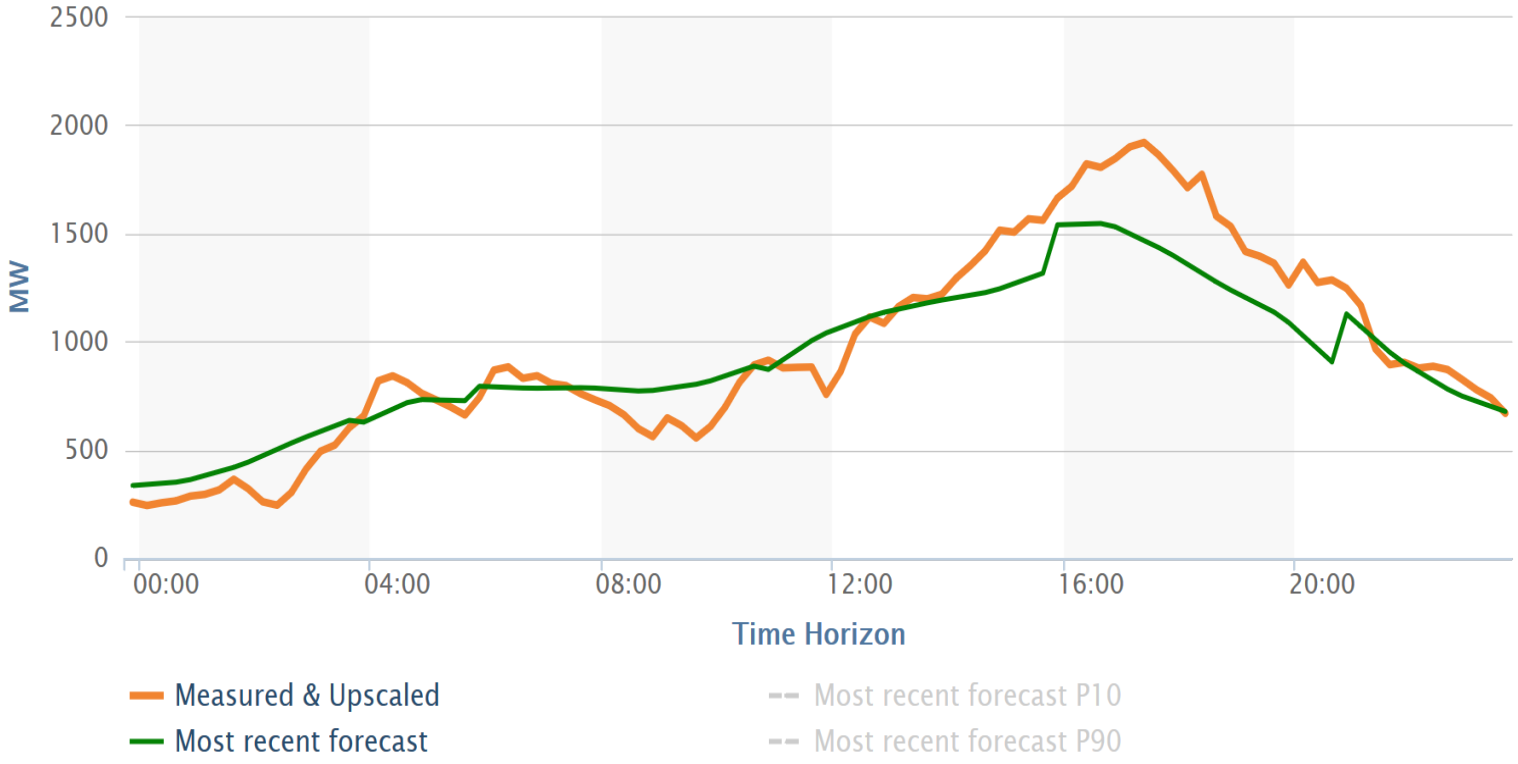
Challenges of operating the power system

Should he get his bath at midnight ?

Challenges of operating the power system

Challenges of integrating Renewable Energy Sources

Belgian Wind Power Forecasting – 18.07.2019



Source: Elia, Données de Production Éolienne

Power from RES: not only variability, also **uncertainty**

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Security of supply is not guaranteed

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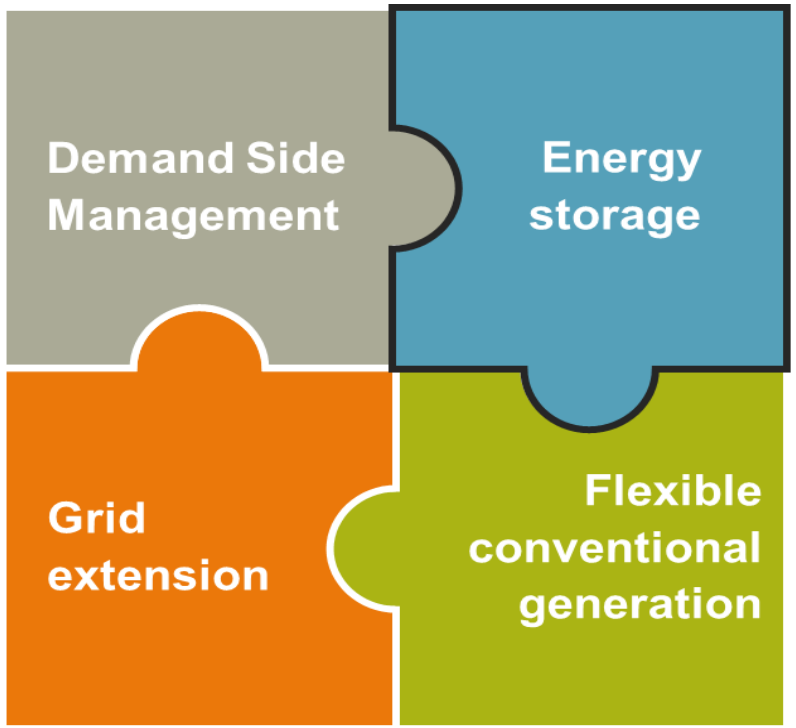
Flexibility is necessary

Challenges of operating the power system

How to achieve flexibility?

Has yet to demonstrate full potential: practicability?

Social acceptance becoming increasingly limited; big investments needed

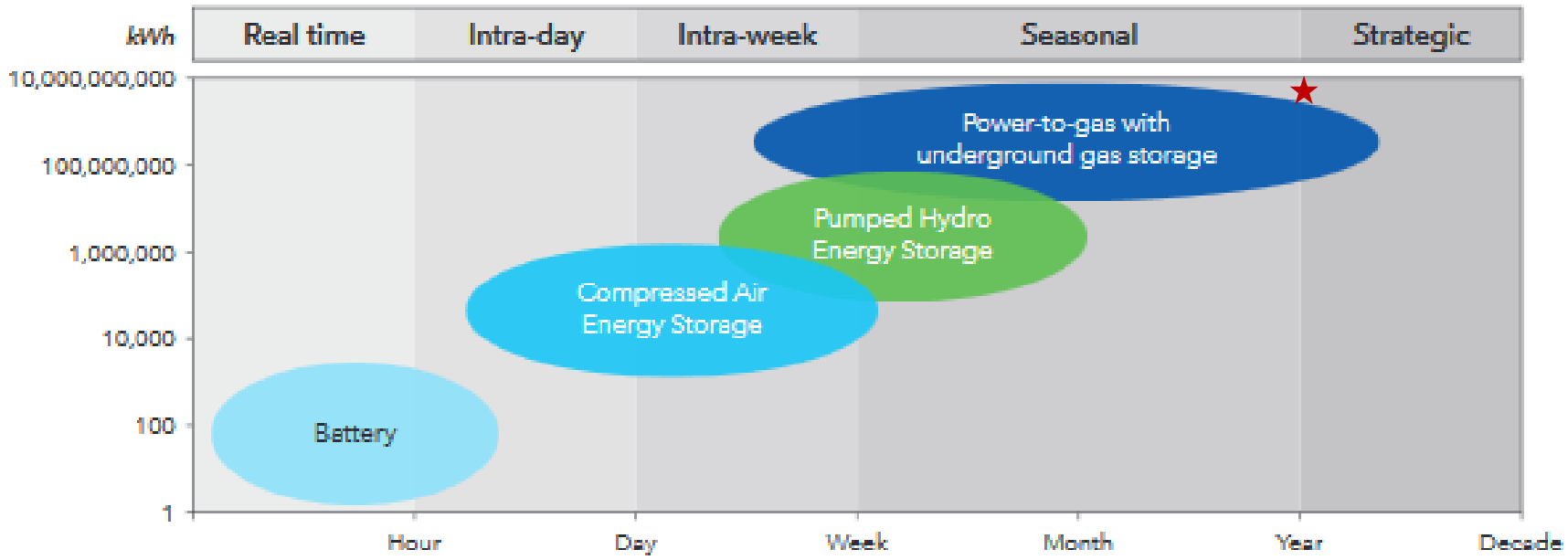


Many available technologies, value for host of different applications and locations.

Concerns about the environmental impacts and sustainability

Technologies and Applications

Both short and long-term energy storage technologies are needed



★ These are only four of many technologies

- Different energy technologies can be used for different timeframes
- Bulk energy storage technologies (e.g. thermal storage, power-to-x, CAES and LAES) can provide long term/seasonal balancing. But further cost declines needed!
  - ➢ Currently unclear how these longer-term applications will be monetised

Technologies and Applications

Many Energy Storage Technologies on the Market and in R&D

Chemical

- Ammonia
- Drop-in Fuels
- Hydrogen
- Methanol
- Synthetic Fuels
- Synthetic Natural Gas

Electrochemical

Classic Batteries

- Lead Acid
- Li-Ion
- Li-Polymer
- Li-S
- Metal Air
- Na-Ion
- $Na-NiCl_2$
- Na-S
- Ni-Cd
- Ni-MH

Flow Batteries

- Vanadium Red-Ox
- Zn-Br
- Zn-Fe

Hybrid Supercapacitors

Electrical

- Supercapacitors
- Superconducting Magnetic ES (SMES)

Mechanical

- Adiabatic Compressed Air
- Diabatic Compressed Air
- Liquid Air Energy Storage
- Flywheels
- Pumped Hydro

Thermal

- Latent Heat Storage
- Sensible Heat Storage
- Thermochemical Storage

Technologies and Applications

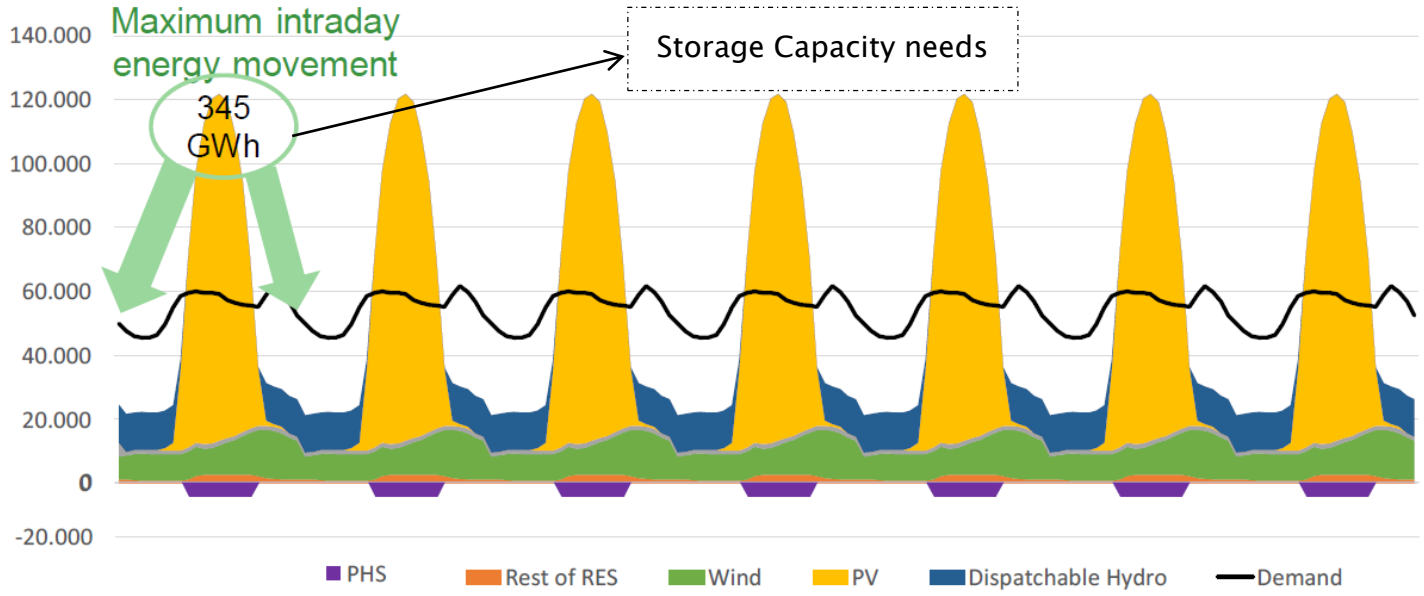
Flexibility is only one of the many energy storage benefits

	Generation	Transmission	Distribution	Customer services
Conventional	Black start	Primary frequency control	Capacity support	End-user peak shaving
Conventional	Arbitrage	Secondary frequency control	Dynamic, local voltage control	Time-of-use energy cost management
Conventional	Support to conventional generation	Tertiary frequency control	Contingency grid support	Particular requirements in power quality
Renewable	Distributed Generation Flexibility	Improvement of the frequency stability of weak grids	Intentional islanding	Continuity of energy supply
Renewable	Capacity firming	Investment deferral	Reactive power compensation	Limitation of upstream disturbances
Renewable	Limitation of upstream disturbances	Participation to angular stability	Distribution power quality	Compensation of the reactive power
Renewable	Curtailment minimisation		Limitation of upstream disturbances	

How energy storage can help achieve security of supply

The role of intra-day storage – The example of Spain in 2050

In 2050: Total demand – 470 TWh; Peak Demand – 70 GW



Source: Eurelectric

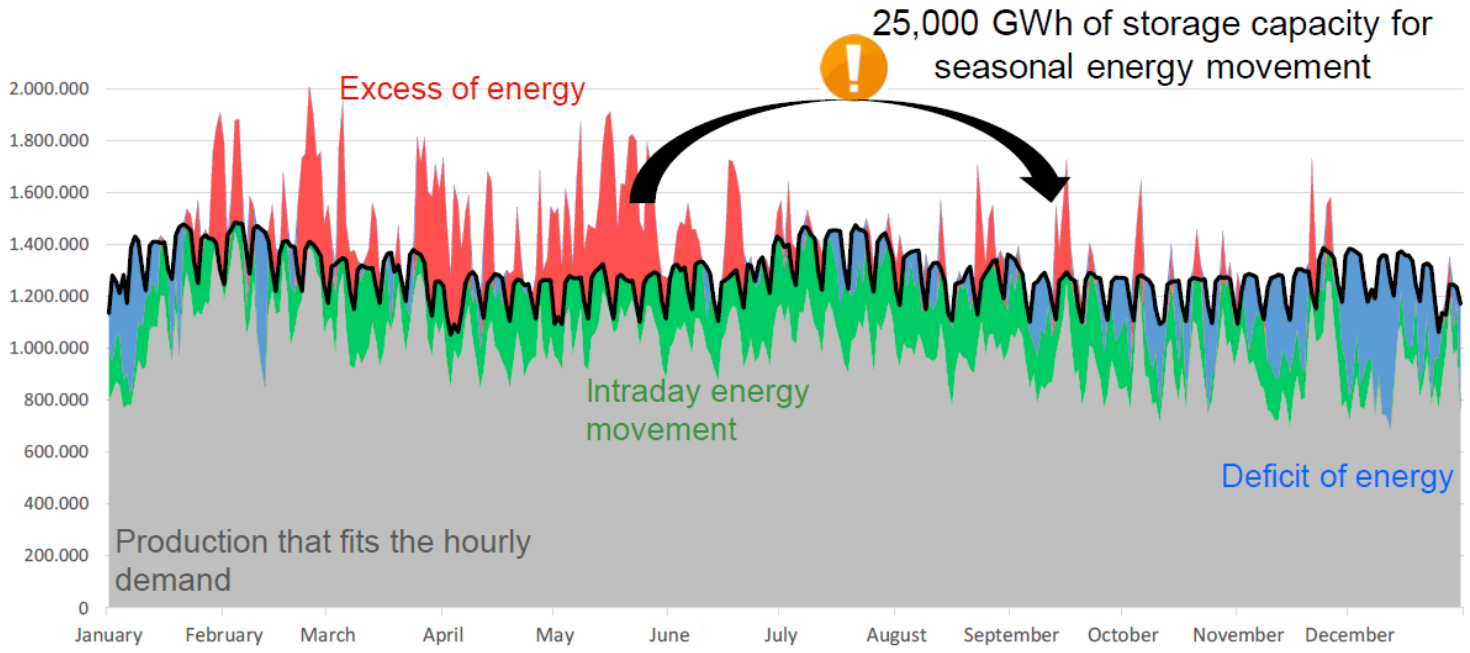
The higher the penetration of renewable energy, the higher the need for flexibility

ES technologies can store energy when production in excess and discharge when needed

The global yearly production capacity of batteries in 2016 = 28 GWh. In 2020 expected to be 174 GWh

How energy storage can help achieve security of supply

The role of energy storage for seasonal needs – The example of Spain in 2050



Source: Eurelectric

ES can provide seasonal storage – 72 times the capacity needed for intraday storage

Regulatory framework – challenges and opportunities

EU and national legislation

‘Clean Energy for all Europeans’ Package:

- ✓ Publication in the Official Journal of the EU on 14 June 2019
- ✓ Energy storage role in the energy transition recognised
- ✓ Several measures to promote energy storage

National Energy and Climate Plans:

- ✓ The EC issued recommendations to Member States on 18 June 2019 on how to amend the drafts
- ✓ The final plans must be ready by 31 December 2019 and will be revised every two years

Regulatory framework – challenges and opportunities

Regulation: Challenges and opportunities for Energy Storage

Challenges

- Policymakers tend to pick technology winners & losers
- Complexity of storage business case & lack of long-term revenue streams
- Uncertainty of how to monetise & tender some storage services (e.g. DSO/TSO investment deferral or avoidance)

Opportunities

- Ambitious EU and UN decarbonisation and RES targets (32% by 2030) require significant increase in system flexibility
- Energy storage is increasingly recognised as a key enabling technology of the energy transition
- Technology costs are decreasing
- New revenue streams, players, and applications are emerging

For example: a key aspect is the ownership provision…

Regulatory framework – challenges and opportunities

Ownership: a key point to address

Article 54, Directive (EU) 2019/944 – Ownership of energy storage facilities by transmission system operators

1.Transmission system operators shall not own, develop, manage or operate energy storage facilities.

2.By way of derogation from paragraph 1, Member States may allow transmission system operators to own, develop, manage or operate energy storage facilities, where they are fully integrated network components and the regulatory authority has granted its approval, or where all of the following conditions are fulfilled:

> *[…] b. such facilities or non-frequency ancillary services are necessary for the transmission system operators to fulfil their obligations under this Directive […] and **they** are not used to buy or sell electricity in the electricity markets […]*

Regulatory framework – challenges and opportunities

Ownership: a key point to address

- It is paramount to maximise social welfare by utilising all available technologies as much as possible
- In the multi-service business case approach, multiple stakeholders are together involved in the ownership, development, management, and/or operation of an energy storage facility in order to maximise its social welfare by fully deploying all services storage can deliver.
  - ✓ If a regulated entity could own, develop and manage a storage facility to fulfil their obligations, a non-regulated entity could use a defined capacity fraction for market-based services

Storage has a clear value in the energy transition: we must ensure that the needed storage is built

Conclusions

Many challenges, but also optimism

- The energy transition entails significant challenges
- Energy storage can and shall play a key role in addressing them – **it contributes massively to security of supply**
- Energy storage leads a.o. to further integration of RES and consequently contributes to the fight against climate change
- More business cases and specific system products need to be developed to facilitate market uptake

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