European Association for Storage of Energy

How to Support Energy Storage Profitability?

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Introduction to EASE

The European Association for Storage of Energy (EASE)

- EASE is the leading member-led association representing the energy storage industry in Brussels

- 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

Introduction to EASE

EASE Members

ALABC
BASF The Chemical Company
BOSCH Invented for life
BSEF The International Bromine Council
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cellcube
CENER ADItech
circe
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DBE Wave & Tidal Solutions
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Why Do We Need Storage?

Decarbonisation and the Energy Union – Example: Germany

ca. 86 GW

Maximum peak demand

Source: German TSOs (2016)

ca. 300 GW

RES installed capacity needed to cover peak demand

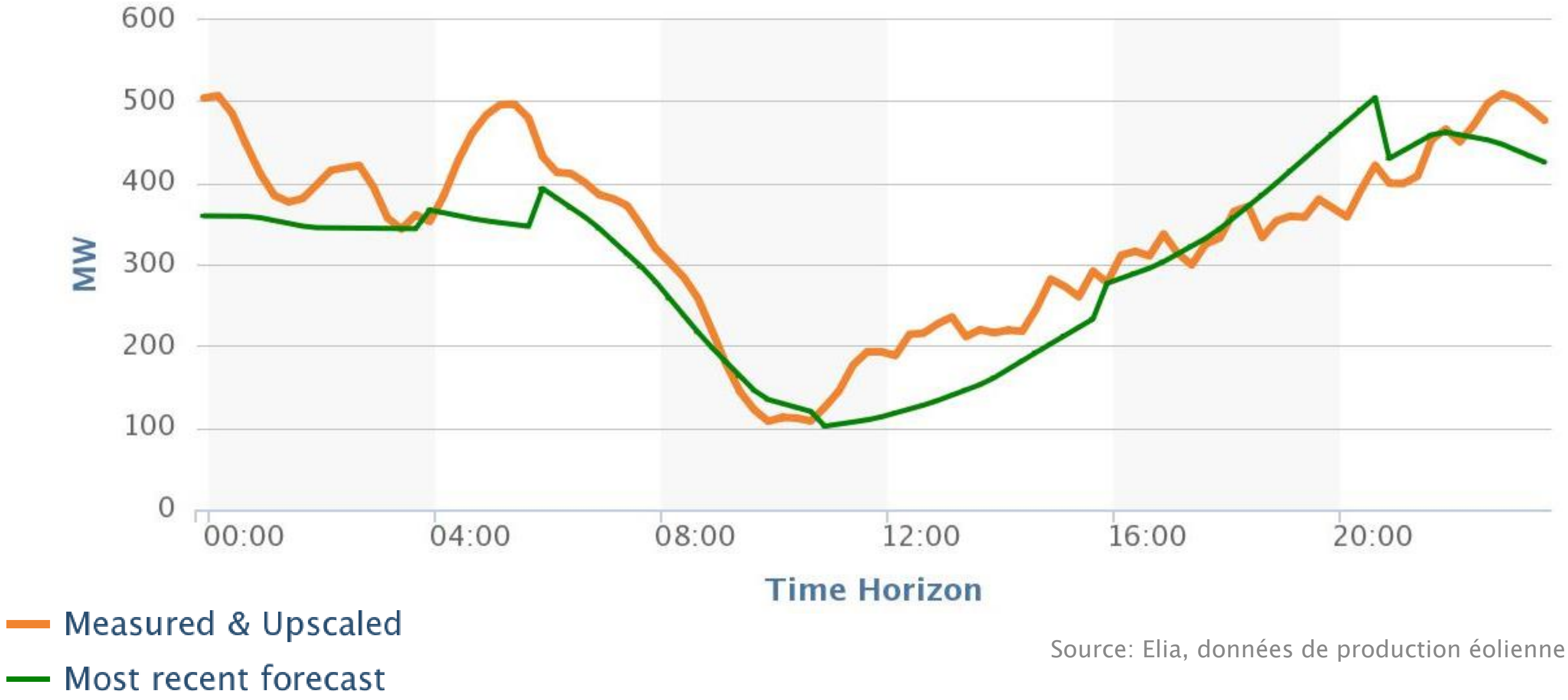
Source: Sachverständigenrat für Umweltfragen (SRU): Wege zur 100% erneuerbaren Stromversorgung.

How to maximise the use of RES to meet EU decarbonisation goals?

Why Do We Need Storage?

Balancing Generation and Consumption at all Times

Belgian Wind Power Forecasting – 02.09.2018



Source: Elia, données de production éolienne

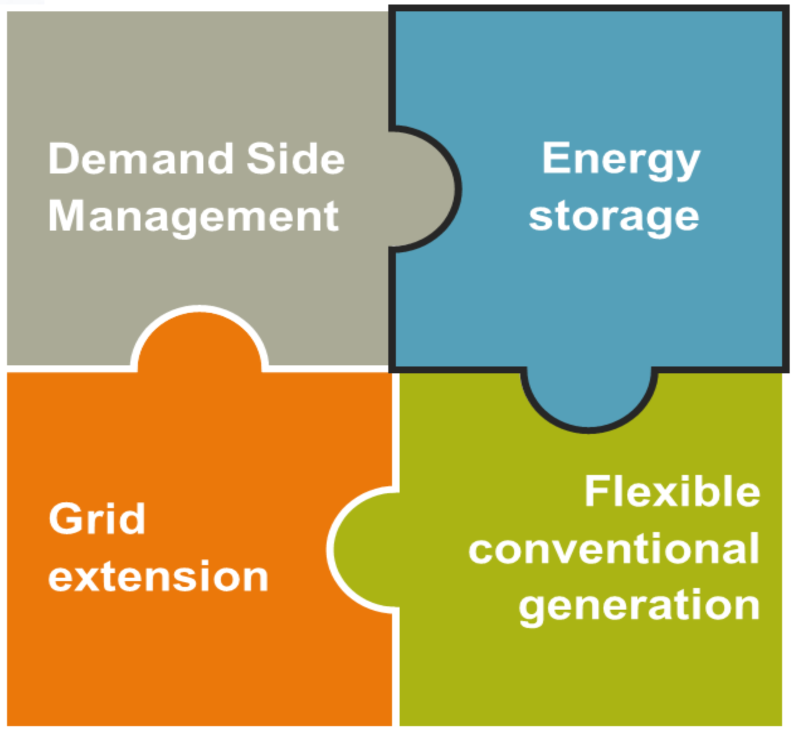
This challenge becomes more difficult the more variable renewables (vRES) you have in the system.

Why Do We Need Storage?

Available Flexibility Options to Integrate Variable Renewables

Uncertainties about practicability…has yet to demonstrate full potential

Social acceptance becoming increasingly limited



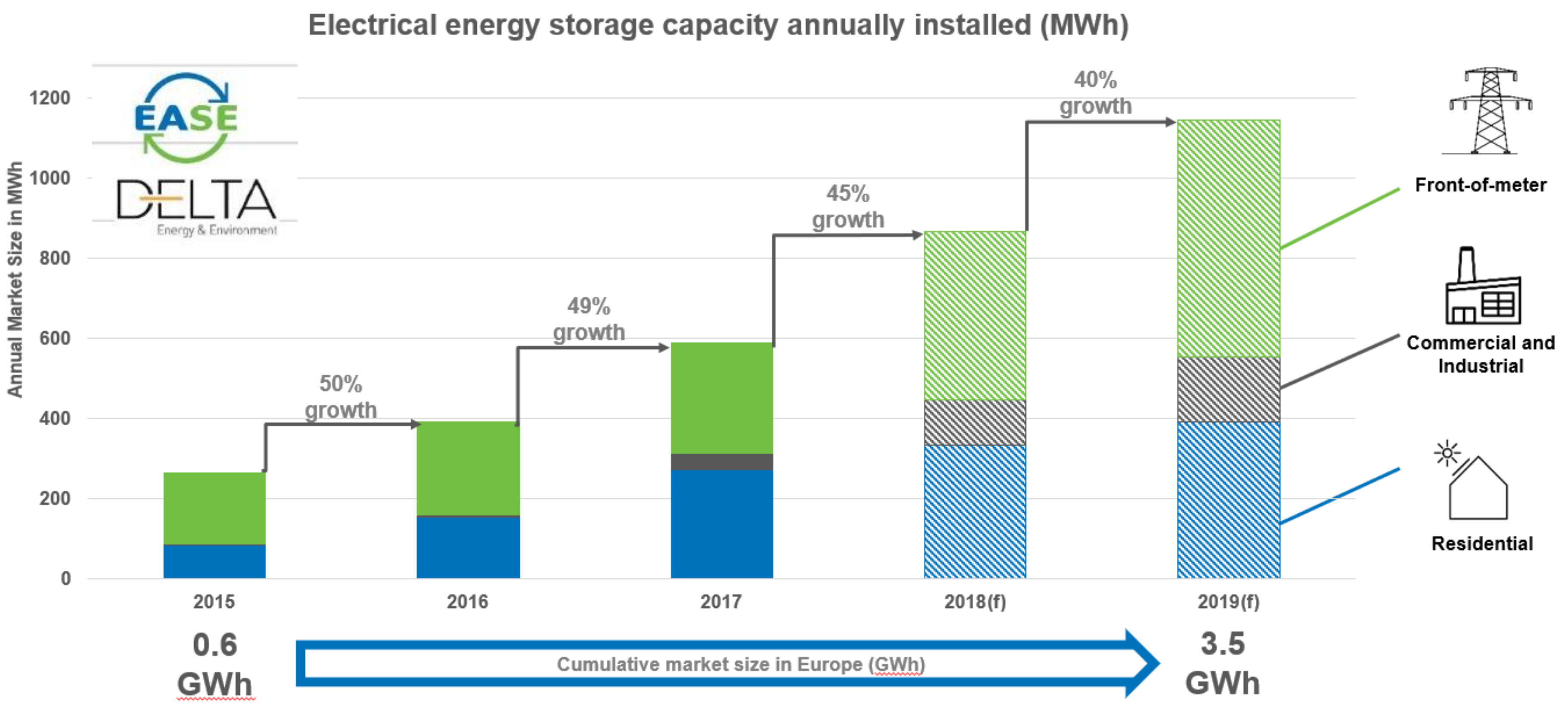
Many available technologies, value for host of different applications and locations.

Concerns about the environmental impacts and sustainability

The European Energy Storage Market is Booming

Electrical Energy Storage

The analysis includes electrical, electrochemical and mechanical storage (with the exception of pumped hydro storage).



Source: European Market Monitor on Energy Storage 2.0 – EASE; Delta EE

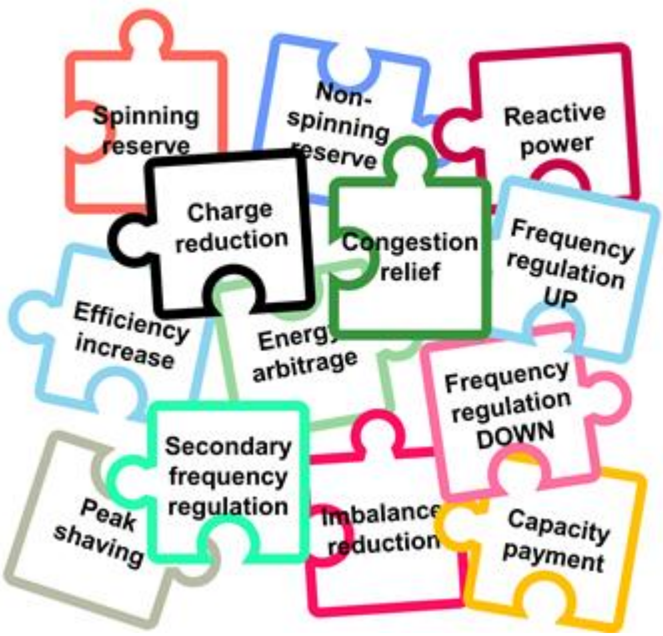
Energy Storage Applications

Generation/Bulk Services	Ancillary Services	Transmission Infrastructure Services	Distribution Infrastructure Services	Customer Energy Management Services
Arbitrage	Primary Frequency Control	Transmission Investment Deferral	Capacity Support	End-user Peak Shaving
Electric Supply Capacity	Secondary Frequency Control	Angular Stability	Contingency Grid Support	Time-of-use Energy Cost Management
Support to Conventional Generation	Tertiary Frequency Control	Transmission support	Distribution Investment Deferral	Particular Requirements in Power Quality
Ancillary Services RES Support	Load Following		Distribution Power Quality	Maximising self-production & self-consumption
Capacity Firming	Frequency Stability of Weak Grids		Dynamic, Local Voltage Control	Demand Charge Management
RES Curtailment Minimisation	Black Start		Intentional Islanding	Continuity of Energy Supply
Limitation of Upstream Perturbations	Voltage support		Limitation of Upstream Disturbances	Limitation of Upstream Disturbances
Seasonal Arbitrage	New ancillary services		Reactive Power Compensation	Compensation of the Reactive Power
Cross-Sectoral Storage				EV integration

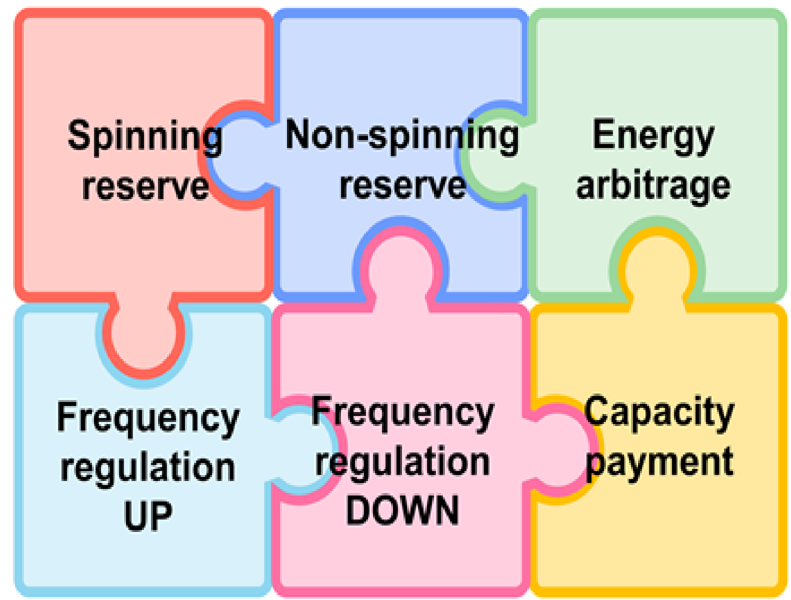
Theoretically, storage can provide all of these services. In practice, not all are monetised and/or open to storage providers.

Revenue Stacking to Ensure Storage Profitability

Applications and revenues



Applications by ESS in California



Source: ENEL – EASE Investor Workshop 2017

- Energy storage technologies have multiple applications and can derive revenue from multiple stacked revenue streams.
- **For a robust storage business cases, it is paramount to monetise all storage services and to allow revenue stacking**

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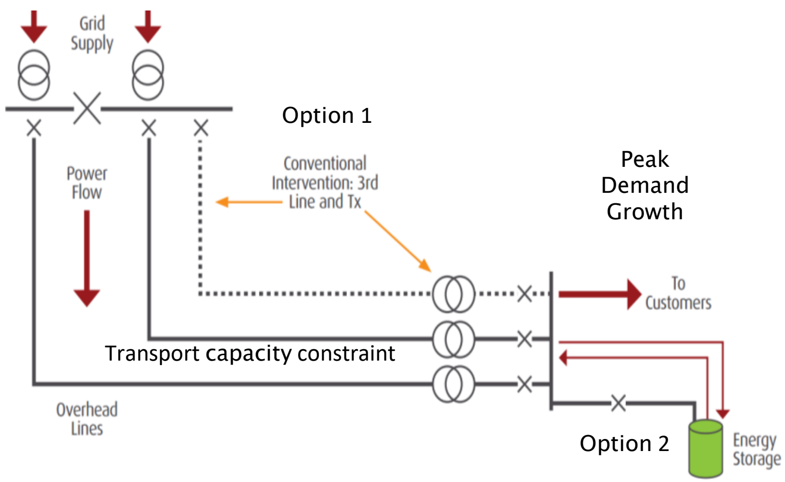
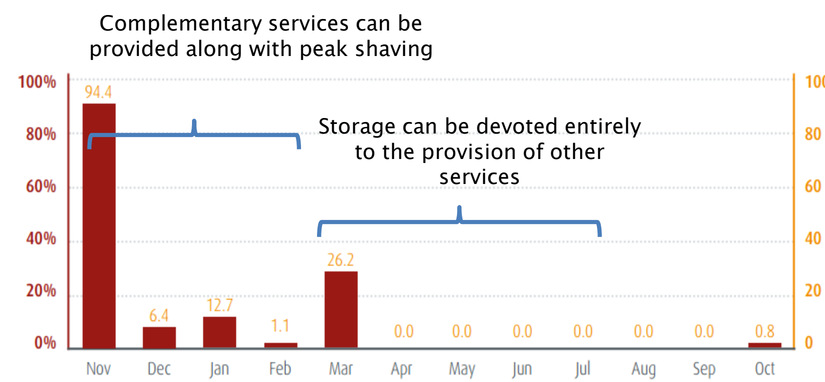
Technologies and Applications

Network reinforcement deferral: peak demand growth triggers power network reinforcements

- Option 1: Traditional network reinforcement (overhead or underground power lines)
- Option 2: Energy storage can be used to provide security of supply when required while providing additional services to the TSO at other times



Energy capacity allocated to serve peak load at the Leighton Buzzard ESS



Source : UKPN, 2016. Successful Demonstrations of Storage Value Streams

Possible Technologies:

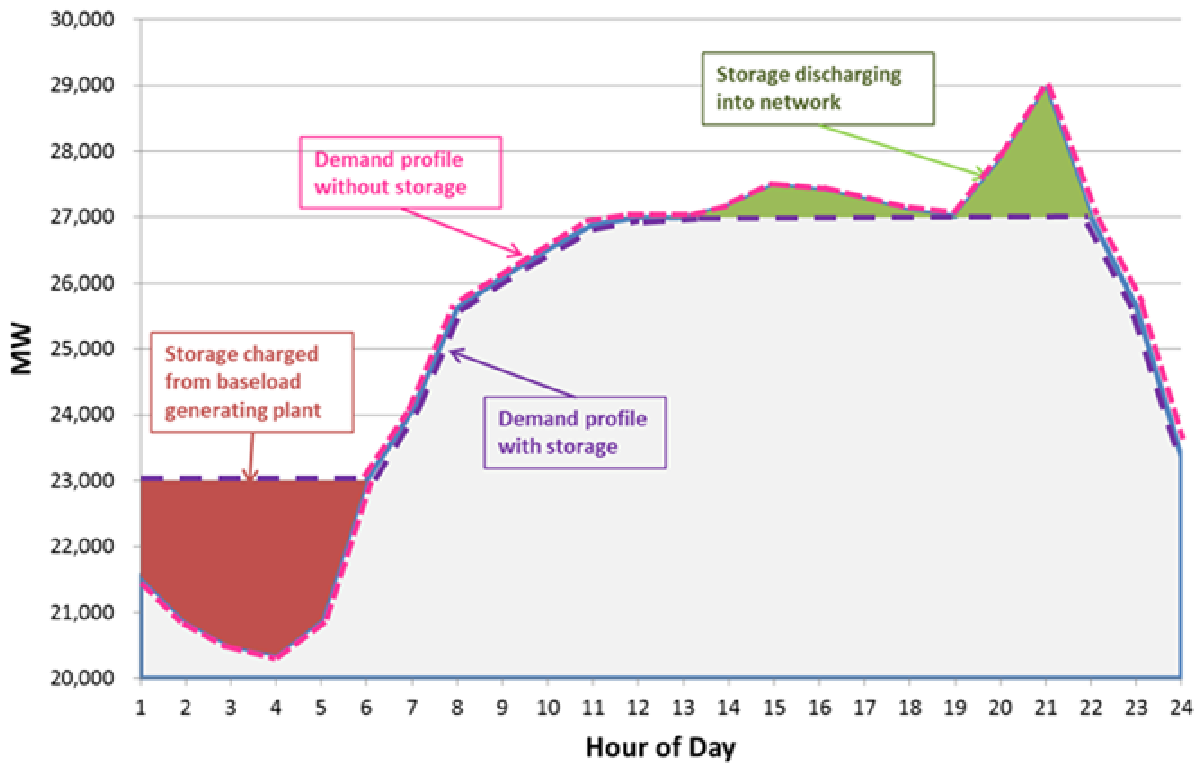
- Mechanical: Compressed Air Energy Storage, Liquid Air Energy Storage
- Electrochemical: Lead Acid, Li-Ion, NaS, Flow batteries

Technologies and Applications

Balancing

Possible Technologies:

- Mechanical: Compressed Air Energy Storage (CAES), Liquid Air Energy Storage (LAES), Pumped Hydro Storage
- Electrochemical: e.g. Lead Acid, Li-ion, NaS, Flow batteries (e.g. Vanadium, Zinc-Bromine)



Source : http://energyclub.stanford.edu/wp-content/uploads/2013/06/kavousian-3.png

EU Energy Storage Policy and Regulation

Multi-Service Business Cases

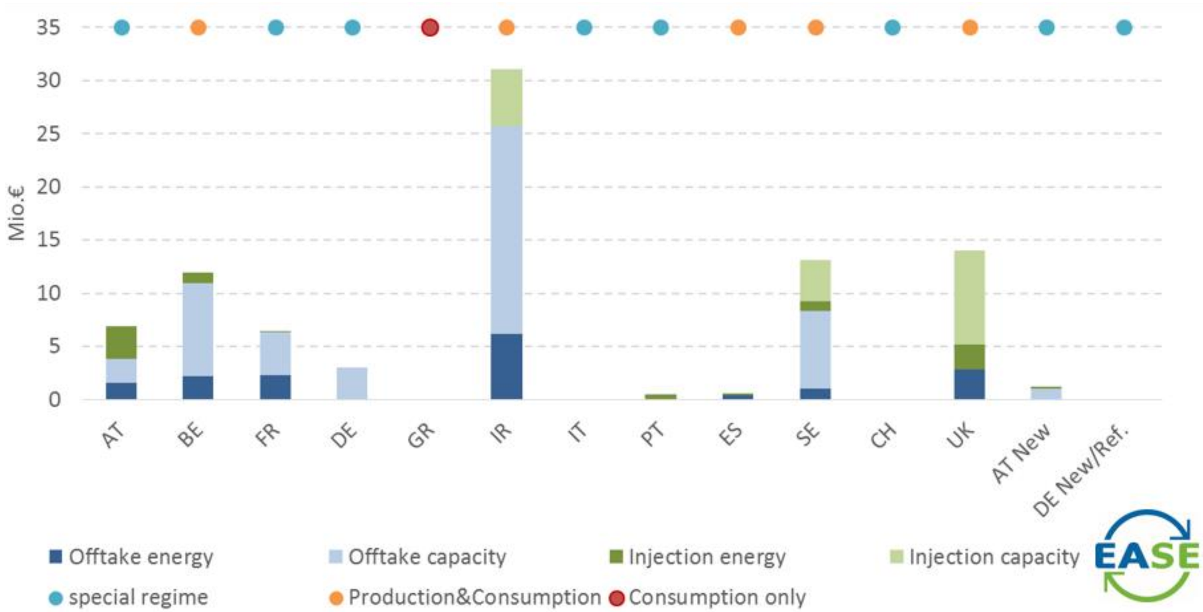
- The EU institutions are currently clarifying the framework under which regulated entities could own, develop, manage and operate energy storage facilities (Articles 36 and 54 of the recast Electricity Directive):
  - Council: derogation for energy storage facilities "which are fully integrated network components"
  - Parliament: exception for the operation of energy storage facilities for "local short-term control of the distribution system"
- It appears that regulated entities will be allowed to own, manage and operate storage facilities in specific, non-market cases
- Therefore it is crucial to explore different ways to maximise the value of the storage facility when a regulated entity will have been allowed to build it, e.g. by looking into multi-service business cases

Multi-service business cases see a regulated entity share operation and/or ownership of one energy storage device with a non-regulated entity

EU Energy Storage Policy and Regulation

Example: Grid Fees for Energy Storage Systems

Indicative grid charges for a fictive large-scale PHS plant



Source: EASE Position on Energy Storage Deployment Hampered by Grid Charges, 2017
PHS: Pumped Hydro Storage

- **Significant variance between countries creates distortions** in cross-border energy trade: investment in PHS plants not only depends on where they are most needed, but also where grid costs are lower.
- EASE calls for a joint EU approach to grid charges, taking into account the contributions of energy storage to grid stability.

EU Energy Storage Policy and Regulation

Key Points for Energy Storage Profitability

- **Revenue stacking**, possibility for multi-service business cases
- Appropriate **grid fees and tariffs** that take into account the positive benefits of storage for the grid
- **Long-term visibility on revenues:** long-term contracts (up to 3 years) should be allowed for storage services
- **Technical requirements, prequalification criteria, and tendering** (e.g. network code requirements) should be harmonised as much as possible & should place storage on a level playing field with other flexibility providers
- More needs to be done to clarify:
  - How to monetise different storage services?
  - How to design and tender new flexibility services, esp. at distribution level?
  - How will the need for different services change as RES deployment increases? (e.g. synthetic inertia, enhanced frequency response, …)

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EASE

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