“Energy Storage, a key enabler of the energy transition”

ANIMP Energy section – webinar series 2022

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European Association for Storage of Energy

EUROPEAN ASSOCIATION FOR STORAGE OF ENERGY

EASE Mission

Awareness raising

Raise awareness about the benefits of energy storage, as well as its crucial role in supporting the energy transition.

Information-sharing

Serve as a platform for information-sharing and debate on different technologies, applications, and business cases.

Market design

Promote a fair and future oriented energy market design that recognises storage as an indispensable element of the energy system.

European Association for Storage of Energy

EUROPEAN ASSOCIATION FOR STORAGE OF ENERGY

Members

The European Association for Storage of Energy (EASE), established in 2011, is the leading member-supported association representing organisations active across the entire energy storage value chain.

EASE promotes the deployment of energy storage to support the cost-effective transition to a resilient, climate neutral, and secure energy system.

EASE represents over 50 members including utilities, technology suppliers, research institutes, distribution system operators, and transmission system operators

EASE members

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Key element of the Energy Transition

	2020	2030	2040	2050
GHG emissions	– 20%	– 50%		Climate neutral
% RES	20%	67%		> 85%

The Energy Transition requires an accelerated roll-out of Renewables – however, its “intermittent” nature poses system stability and resiliency challenges

Energy Storage is a key element of the Energy Transition since it provides the necessary stability, flexibility and resiliency to the grid

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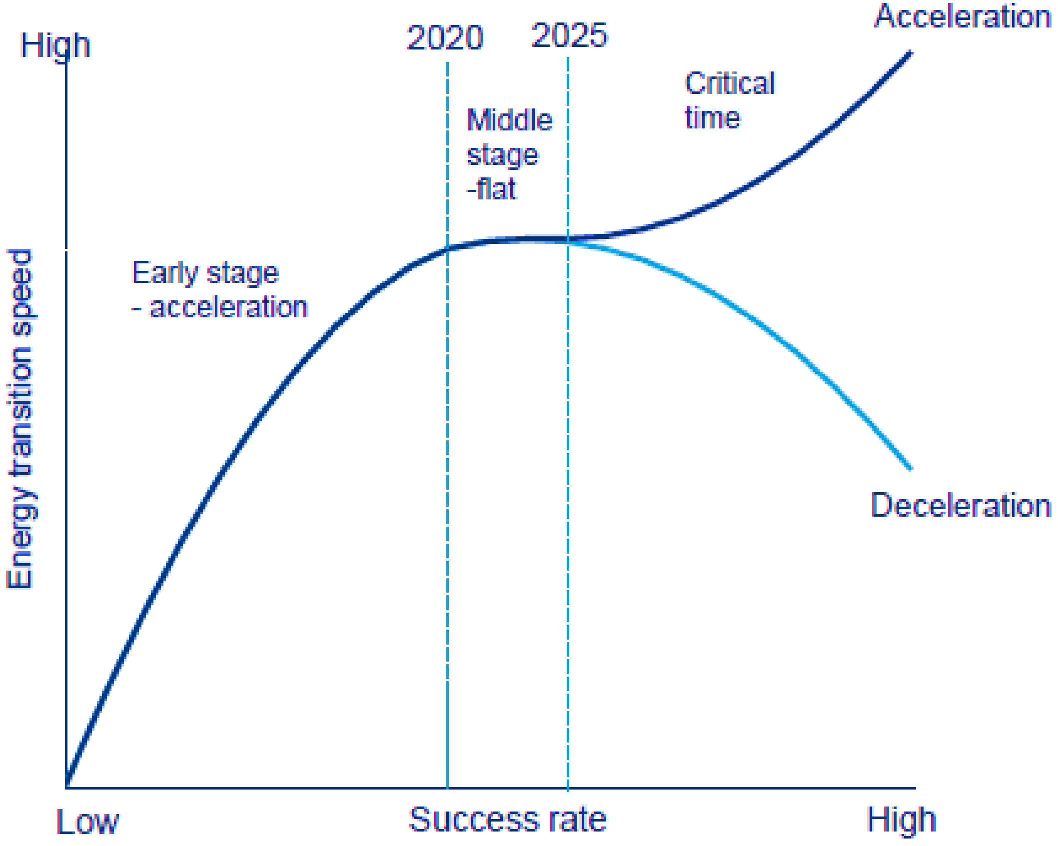
Flexibility, resiliency and stability to the grid



In 2050

Solar
20 TW

Wind
25 TW

Batteries
7,7 TWh

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Energy Storage provides different services

Generation Support Services & Bulk Storage Services

- Energy Arbitrage
- RES curtailment minimisation
- Capacity Firming
- Support to Thermal / RES generation

Transmission & Distribution Infrastructure Support

- Transmission / Distribution upgrades deferrals
- Reactive Power Compensation
- Islanding
- Contingency grid support

Ancillary Services

- Frequency Containment Reserve
- Automatic Frequency Restoration Reserve
- Black Start
- Load Following

Behind-the-Meter Customer Energy Management

- End-user Peak Shaving
- Energy Arbitrage
- Back-up power
- Self-consumption / production
- EV integration

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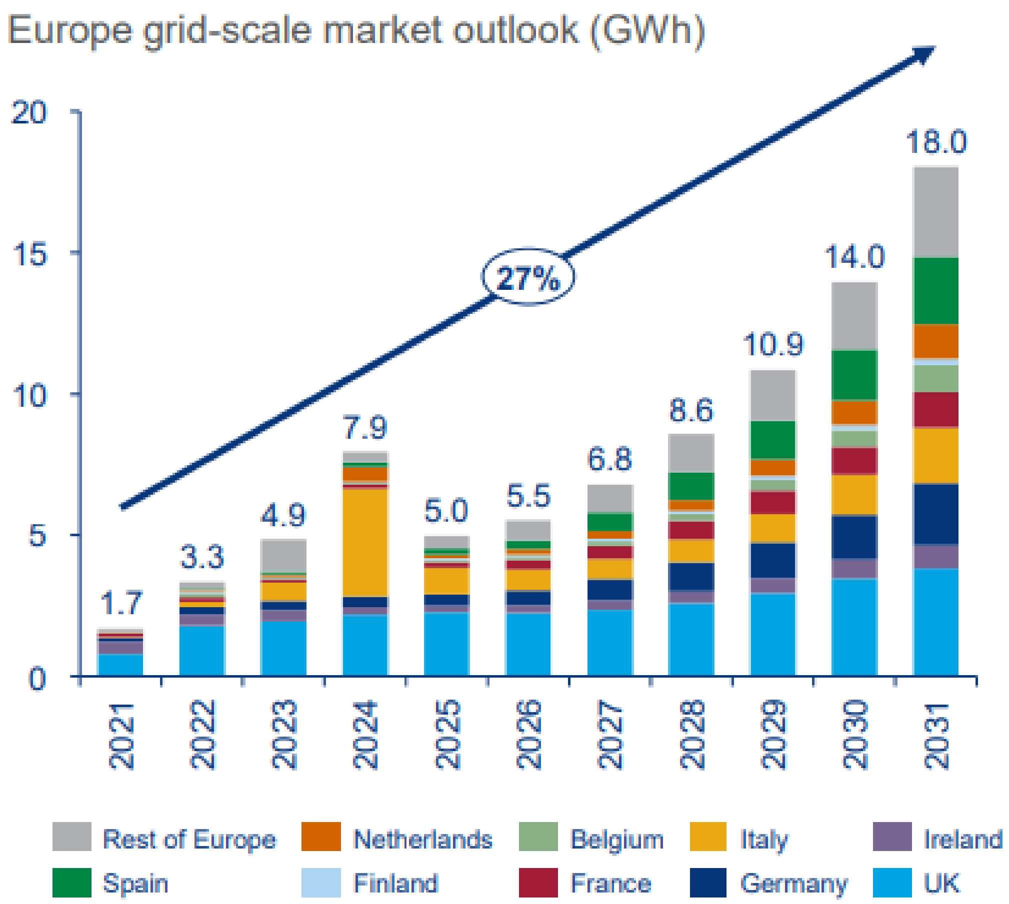
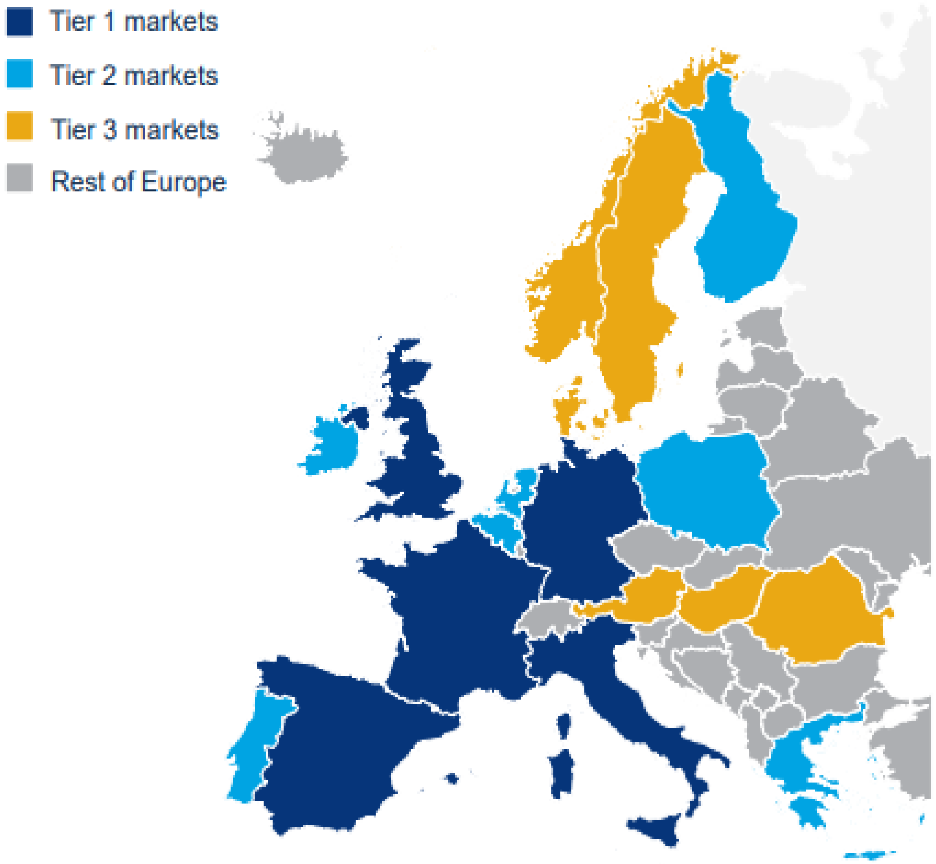
Massive growth projections





Source: Wood Mackenzie, March 2022

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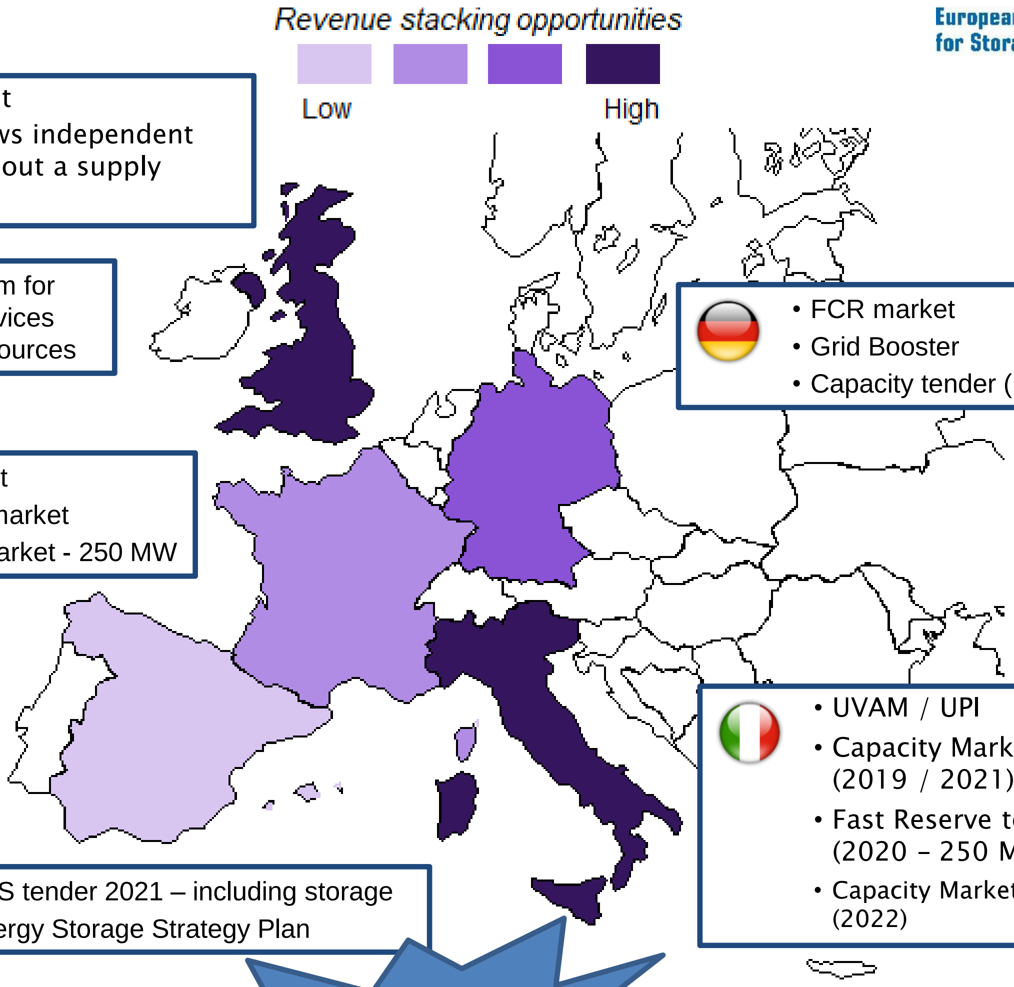
Key trends facilitating its roll-out

1. Increasing Regulatory Support
2. Growing number of tenders
3. Appearance of financial investors
4. Reduction in Price of batteries
5. Increasing optimization of value of batteries – SW
6. Convergence Power and e-Mobility (V2G)
7. New technologies



UK
- EFR / Dynamic containment
- Balancing mechanism allows independent aggregators to access without a supply license

Ireland
- DS3 System Service program for availability payments for services procurement, open to all resources

Germany
- FCR market
- Grid Booster
- Capacity tender (RES+S)

France
- FCR market
- Balancing market
- Capacity Market - 250 MW

Portugal
- 2021 - PV+BESS auction (670 MW)

Italy
- UVAM / UPI
- Capacity Market tenders (2019 / 2021)
- Fast Reserve tender (2020 – 250 MW)
- Capacity Market tender (2022)

Spain
- RES tender 2021 – including storage
- Energy Storage Strategy Plan

Enel awarded 6,6 GWh of storage capacity

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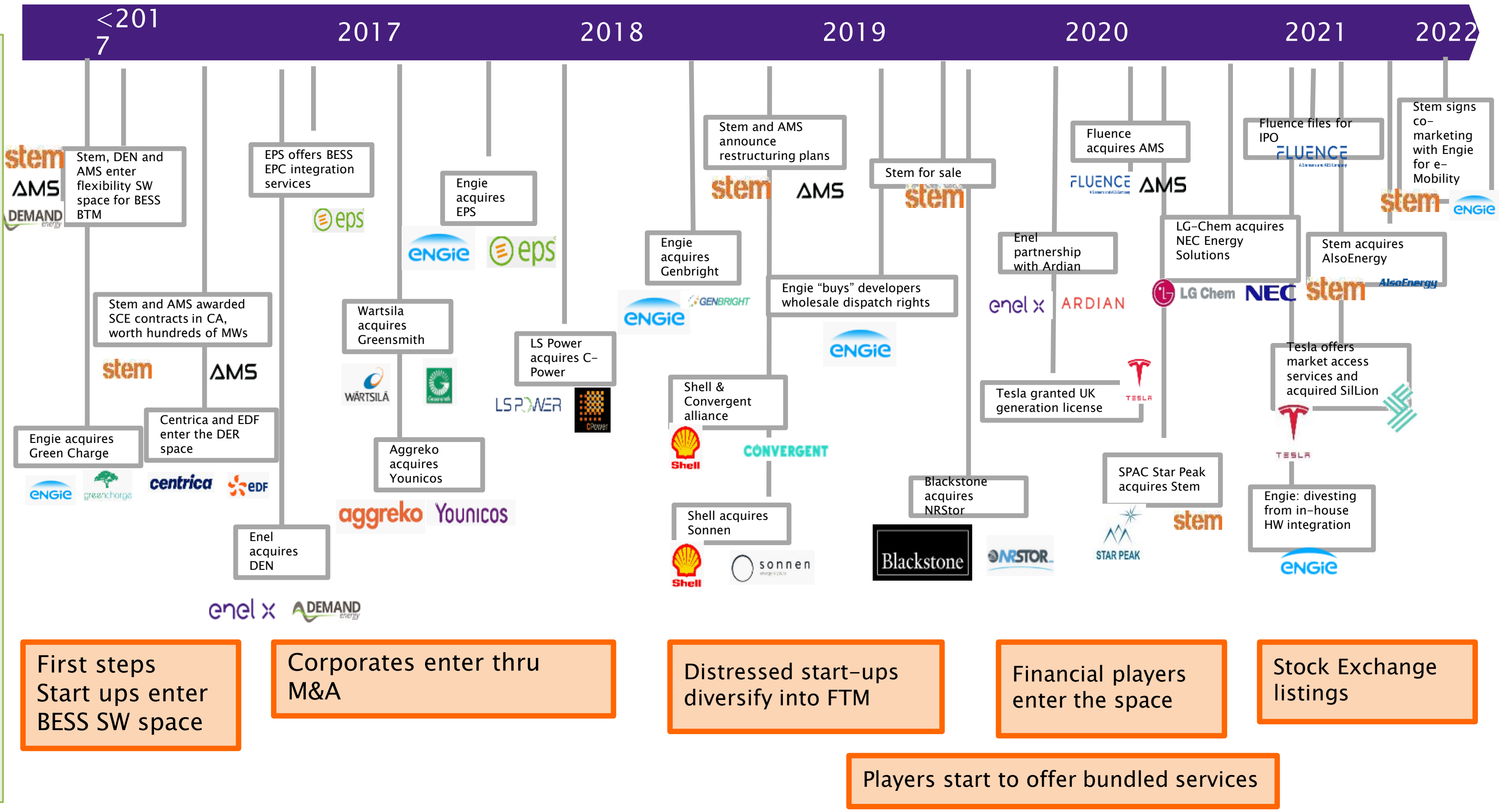

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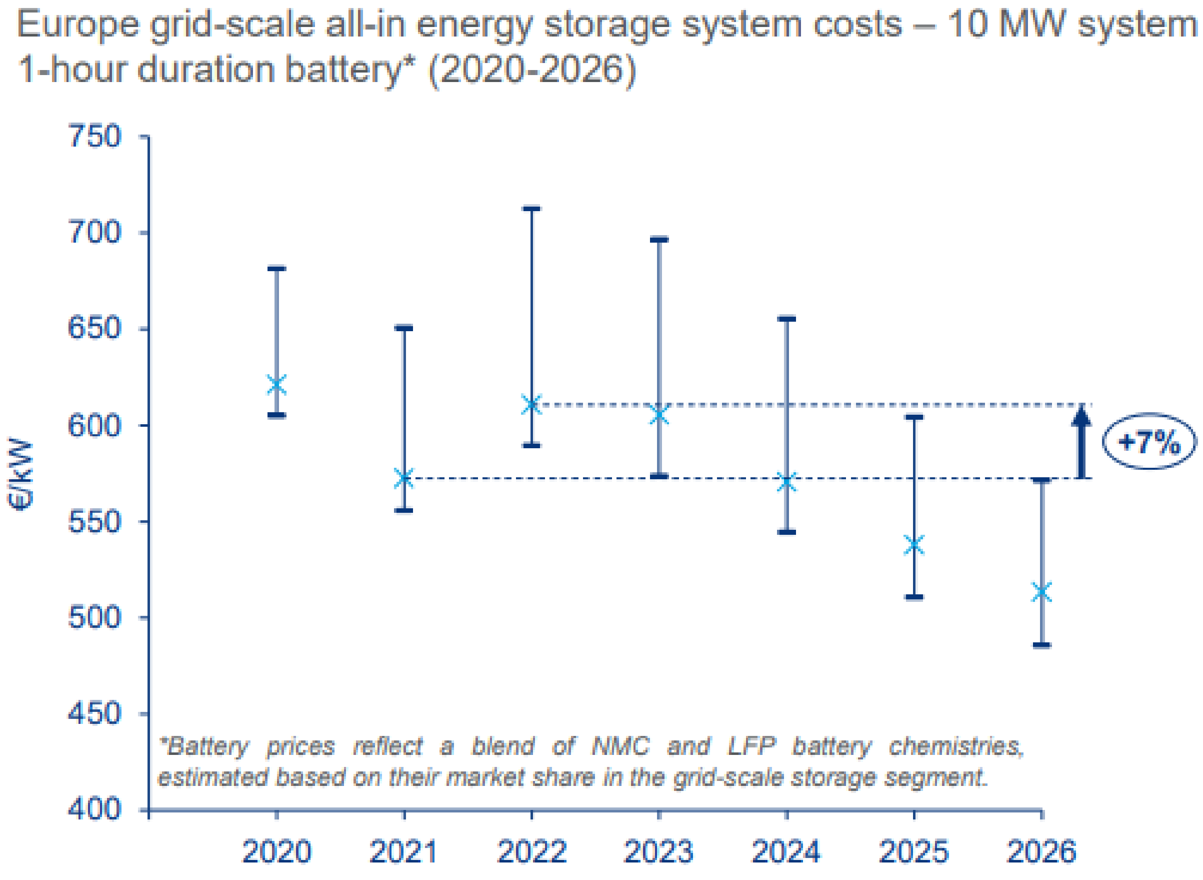

Source: Wood Mackenzie, March 2022

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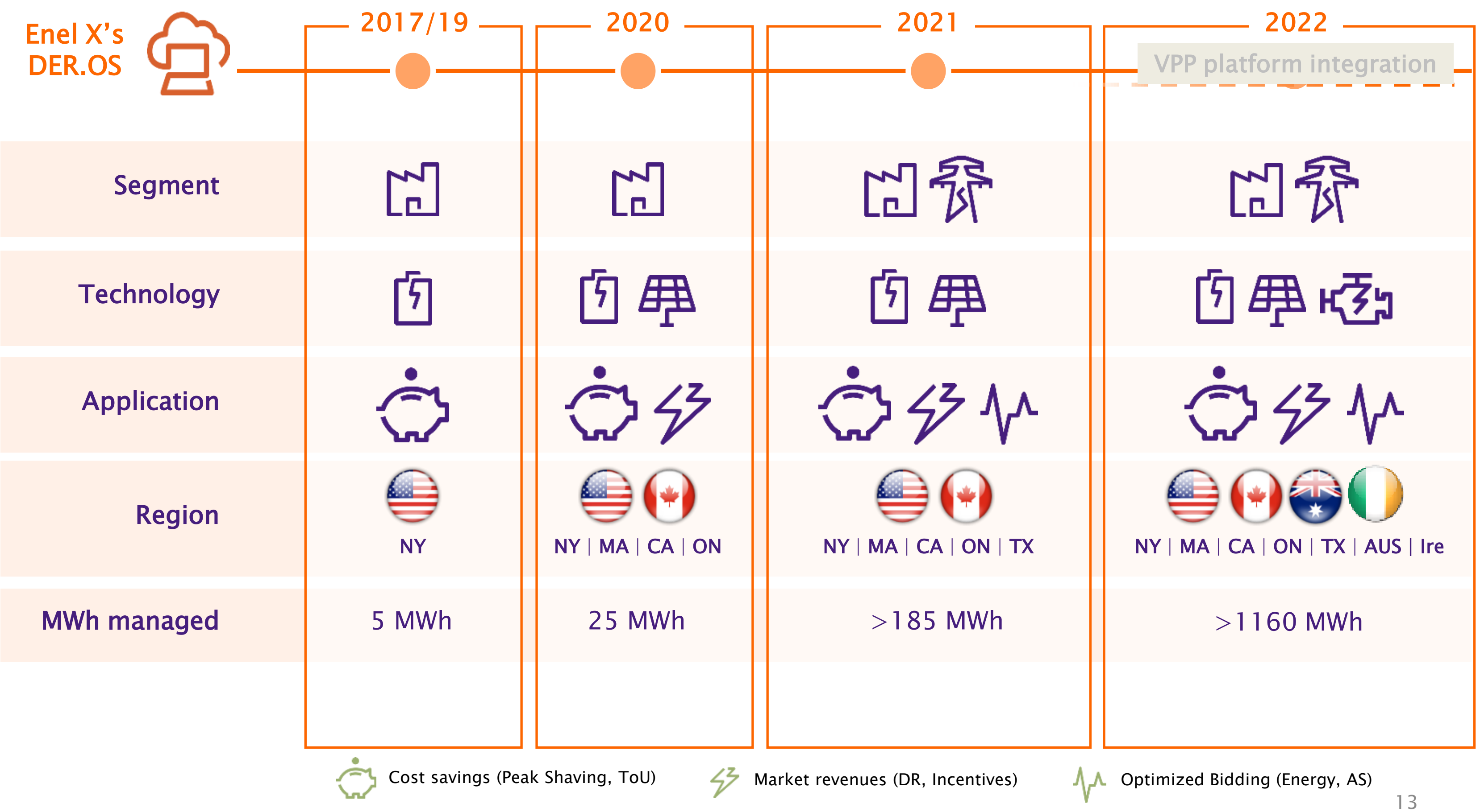
Machine learning algorithms and AI improve BESS performance



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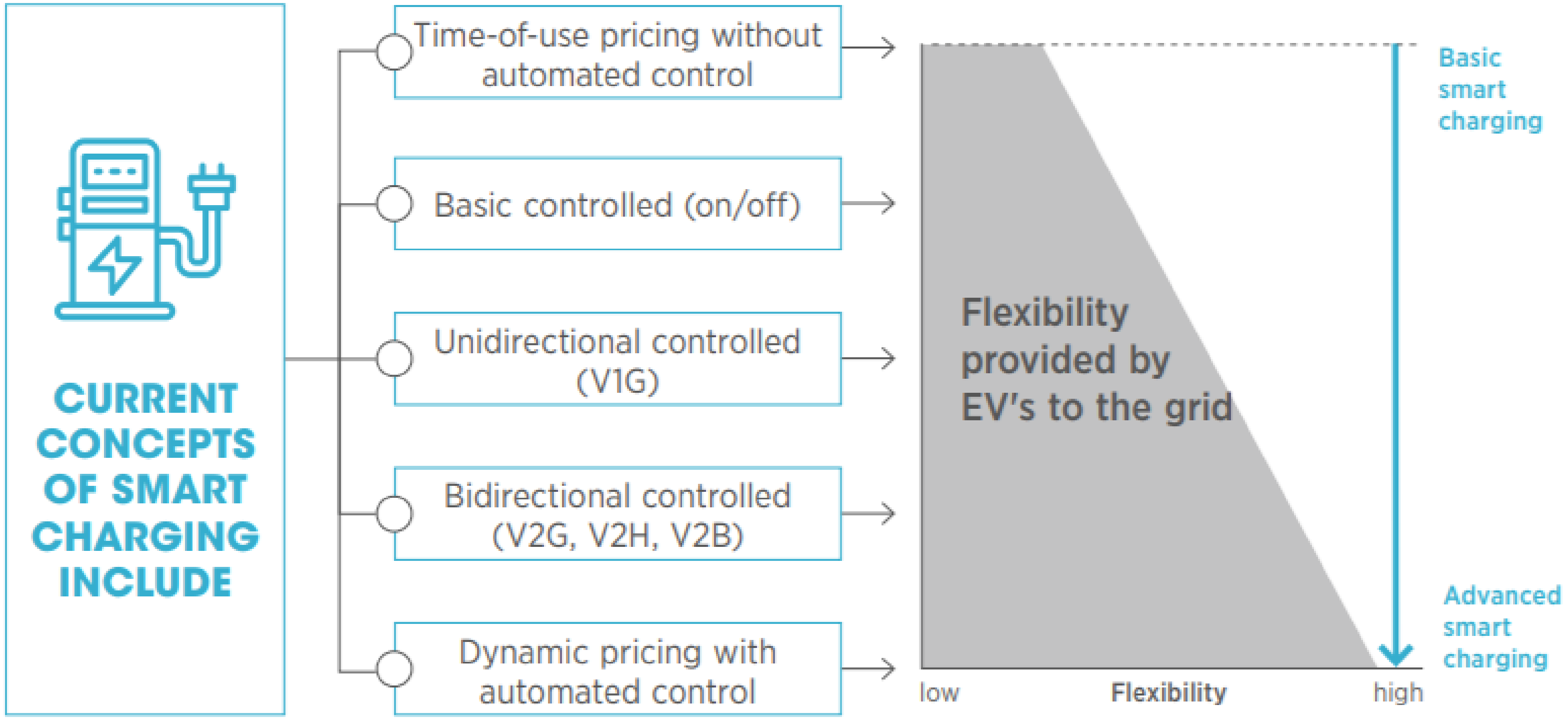

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Electrochemical

Redox Flow Batteries
- Vanadium
- All iron
- Zinc/Bromide
- Metal Complex
- H_2 Bromide

Non-Flow Batteries
- Na-Ion
- Solid state
- Lithium – sulfur
- Aqueous Electrolyte
  - Zinc hybrid cathode
  - Metal/hydrogen
  - Metal/air

Mechanical

- Liquid Air
- Liquified CO_2
- Gravitational

Thermal

- Solid state materials
- Phase changing mat

Chemical

- Hydrogen power-to-power

Electrical

- Supercapacitors

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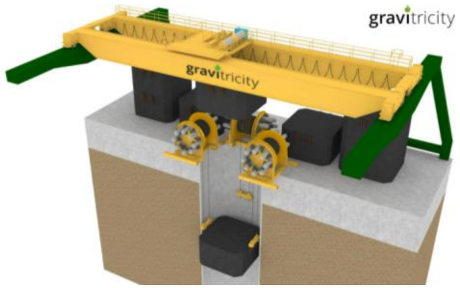
Where do we go from here? Which new technologies are going to enter the market?

A. "New science" technologies: highly innovative

B. "No new science, but new engineering"



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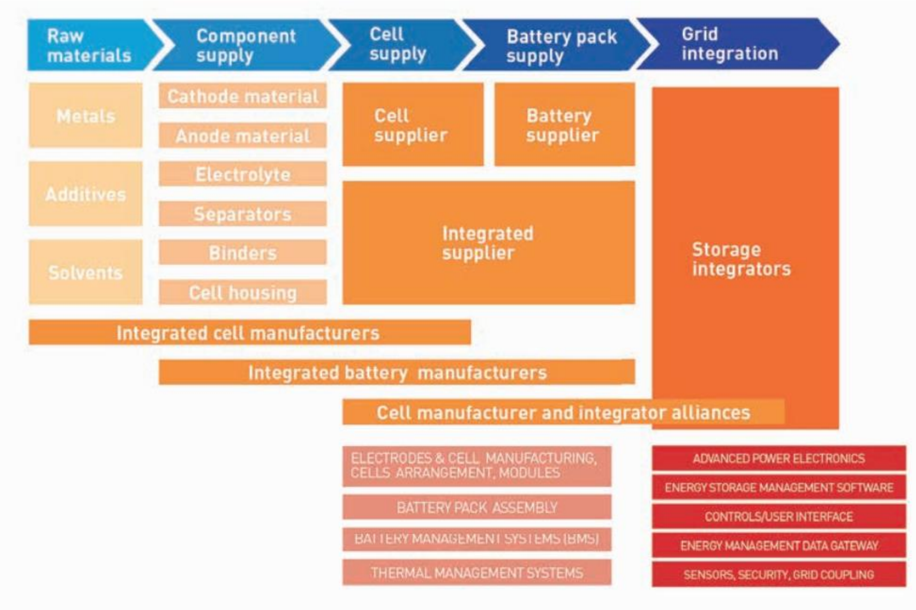
A. “New science” tech: highly innovative – Redox Flow Batteries

Fast-acting storage ☺
Power storage ☺
ES daily (6h) ☺
ES weekly (30-40h) ☺



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A. "New science" techn: highly innovative – Redox Flow Batteries

- Substantial cost reduction (reactants and electrolytes, membrane and materials)
- Better life time of the membrane, and possibly improvements in power and energy density.
- Lack of pilots and demonstrators
- Reach a volume level that will allow for economies of scale and achieving a competitive LCOSE.

→ Strong R&D efforts required

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B. “No new science, but new engineering” – Gravity-based storage

- Fast-acting storage ☺
- Power storage ☺
- ES daily (6h) ☺

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B. "No new science, but new engineering" – Gravity-based storage

Need for feasibility studies

Need to develop demonstrators to validate technologies capability

Need to lower construction costs

Need to scale up, attract investors, create awareness

In a nutshell: different ES technologies face different challenges. But also…

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Technology	Number of cycles	Roundtrip efficiency	Environmental impact	Safety compliance	Stage of Commercial Viability
LFP	<5000	85-95%			Operational
Iron Redox-Flow	>15000	70-80%	+	+	Adolescent/ Emerging
Vanadium/Zinc Bromide Redox-Flow	>15000	70-80%	+	-	Adolescent/ Emerging
Na-Ion	<3000	85-95%	+	+	Emerging
Li-S	<1500	85-95%		-	Embryonic / Adolescent
Li-Solid State	<1500	85-95%	+	++	Embryonic / Adolescent
Supercapacitors	Up to 1M	Up to 95%	++	+++	Early / Mature mainstream
Aqueous Electrolyte	up to 30000	Up to 80%	+++	++	Early mainstream / Embryonic
Gravitational	No degradation	82%	+++	++	Emerging

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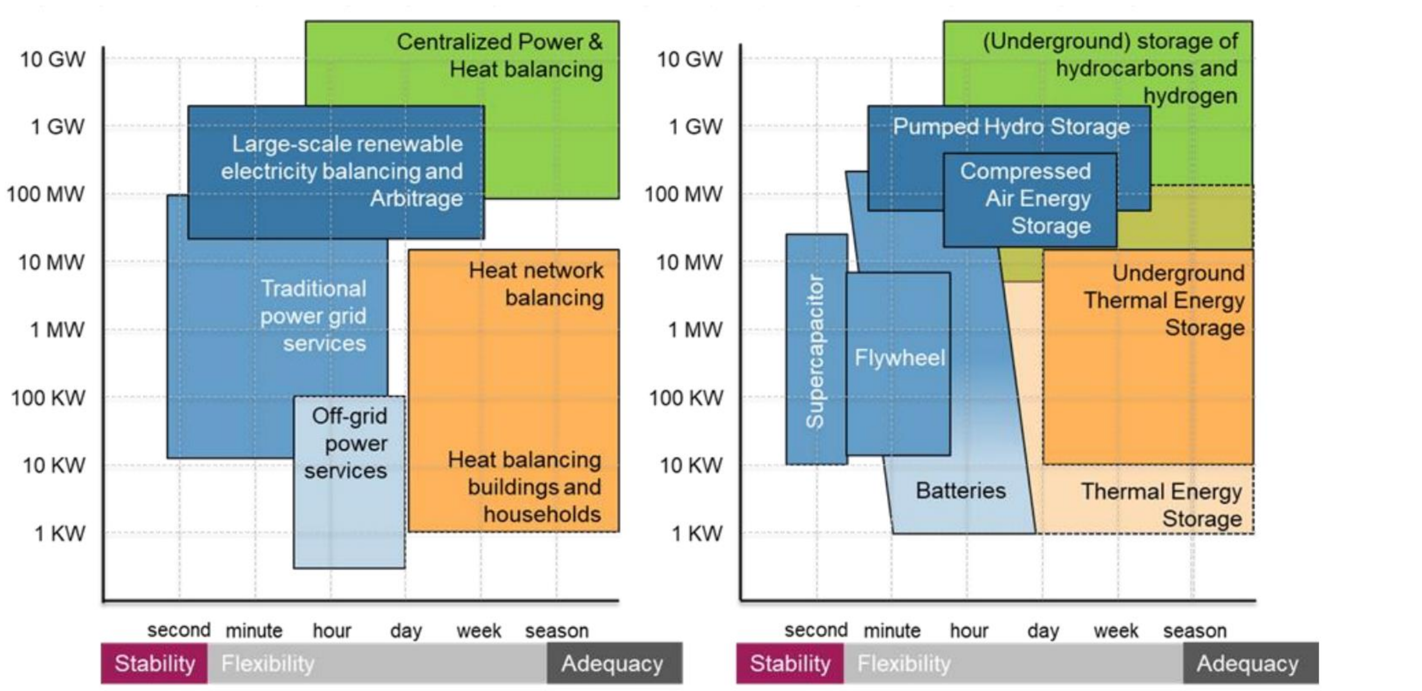
Important: Different energy storage technologies provide different services at different timeframes



Reference:TNO inspired by IEA

It's not a "format war"; it's about complementarity

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It's not a "format war"; it's about complementarity

- *What is the ES duration?*
- *Where is it located geographically?*
- *Is it for FtM or BtM?*
- *What are the conditions?*
- *Is it high or low cycling?*
- *How important is efficiency?*
- *Is durability or longevity relevant?*
- *Is CAPEX or OPEX what matters to me?*

Depending on how we answer to these questions, some ES technologies are more suitable than others