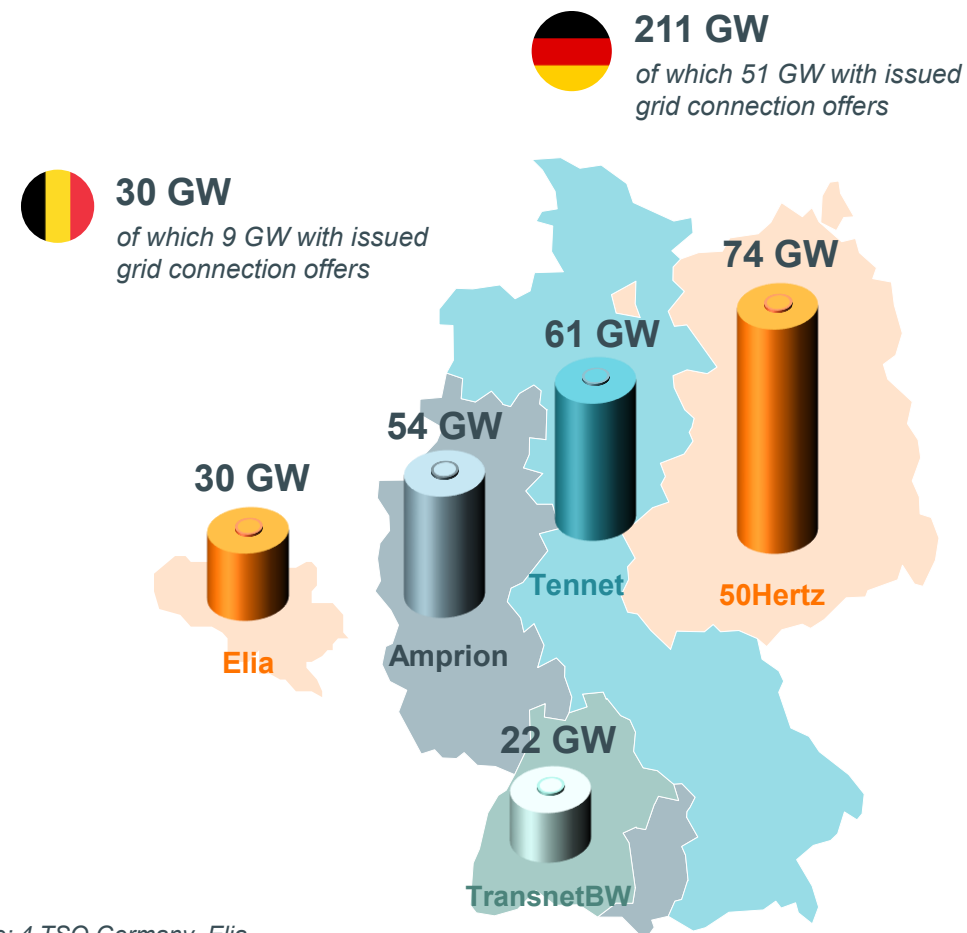
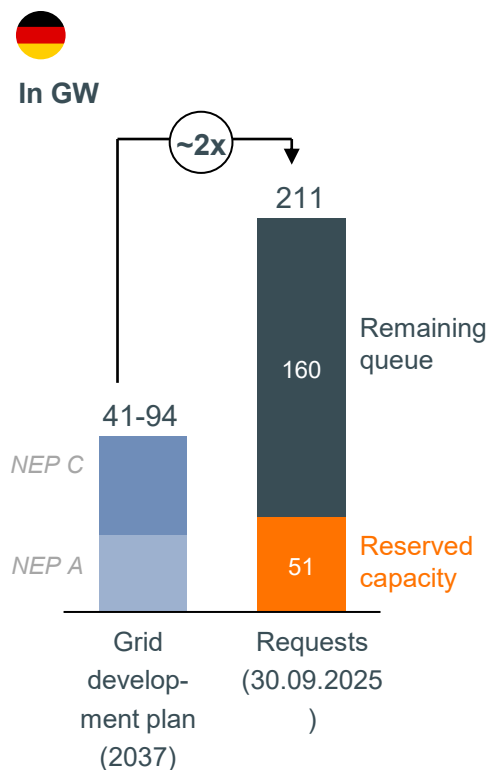
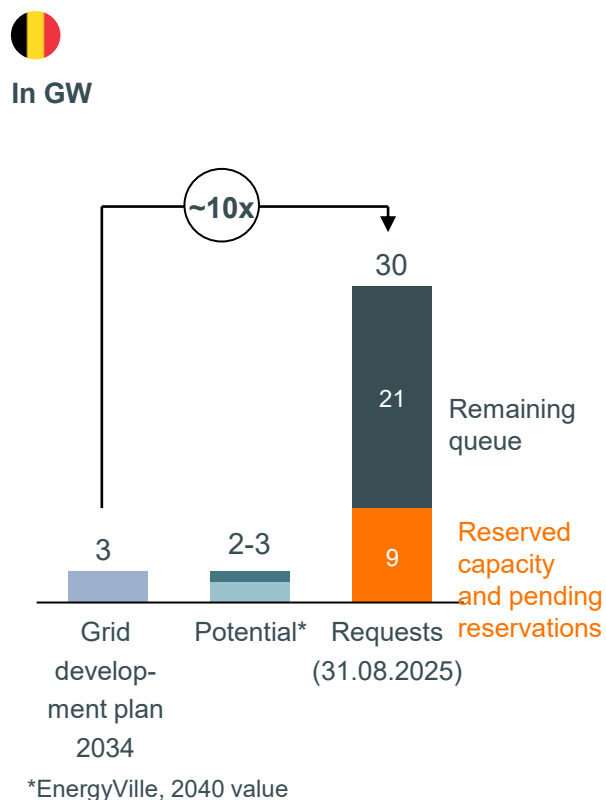


Storage for System Strength

Insights into the Elia Group Viewpoint study
“Storage for System Strength”

17th April 2026 Frie Gybels

The Storage Surge: Rising number of connection requests of batteries



Source: 4 TSO Germany, Elia
As of 30 September 2025 in Germany and 31 August 2025 in Belgium

Storage for System Strength for a sustainable, affordable and secure system

OUR RESEARCH



Elia Group's *The Power of Flex* study examines flexibility in Europe's electricity system, focusing on consumer participation and decentralised solutions. It identifies storage as a key enabler for managing peak demand and integrating renewables. Battery storage is noted for its fast response and grid support potential. The report calls for scaling residential and utility-scale storage through market incentives and regulation, and stresses integrating storage into wider flexibility strategies alongside demand-side management and digital controls.



Elia Transmission Belgium publishes its Belgian Electricity system blueprint for 2035-2050. The study provides insights into Belgium's options regarding its future energy mix and evaluates their technological and economic impacts. It finds that without a clear policy regarding electricity supply towards 2050, Belgium will likely end up in the most costly scenario. The study highlights the growing volatility of the energy system and the resulting importance of unlocking demand-side flexibility and storage across the system to manage this volatility. This will be essential for managing the energy system in the most cost-effective way and for limiting the economic curtailment of renewable energy sources.



November 2021



Elia Group publishes its *Roadmap to Net Zero* study on building a climate-neutral European energy system by 2050. It concludes that Europe's direct electricity demand can be met only if RES expansion triples and more interconnectors are built to balance uneven RES distribution. Interconnectors also smooth weekly wind fluctuations and reduce local supply dips. Short term flexibility such as storage and other means is key to balance the system in the short term.

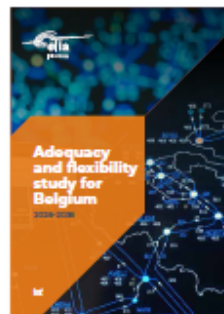
November 2023

September 2024



The study *Warmer Lichtsturm - Umgang mit Erzeugungsspitzen aus PV und Wind*, prepared within the framework of the 50Hertz Scientific Advisory and Project Board, examines the expected scope of the challenge of generation peaks from solar and wind power production. The analysis identifies a range of generation- and demand-side measures, including storage, to manage generation peaks, especially from PV. It is a conceptual short study that explores various possible solution approaches.

September 2024



The latest *Adequacy and Flexibility Study for Belgium*, which covers the period 2026–2036, identifies energy storage, amongst other technologies, as a valuable enabler of system adequacy and flexibility in Belgium's evolving electricity landscape. Significant growth in large-scale battery storage is anticipated. By 2036, large-scale batteries are expected to significantly increase their share in the contribution to fast up- and downward flexibility, depending on the future generation mix. The study underscores the need for strategic integration of storage solutions, together with flexible demand and modulation of renewables, to ensure system resilience and cost-efficiency.

June 2025

Available for download here:
https://issuu.com/eliagroup/docs/storage_for_system_strength_store_smartly_for_a_s?fr=sNDc3Yzg5NDM4MTI

Open the dialogue: We held discussions with over 50 companies, associations, universities, and think tanks



And many more.

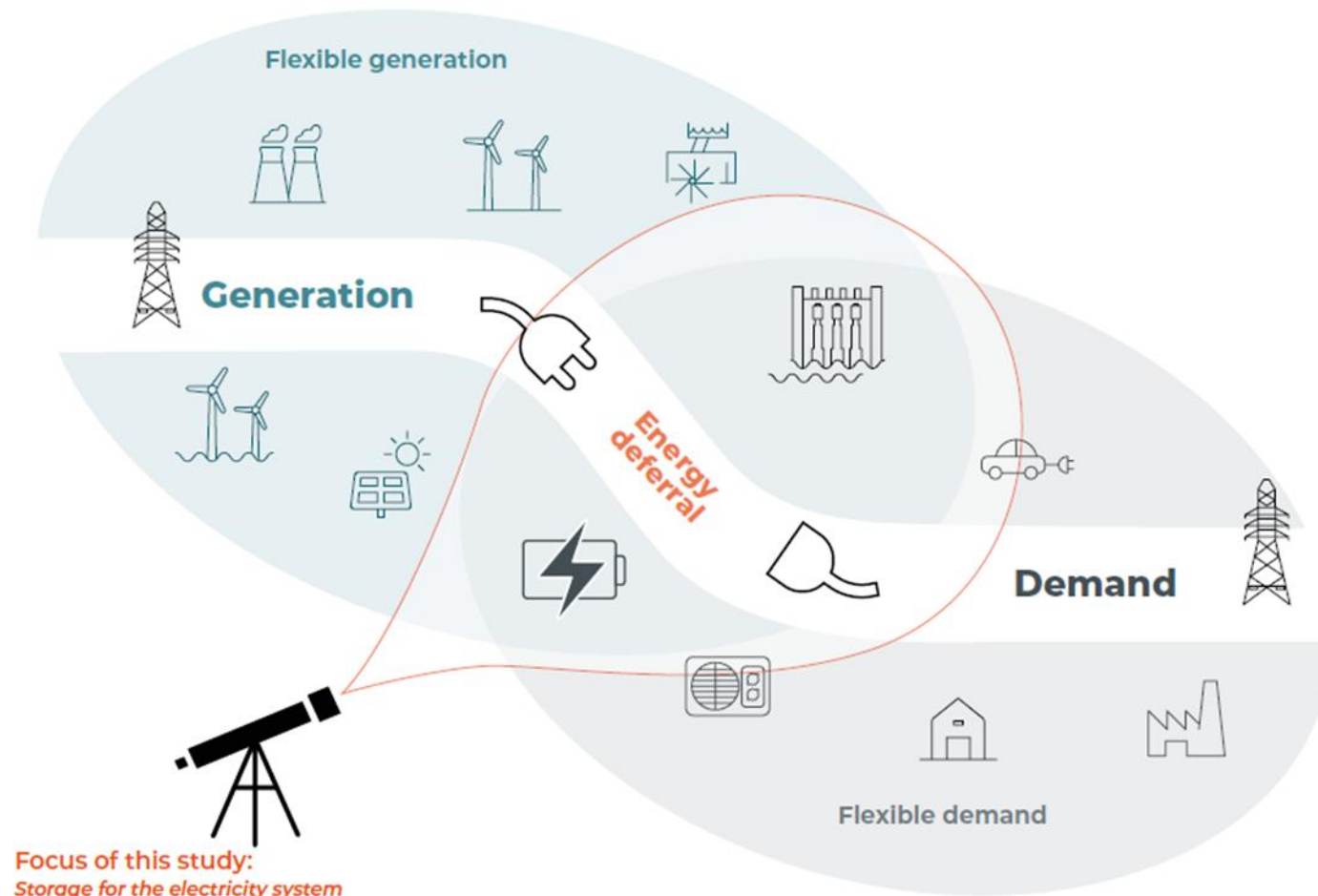
Focus of the study – Energy storage for the electricity system

EU definition of storage

Energy storage means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reversion of such energy into electrical energy or use as another energy carrier.

Study analyses

- Focuses on **battery energy storage systems (BESS)**
- Touches upon long-duration energy storage (LDES) and other technologies

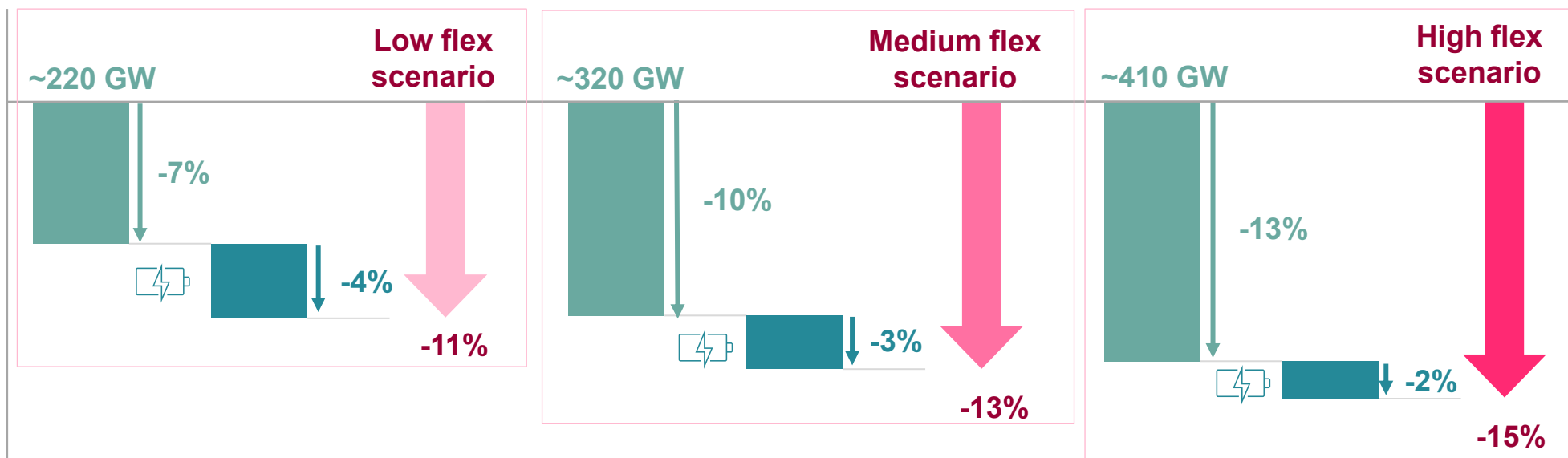


If more consumption can be turned into decentralized flexibilities, less battery storage is needed to bring down system costs.



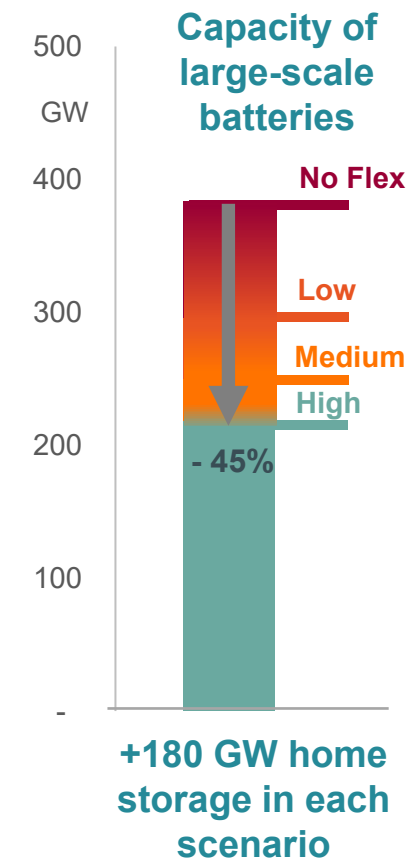
Relative cost savings in % for the European energy system for three levels of flexibility and battery deployment

Simulation result from a European expansion model for 2050.



Decentralised Flexibilities (electric vehicles, heat pumps, industrial demand)

Batteries




1 FROM VOLUME TO VALUE

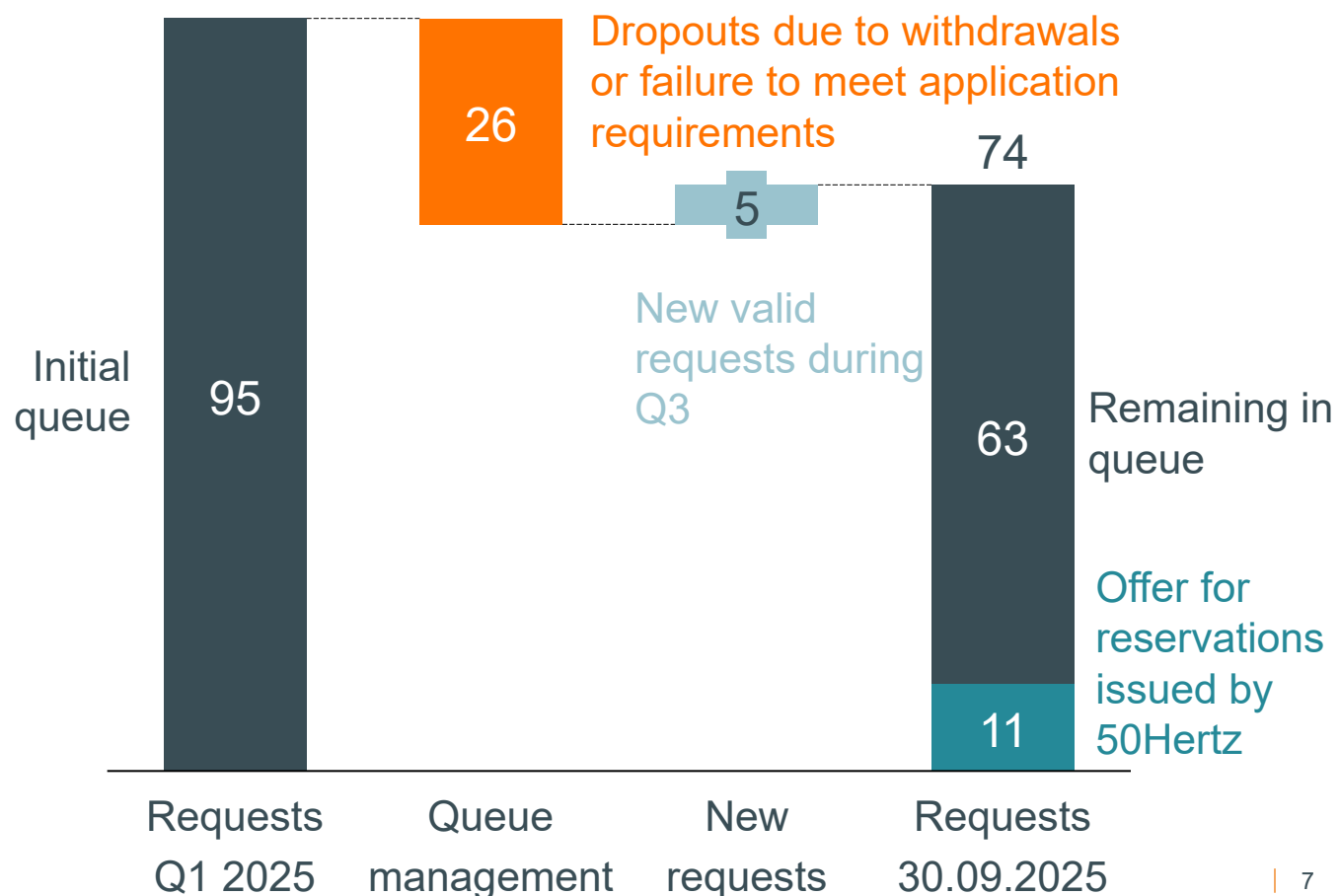


Introduce future-proofing grid connection processes

Provide clear recommendations and guidance on grid connections to:

- allocate grid connection **capacity per technology** in line with the main objectives of the Member States policies and societal ambitions
- prioritise the connection of mature projects: a “**first needed and ready, first served**” principle

 **Effect of active queue management**
for the queue length at 50Hertz in 2025 [in GW]



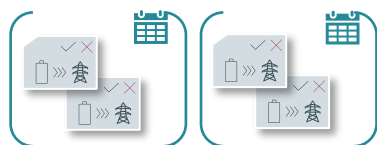
1 FROM VOLUME TO VALUE - How to move beyond ‘first come, first served’

1 | Optimised study processes

Status quo:
Individual assessments



New approach:
Batch or cluster processing



Improving:
Transparency
data reliability
efficiency

2 | Capacity allocation on societal choices



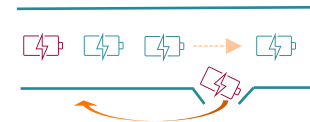
Improvement:
Align grid capacity
with societal
ambitions

3 | Active access queue management

Status quo:
First come,
first served



New Approach:
Active queue
management



Reorder based
on readiness & maturity

This illustration is only exemplary for battery storage and does not consider other technologies.

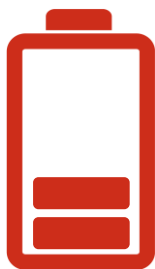
Update in Germany

Since 01/04/2026 – Maturity process for grid connections to the transmission grid published on netztransparenz.de by the 4 TSOs

Update in Belgium

On 29/01/2026 - [CREG \(BE regulator\) decision to amend the Code of Conduct](#) regarding the conditions for connection to and access to the transmission grid, including the connection procedures.

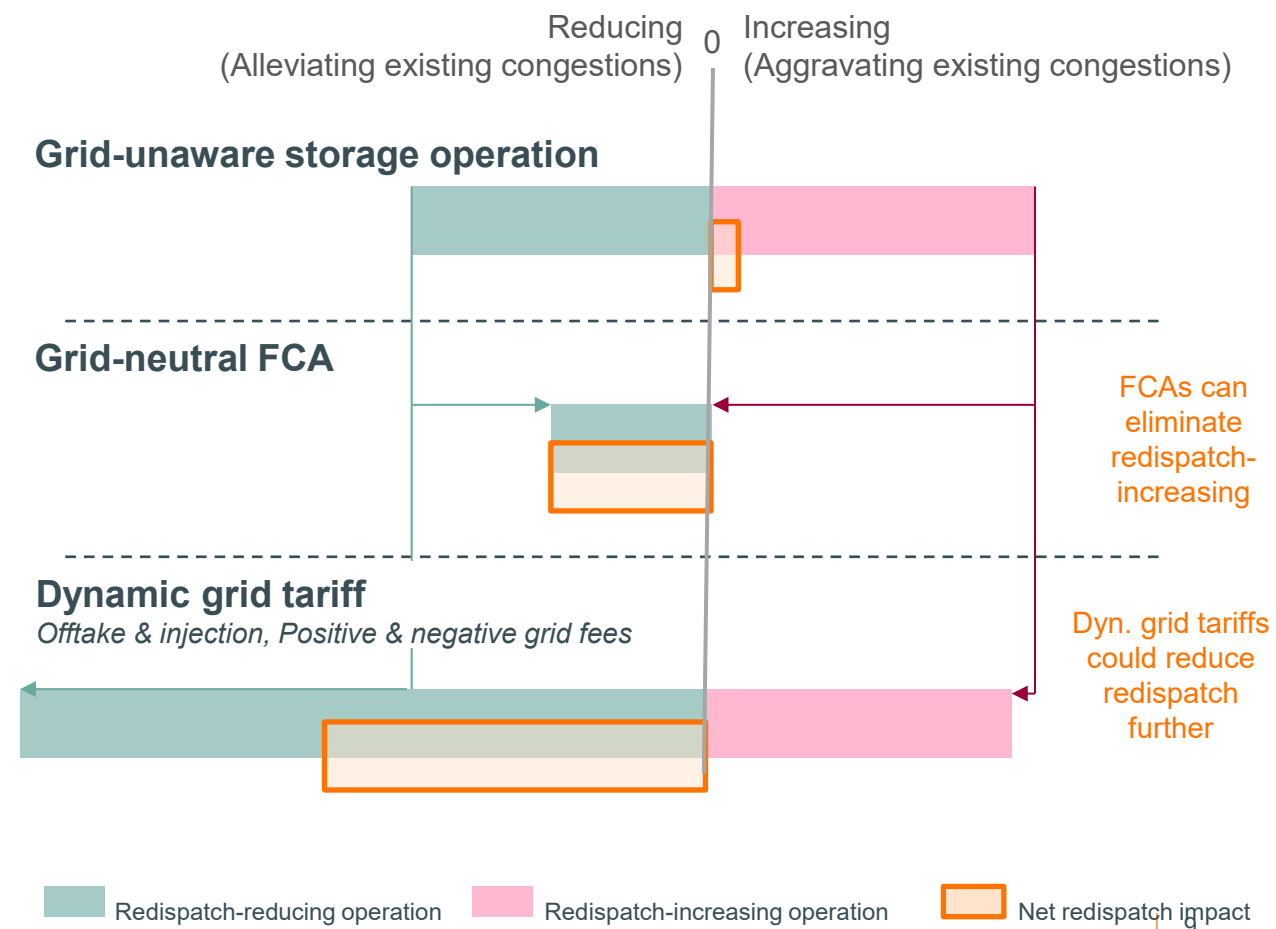
2 FROM BUILDOUT TO BEHAVIOUR



Enhance battery integration by leveraging grid and market signals

- promote grid-beneficial or at least grid-neutral operation
- provide recommendations to inspire national implementation of **Flexible Connection Agreements (FCAs)** and other instruments (e.g., contractual regulations/ restrictions) across all voltage levels, enabling faster connections while maintaining system security
- continue to investigate **temporal and locational signals** for storage systems to incentivise optimal system use.

Impact of BESS operation on redispatch in kWh/kW_{inst} in a generation-dominated region

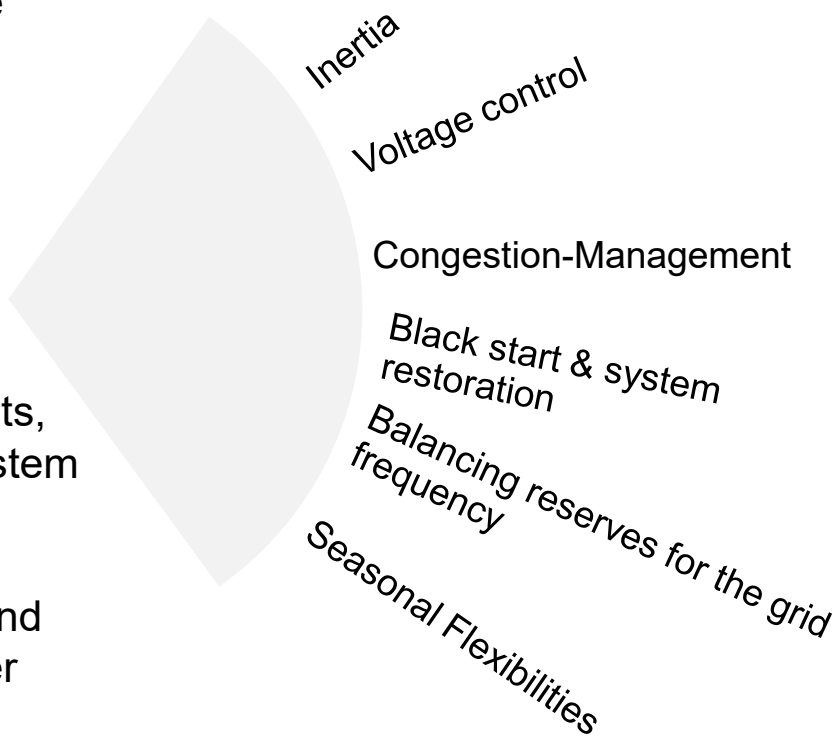


3 FROM STORAGE TO SYSTEM SERVICE



Enable storage to serve the system holistically

- step-up research and innovation funding for grid-supporting storage setups
- establish **clear technical requirements** for BESS to enable key ancillary services
- **update the Connection Network Codes**, so all grid-connected assets, including storage, contribute to system security and resilience
- unlock **long-duration flexibility** and **energy storage** in a timely manner



BESS readiness

 Grid forming (GFM) needed





 GFM





Example: procurement 50Hertz

 Since 2026

 Since 2025



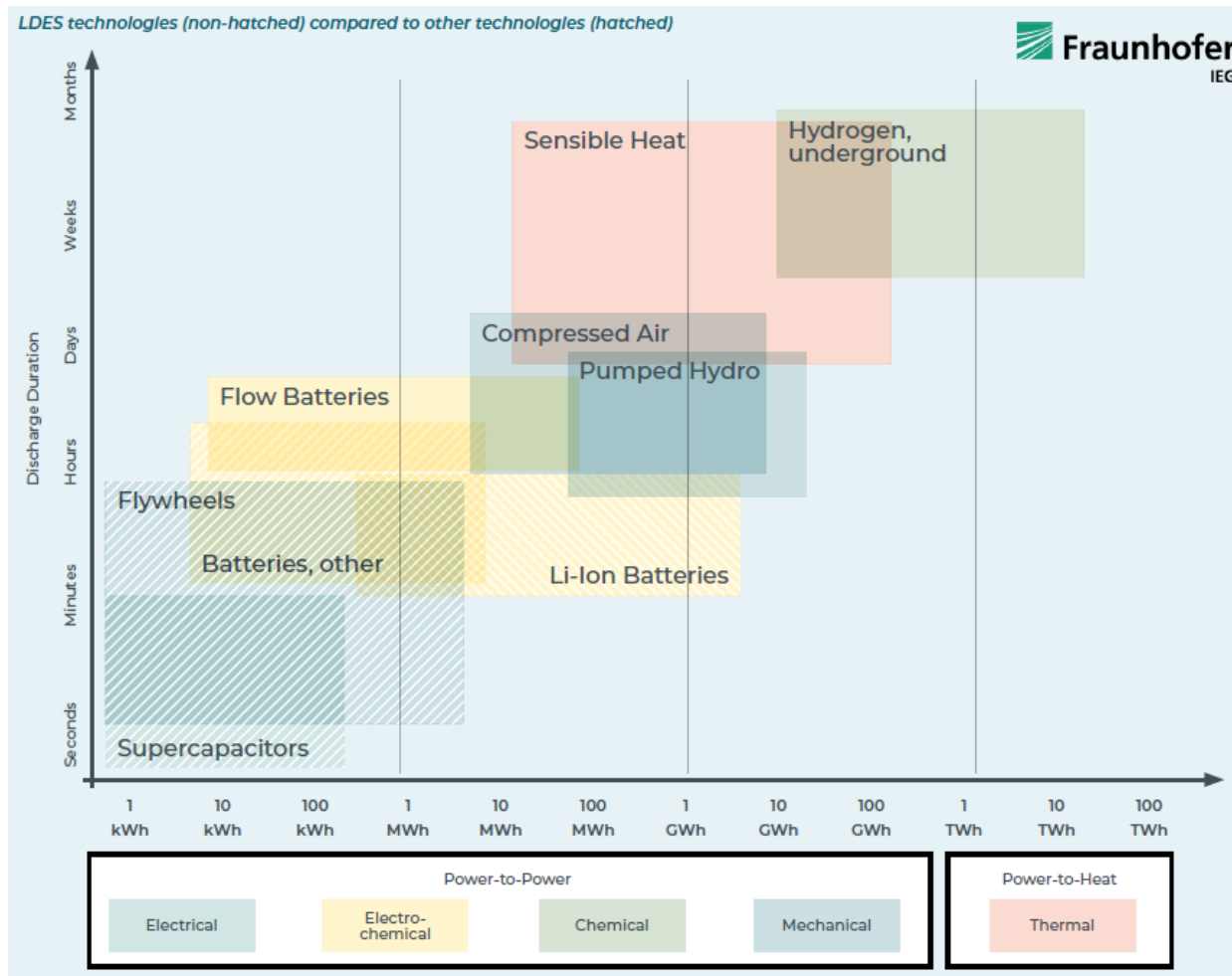
 Tender





3 FROM STORAGE TO SYSTEM SERVICE: Enabling Storage to Serve the System Holistically

Discharge durations and capacities for different storage technologies



Long Duration Energy Storage (LDES)

- unlock **long-duration flexibility and energy storage** in a timely manner to strengthen security of supply in a net-zero energy system
- contribution to system resilience during **longer periods** with little renewable energy feed-in, such as doldrums

Key Pillars of a framework for “Storage for System Strength”

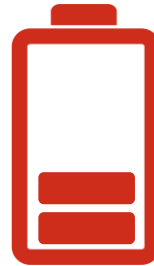


FROM VOLUME TO VALUE

Today’s grid connection process, often organised on a “first come, first served” basis, is no longer fit for purpose. Grid connection capacity should be allocated in alignment with policy objectives and the connection of mature projects should be prioritised.

A comprehensive revision of the process must address queue access management, study process, and capacity allocation in a holistic and coordinated way to ensure that limited available grid capacity is used in the broader interest of society.

GRID CONNECTION PROCESS



FROM BUILDOUT TO BEHAVIOUR

As battery storage scales up rapidly, its operation must become grid aware. Today, battery storage operates in a grid-unaware manner, as market prices do not necessarily reflect local grid situations.

This behaviour can increase redispatch costs, which in turn may necessitate additional grid buildout, leading to higher grid tariffs. Flexible Connection Agreements, introduced in the Electricity Market Design Reform of 2024, along with temporal and locational grid tariffs can provide grid signals to promote grid-neutral behaviour or even incentivise grid-beneficial operation.

GRID SIGNALS



FROM STORAGE TO SYSTEM SERVICE

Storage is a key pillar of the energy transition and must evolve from a market-driven role to providing essential system services, alongside renewables and other technologies.

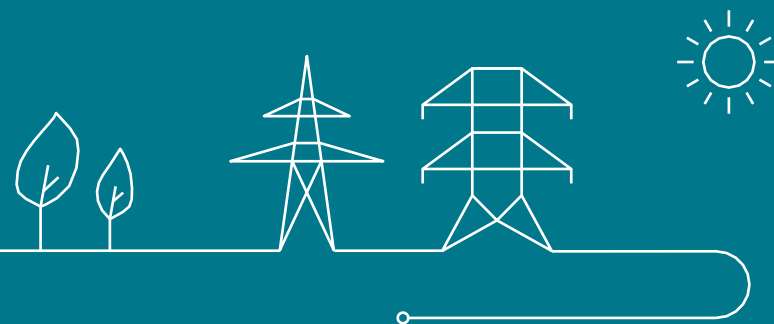
Yet storage alone cannot deliver the full solution, we also need demand-side flexibility and renewable generation modulation. One critical gap remains: long-duration storage, which is indispensable for maintaining system resilience during extended periods of low renewable output, especially as the share of thermal power plants declines.

SYSTEM SERVICES

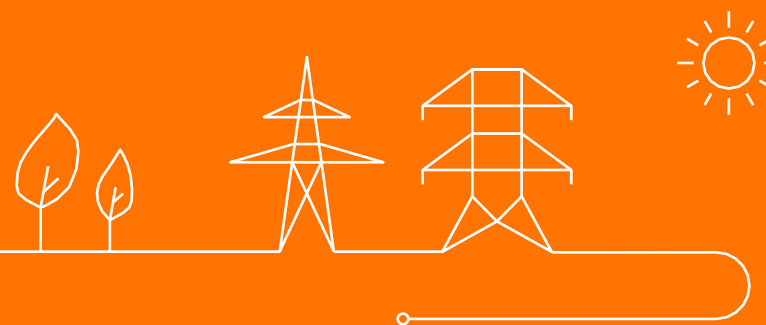
Thank you for your attention!

Questions?

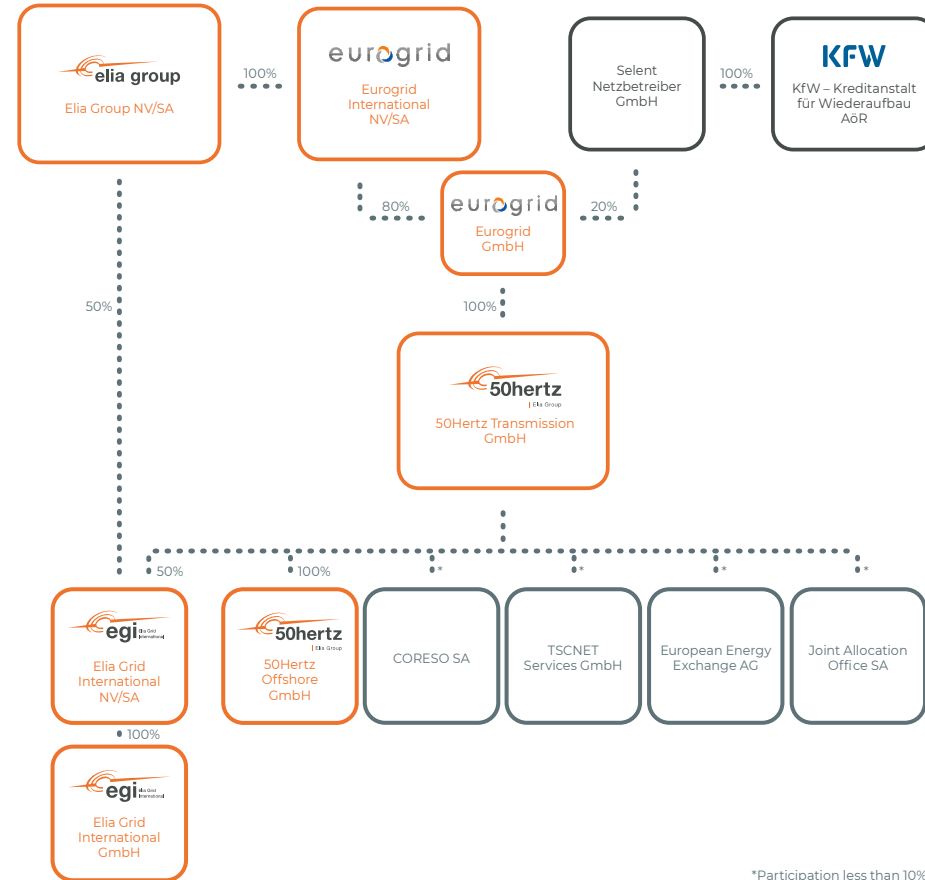
Link to the study



Back-Up Slides



One of four German TSOs & part of the Elia Group



*Participation less than 10%

Quantity of electricity
transported in 2025
110.5 TWh



Our transmission system

We operate an extra high-voltage electricity transmission system. In the east of Germany and in Hamburg, we are responsible for the reliable transmission of electricity over long distances, the connection of offshore wind farms, and for distributing electricity via substations. In 2025, the total length of 50Hertz's transmission system was over 10,700 kilometres.

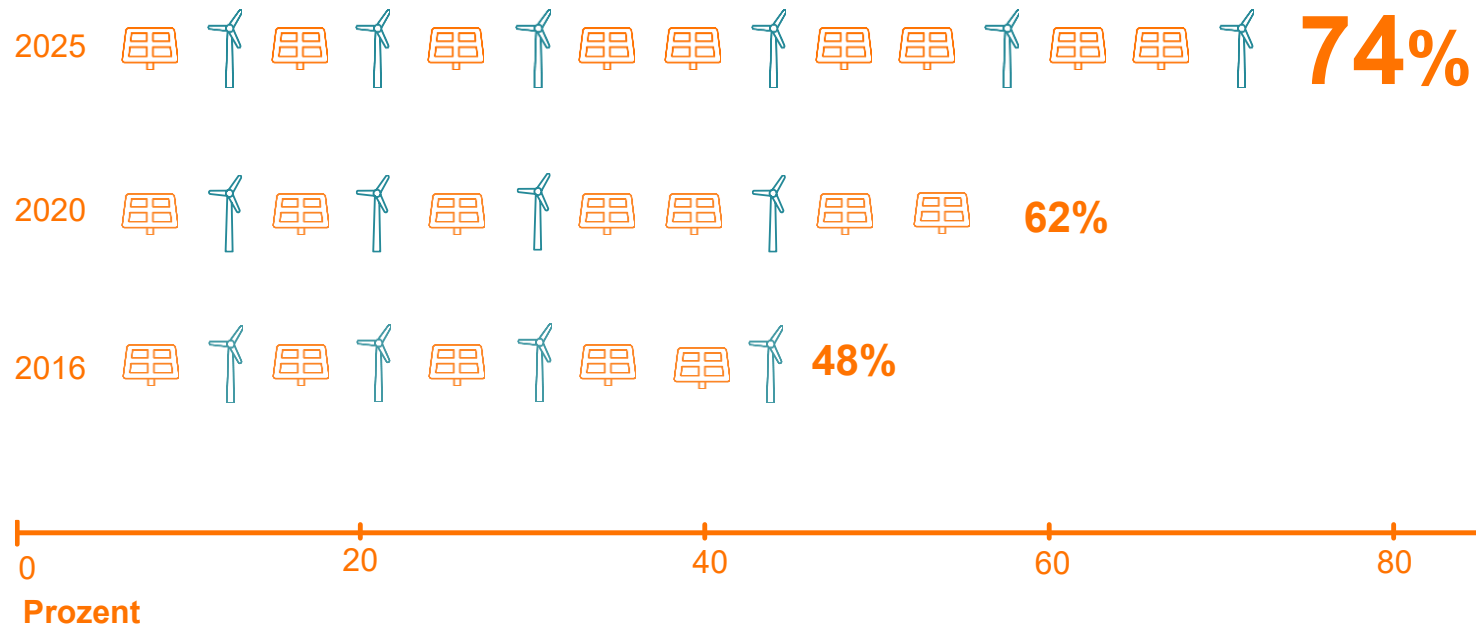
50Hertz offshore circuit lengths in 2025 (total values):

220 kV AC sea cables	560 km
150 kV AC sea cables	290 km

circuit lengths in 2025 (total values):

380 kV AC overhead lines	7,835 km
220 kV AC overhead lines	1,950 km
380 kV AC cables	55 km
400 kV DC cables (HVDC)	15 km
220 kV AC cables	3 km

50Hertz increases investments for a climate-neutral society



RE generation 2025

69 TWh

Electricity consumption
2025

93 TWh