Symposium

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Energy storage within the scope of the Dutch Energy System

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Symposium: *"50 years Energy Storage Technology Collaboration Programme"*
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Introduction to Alliander

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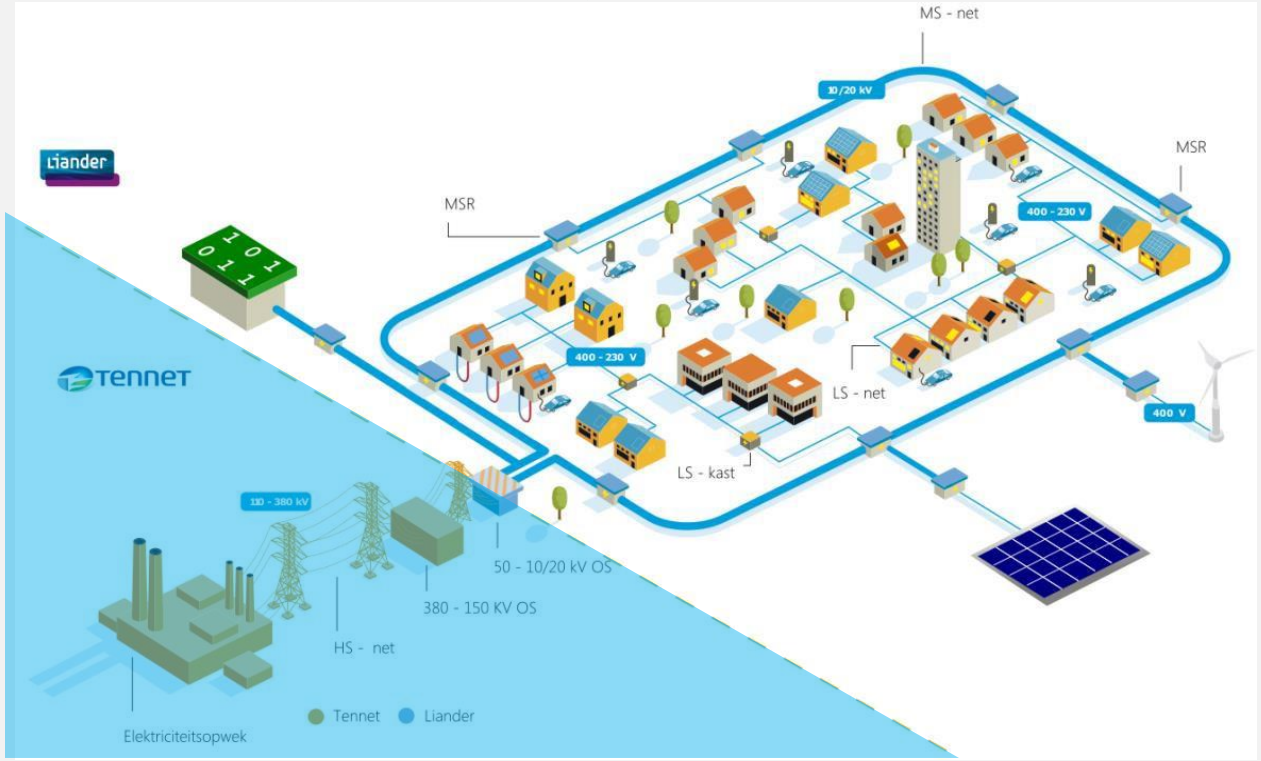
One of the largest grid operators in NL serving:

- 3,4 million small-scale connections (max 3x80A)
- 36.000 large-scale connections (>3x80A)

Grid operators are highly regulated in NL: strict separation of production/supply and grid operation.



Major trends in the Dutch energy system ask for large investments as well as flexibility

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Electrification

- Higher peak demand

Decentralized generation

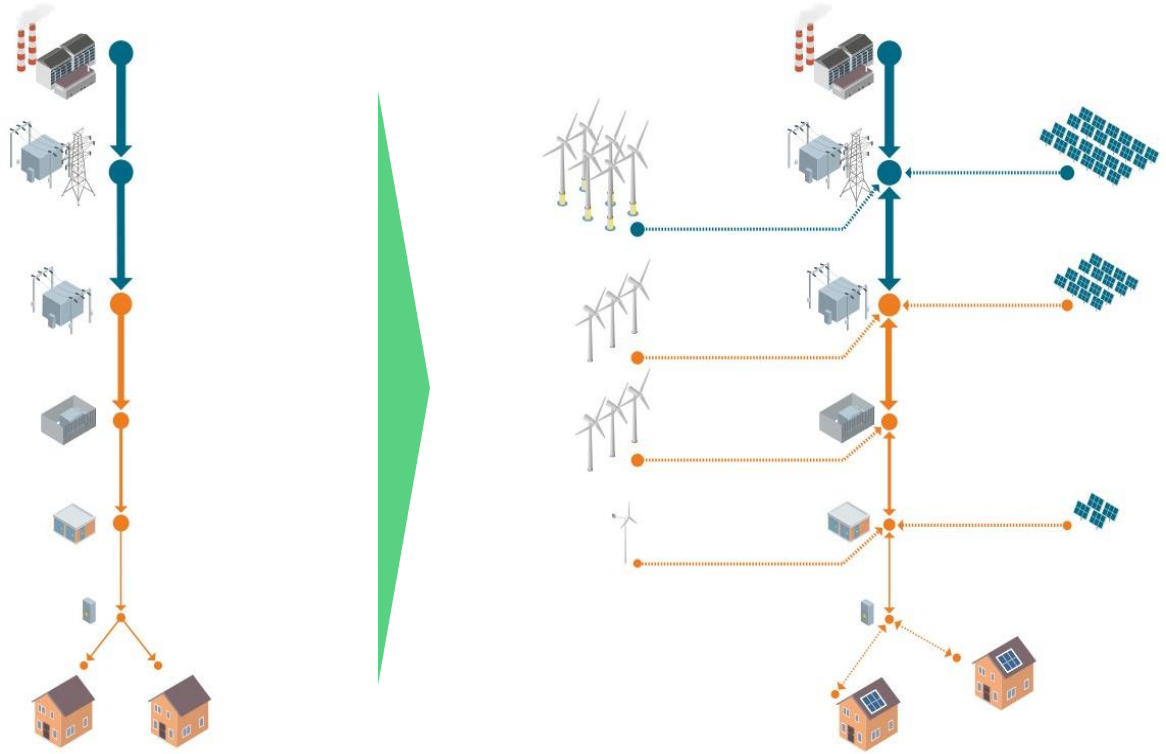
- Intermittent generation (PV, wind)
- More surplus and shortages, high price volatility, more imbalance

Large grid investments needed

- Congestion issues in large parts of NL
- Investments lead to rising grid fees

Centralized
electricity production

Decentralized
electricity production



TSO
DSO

Investments in the grid are higher than ever
However, intensified investments are not enough

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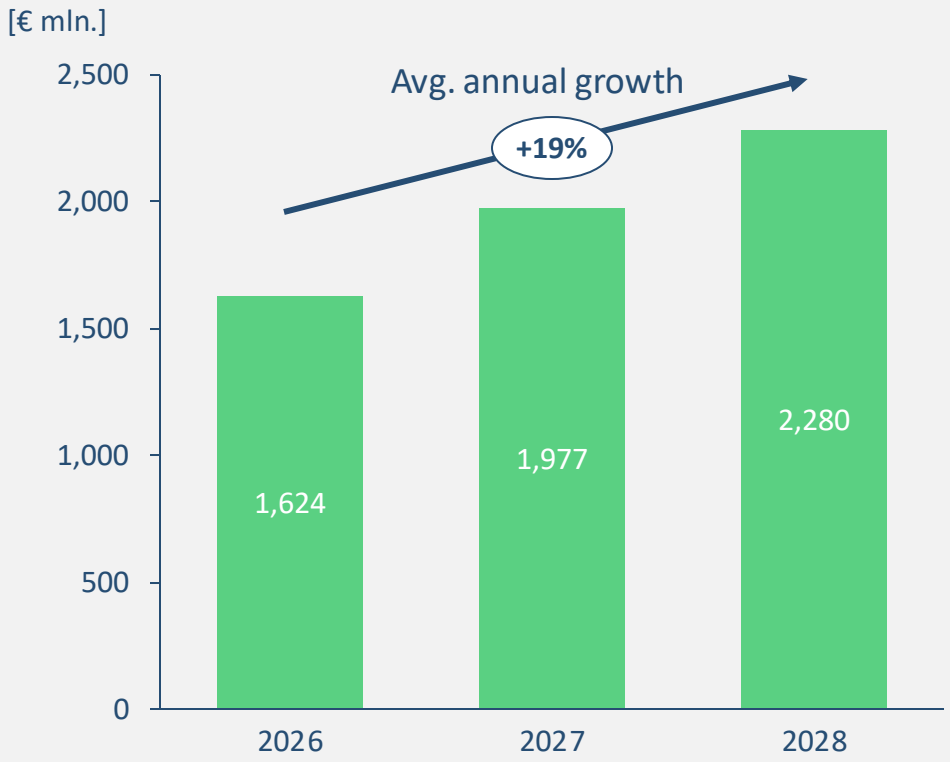
Electricity grid investments are larger than ever…

(Alliander, 2026-2028)



…but will not fully meet demand; flexibility is crucial

- **Further grid investments** to fully meet demand are **undesirable**: inefficient and infeasible
- Consequently, **customers** will face (longer) **waiting times** for new or larger connections
- **Flexibility solutions**, like battery storage, are key to efficiently meet demand

Source: Liander investment plan 2026-2028

Preference for battery systems to be at least ‘grid neutral’ and ideally ‘grid positive’

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‘Grid negative’

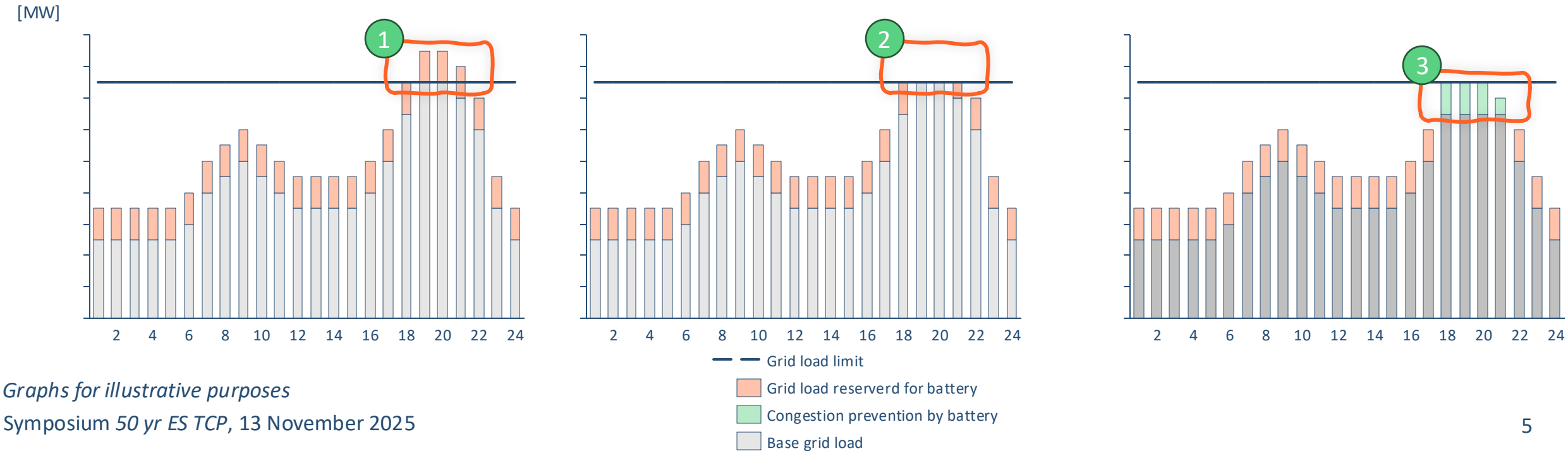
Using traditional contracts, the needed grid capacity increases when batteries are connected to the grid

‘Grid neutral’

During moments of peak demand, the contracted capacity for storage is reduced to **prevent congestion.**

‘Grid positive’

During moments of peak demand, storage systems are activated to counter the peak loads and **reduce congestion and connect other customers**



Graphs for illustrative purposes

Specifics for small-scale connections (homes and small businesses)

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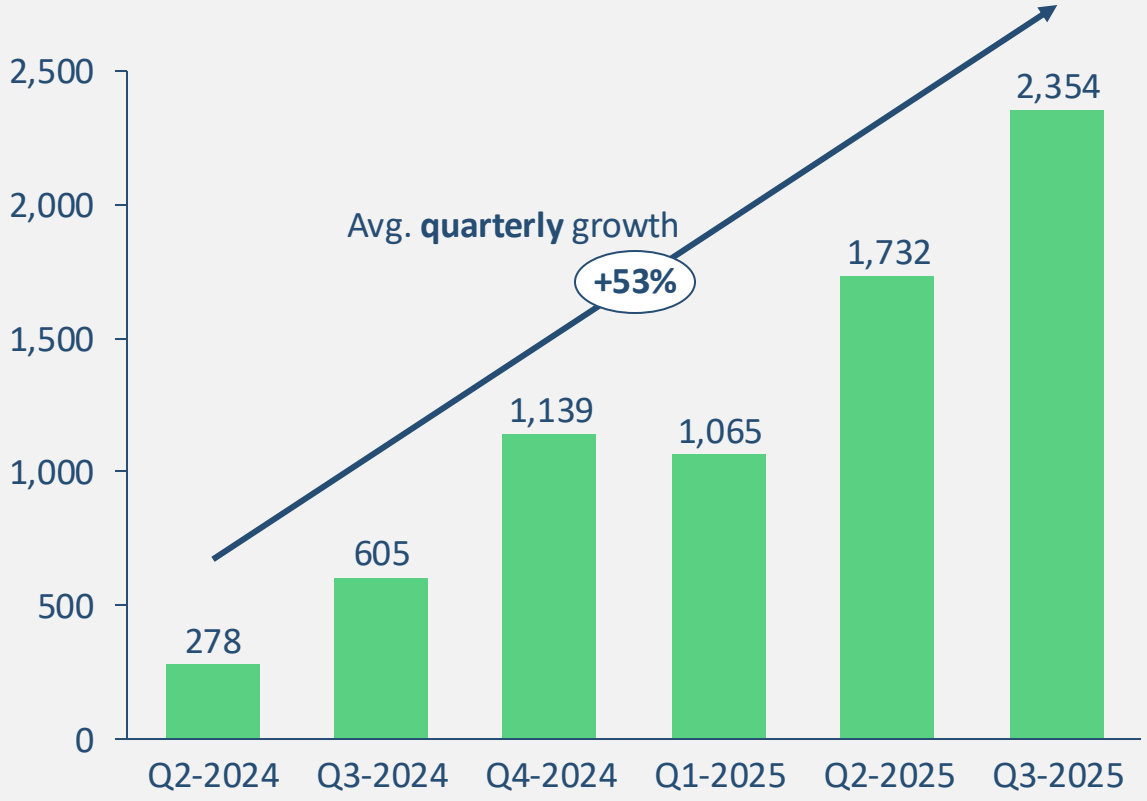
- Large growth in residential batteries
- Further growth expected as net-metering ('saldering') stops in 2026

Effects on the grid:

- Self consumption batteries are '**grid neutral**' by definition.
- Energy trading has a (small) risk of increasing peaks but also potential to reduce grid loads.
- NL Flex pilot in winter 2025/2026 to test '**grid positive**' signals to EV, PV, Heat pumps and batteries.

New registered residential batteries – Alliander



Source: EDSN / Energieleveren.nl, also includes batteries at small commercial connections
CQGR (Compound Quarterly Growth Rate) = average quarterly growth in new registrations.

Specifics for large-scale connections

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Effects on the grid:

- Congestion management contracts available to ensure '**grid neutral**' batteries.
- Next step: new contracts (CSC) are being developed to add **'grid positive'** batteries to the system.

Current situation for Alliander :

- 419 storage projects on the waiting list:
  - 1400MW of capacity requests for energy use
  - 730MW of capacity requests for feed-in
- 80 storage projects applied for 'grid positive' contracts.

Examples of barriers:

- Development and deployment of new contract types
- Complex congestion situations, especially where both TSO and DSO have congestion
- Grid tariffs are high; developers need contracts with attractive incentives
- Grid operators need certainty that batteries can structurally solve congestion before connecting extra customers
- Provinces and municipalities are hesitant in permit procedures when grid impact is uncertain

NL share in European BESS market is expected to grow from 5% in 2025 (~1,5GWh) to 7% in 2029 (~8,3GWh)

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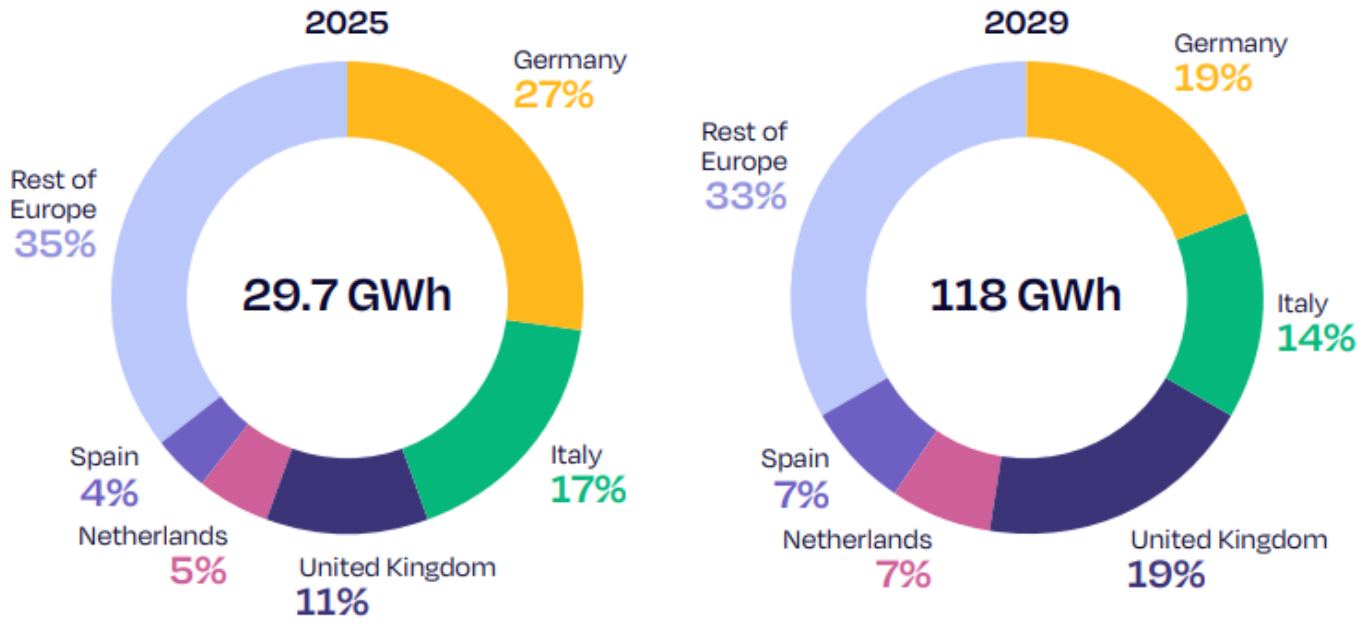
Top 3 countries to install half of Europe's batteries in 2029, but their market share is diluted by more countries

Europe top 5 BESS markets 2025-2029



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- Installed BESS capacity in Europe expected to quadruple between 2025 and 2029
- Currently NL has 5% of installed capacity in Europe, expected to grow to 7% in 2029: primarily driven by new contracts focused on grid neutral and grid positive contracts for large scale battery systems.
- Residential batteries also expected to grow rapidly due to ending of 'net metering'

Source: European Market Outlook for Battery Storage 2025-2029

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The Energy Storage TCP

Thank you for listening!

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