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Storage economics Insights from Electricity Market Outlook modelling

Renewable & Storage Forum

October 2025

INTRODUCTION

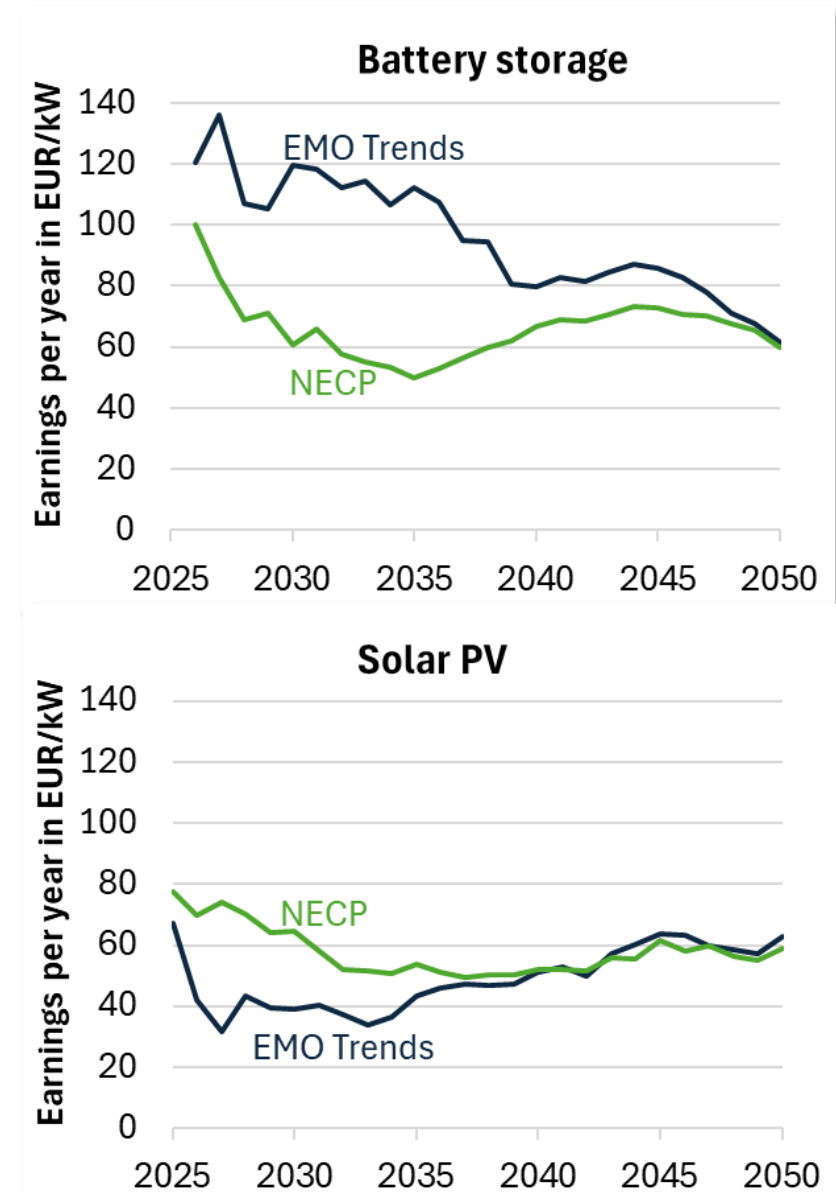
- Moving to climate neutrality: Electricity sector will decarbonize faster than any other energy sector.
- Very large shares of variable renewables sources by 2030 (>70%)
- Large shares of renewables specific levels of flexibility
- Governments and markets recognize storage's strategic role in the transition
- But storage economics face many challenges. Modelling can provide valuable insights



STORAGE AND SOLAR PV: COMPLEMENTARY BUT WHAT IF MISMATCHED?

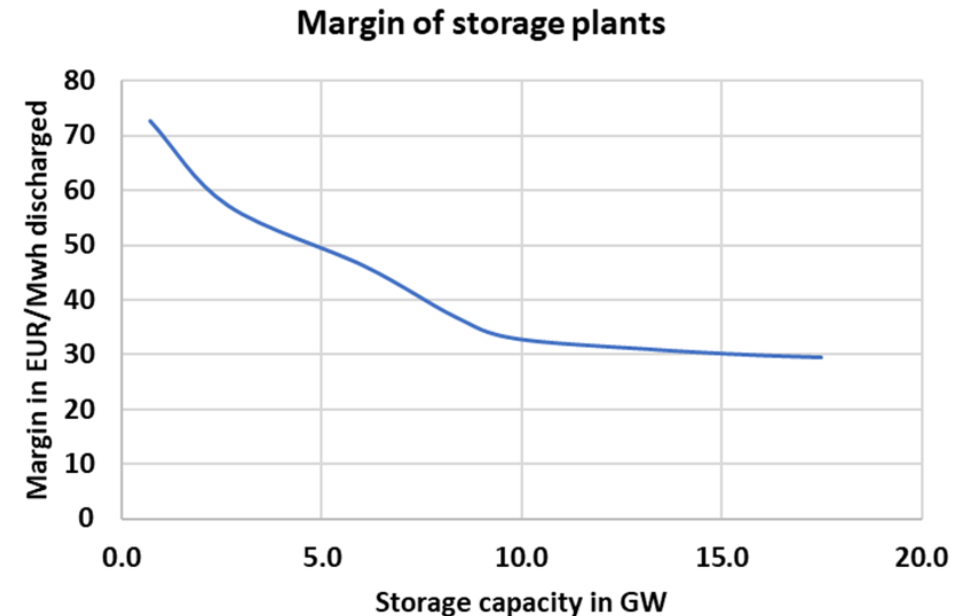
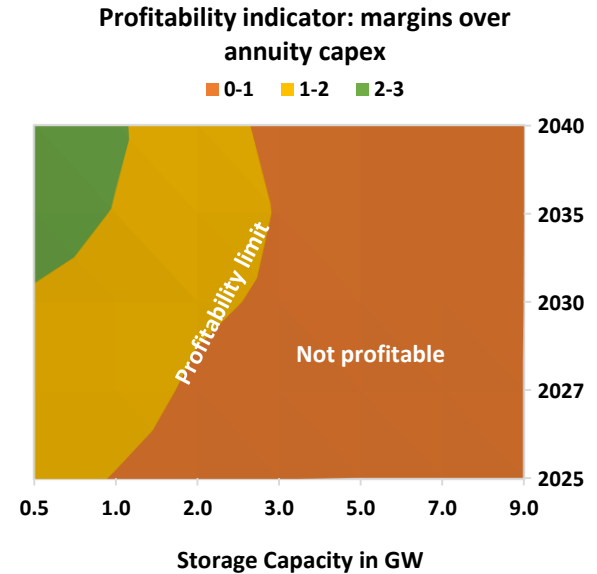
- If **storage** is less than needed to exploit **solar energy**:
 - Curtailment, declined revenues and lost value for solar investment
 - Storage investments excel
- If **storage** capacity increases faster than **solar energy** :
 - Market-price curves tend to flatten, thus reducing arbitrage revenues and eroding the market value of storage investments
 - Induces increased solar energy capture prices

In the “*EMO Trends*” scenario – which reflects current market trends – storage develops less than needed for solar PV contrasting the NECP scenario, where both develop optimally

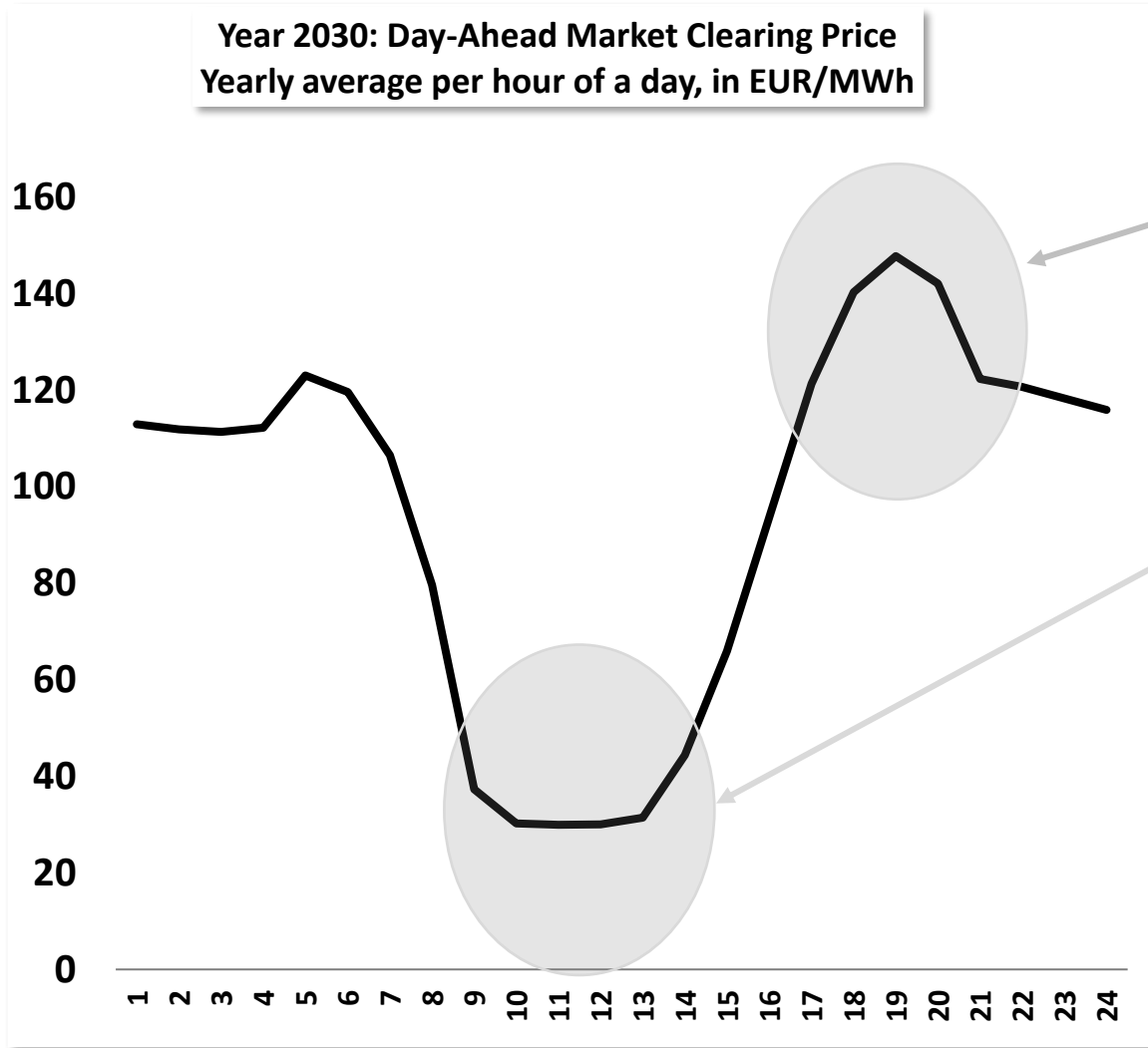


THE ABSENCE OF “FIRST MOVER ADVANTAGE” FOR STORAGE DISCOURAGES EARLY INVESTORS

- First movers take the risk but not the reward as in other markets.
 - First movers will have higher margins,
 - But high revenues last only till market saturation
 - No “cost of new entry” for newcomers
- Storage technologies economics paradox
 - On one hand, the system (consumer) benefits from high and voluminous storage → integrates more renewable electricity and reduces total system costs.
 - On the other hand, the more storage is entering into a system the more the daily SMP curve is flattened therefore arbitrage is reduced along with the profitability of storage investors.



REVENUE STREAM 1: ARBITRAGE



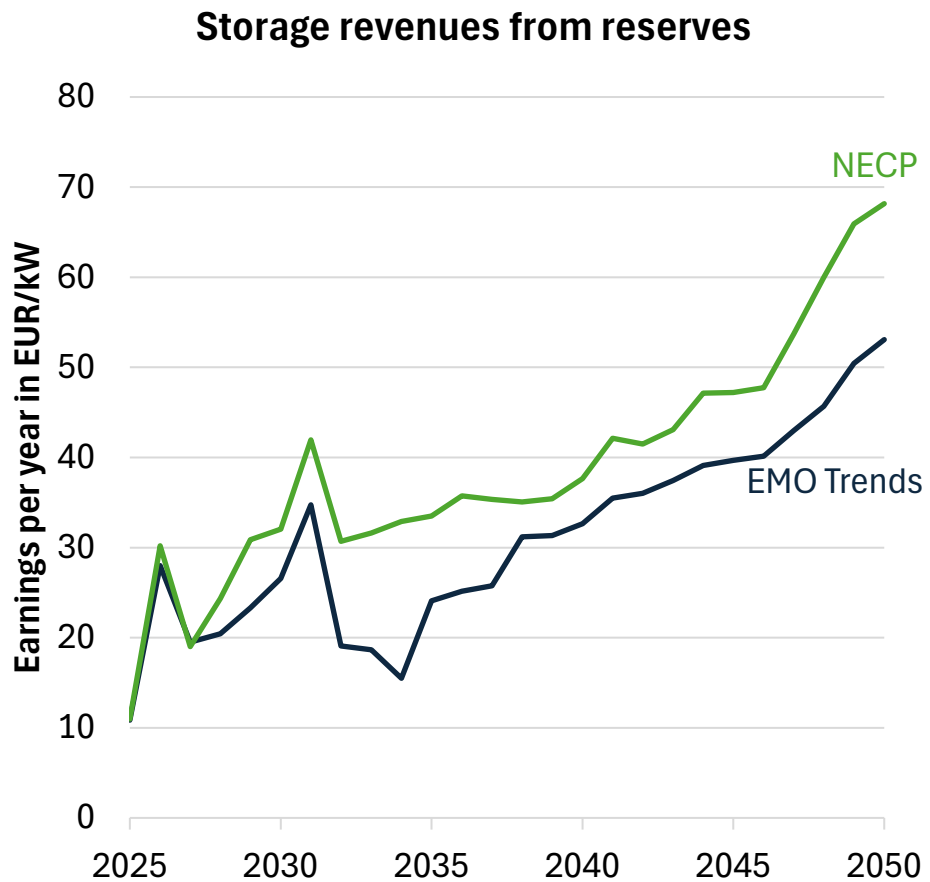
Discharging at peak: Price level usually driven by gas price, ETS price, wind, demand response etc.

Charging at valley: Price level depends on the development of solar, overall storage levels, neighboring countries exports/imports

Plenty of scenarios to examine: Average spread can vary from 20 – 120 EUR/MWh

Too many uncertain factors for a bankable business case

REVENUE STREAM 2: ANCILLARY SERVICES



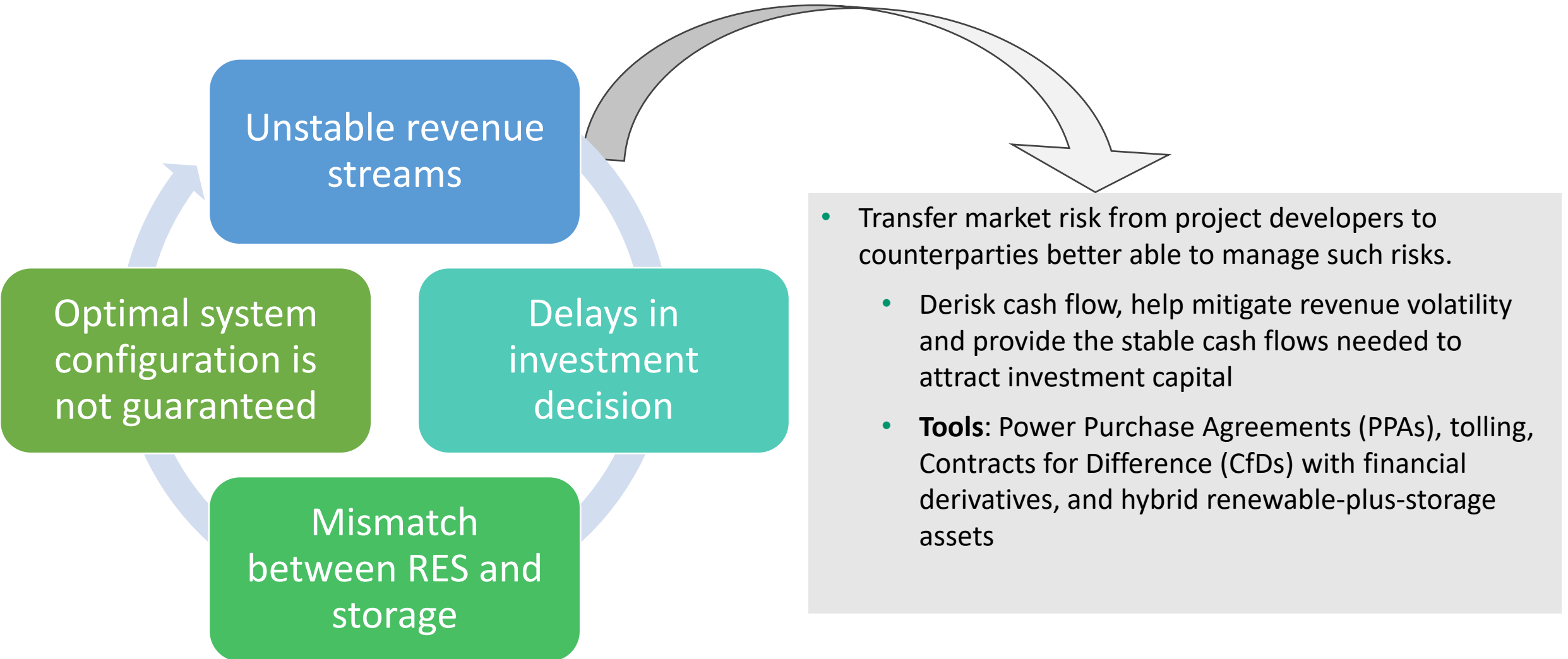
- Increasing RES and demand → Demand for reserves rising.
- Resources that provide ancillary services are becoming more scarce

BUT

- Prices are still low, e.g. for FCR, that storage excels.
- Some valuable ancillary services are not remunerated efficiently from the existing balancing market → **Missing market problem**

A more open and competitive balancing market will maximise the value of battery storage, improve its revenue streams, reduce system costs, and enhance overall energy security

BREAKING THE LOOP



Conclusions

- Lack of centralised coordination → lower overall system efficiency and unstable revenue streams.
- Diversifying revenue streams beyond wholesale markets strengthens resilience
- Investment decisions require multiple overall market and system simulations, not just asset level assessments

ELECTRICITY MARKET OUTLOOK



Full EU market modelled

By modelling all EU countries jointly, our country level projections incorporate factors such as cross border trade, interconnectors and neighbouring country market dynamics.



Providing you with the full market story

Comprehensive range of energy market data

De-code data into actionable insights and projections that tell a coherent story

Constantly monitor the market to quickly identify and address changes impacting your business



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