

**ENERGY
STORAGE**
Global Conference
BRUSSELS, 15 - 17 October 2024

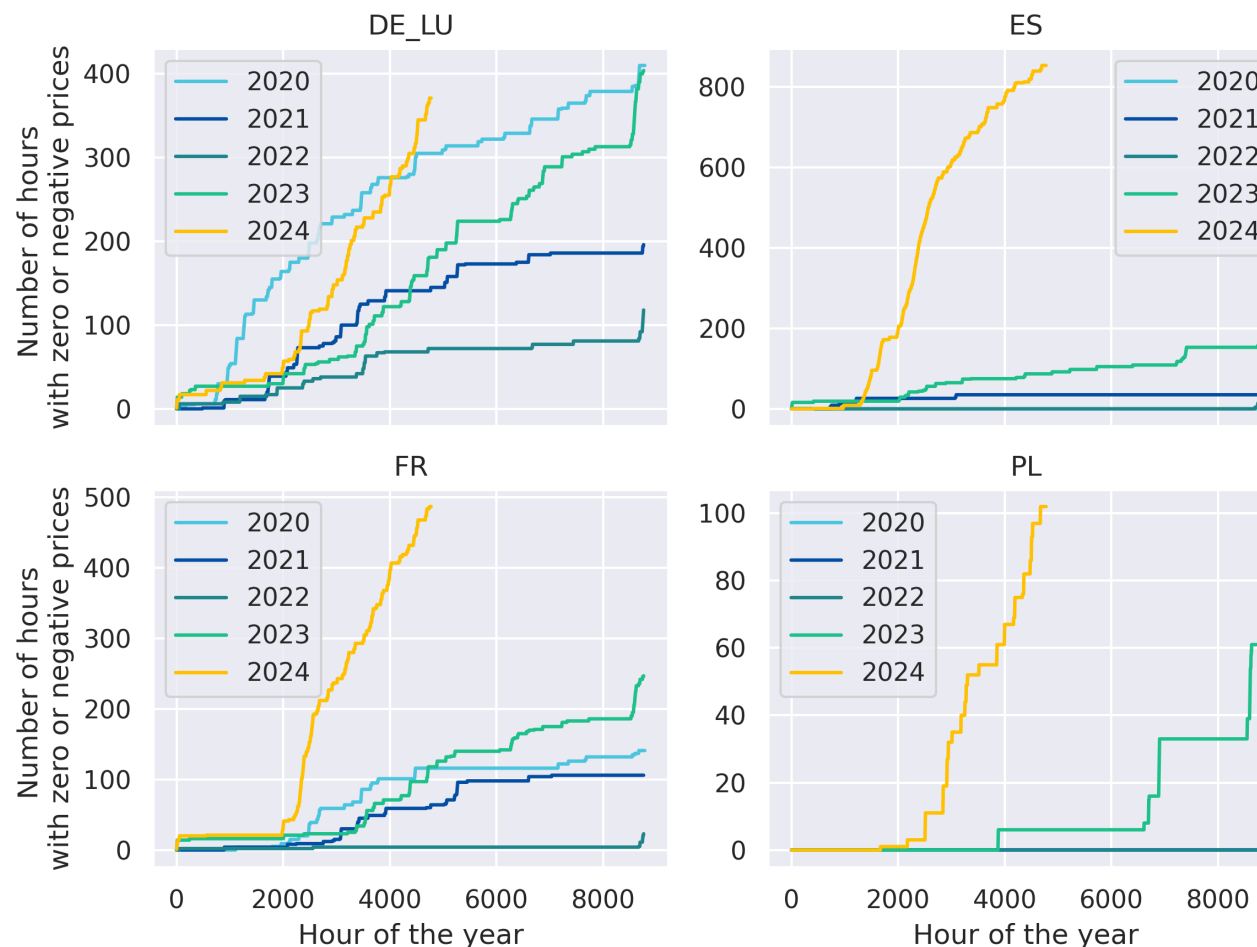
The challenge of renewable curtailment in Europe

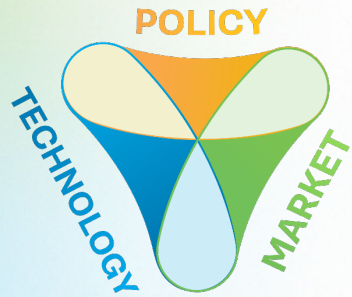
Georg Thomaßen
Joint Research Centre of the
European Commission



Background

- Unprecedented volumes of zero prices in the European power markets in 2024.
- Substantial increase in redispatch volumes in 2023 hints at increasingly congested grids.
- If trends continue, increasingly substantial renewable curtailment in market (zero prices) and in the grids (as part of redispatch) will occur





ENERGY STORAGE

Global Conference

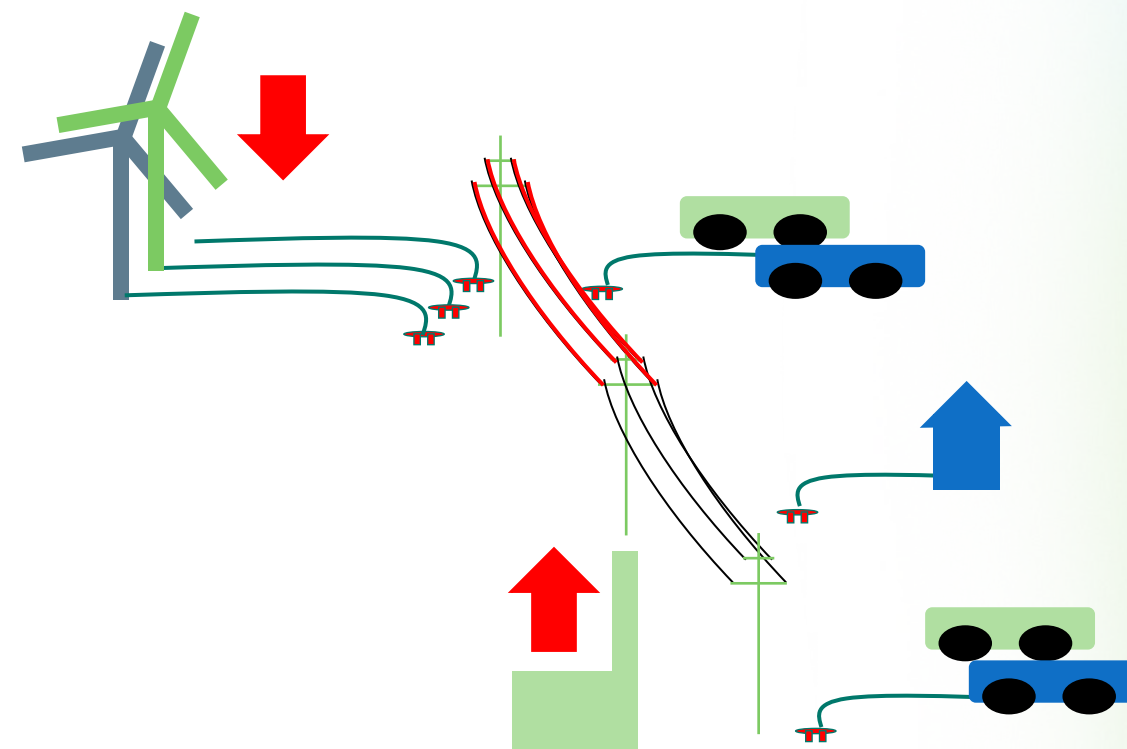
BRUSSELS, 15 - 17 October 2024

Grid-based curtailment

Bringing together the
world of **energy storage!**

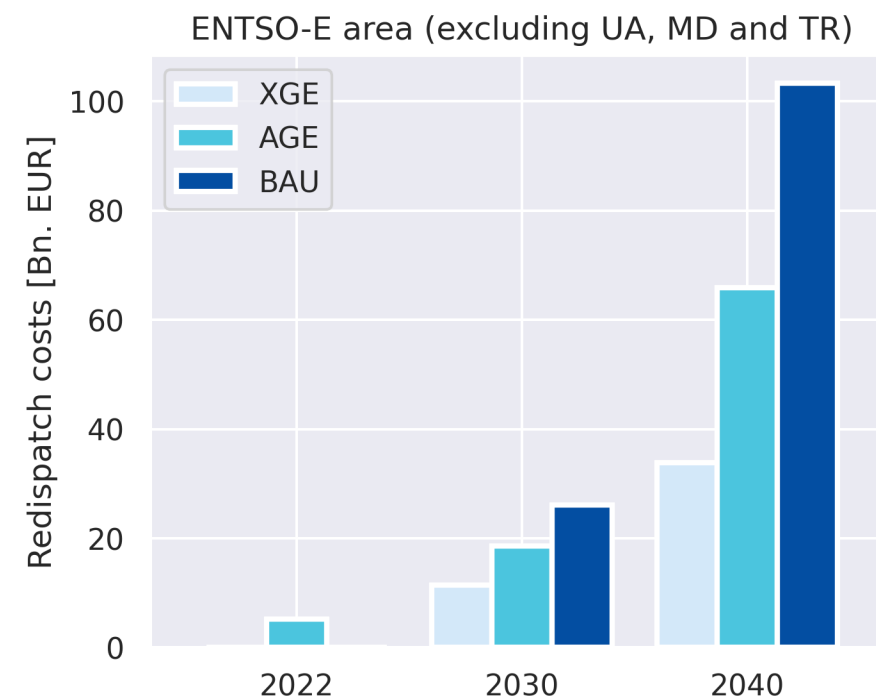
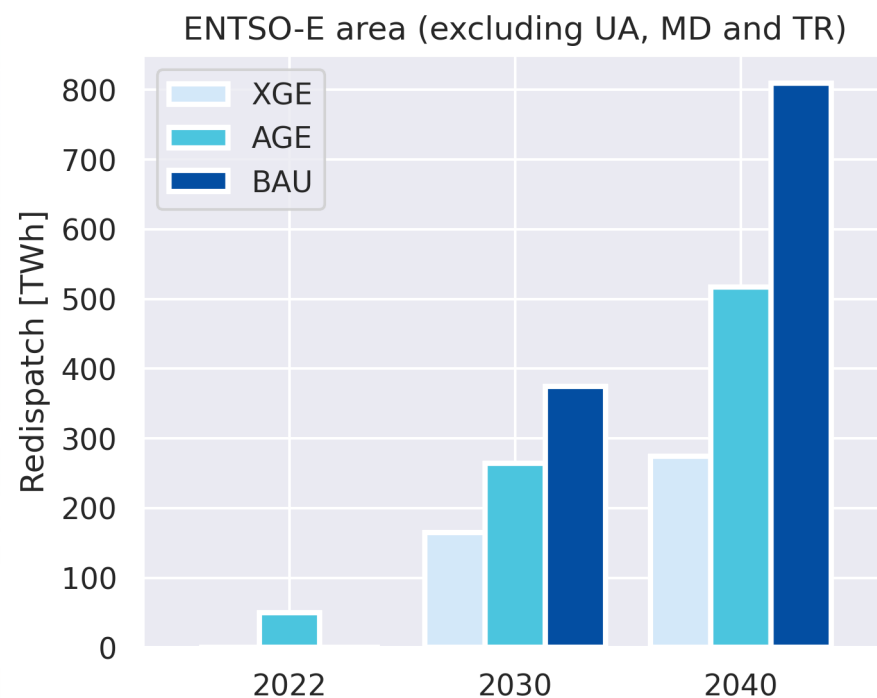
Redispatch

- Assumption of European market: Electricity can flow freely inside one market zone (copper plate).
- If generation focused in one region (e.g. large renewable potentials), while demand is focused in another, transmission needs can regularly exceed grid capacity.
- Redispatch: Generation in surplus region is reduced and financially compensated. More expensive power plant closer to demand increases generation.
- Represents a distortion of the market at high costs for consumers (4 Bn. EUR in 2023) and more CO2 emissions.



Source: (Neuhoff, 2023)

JRC assessment: Redispatch is likely to increase massively



...and lead to substantial renewable curtailment

- In 2040 between 100 and 310 TWh of renewable generation are estimated to be at risk of being curtailed due to bottlenecks in the grid.
- Warnings were echoed by Draghi's report on European competitiveness.



THE FUTURE OF EUROPEAN COMPETITIVENESS – PART B | SECTION 1 | CHAPTER 1

15 von 328

This asymmetric deployment may massively increase the need for redispatch (adjusting generator schedules to achieve a physically feasible dispatch). **Up to 310 TWh of renewable generation could be curtailed due to these limitations in the grid by 2040.** This is up to ten times higher than in 2022. Redispatch costs could range from between EUR 50 billion to 100 billion by 2040, more than 20 times higher than in 2022^{xiv}.

Policy options to address grid congestion



ENERGY STORAGE
Global Conference
BRUSSELS, 15 - 17 October 2024

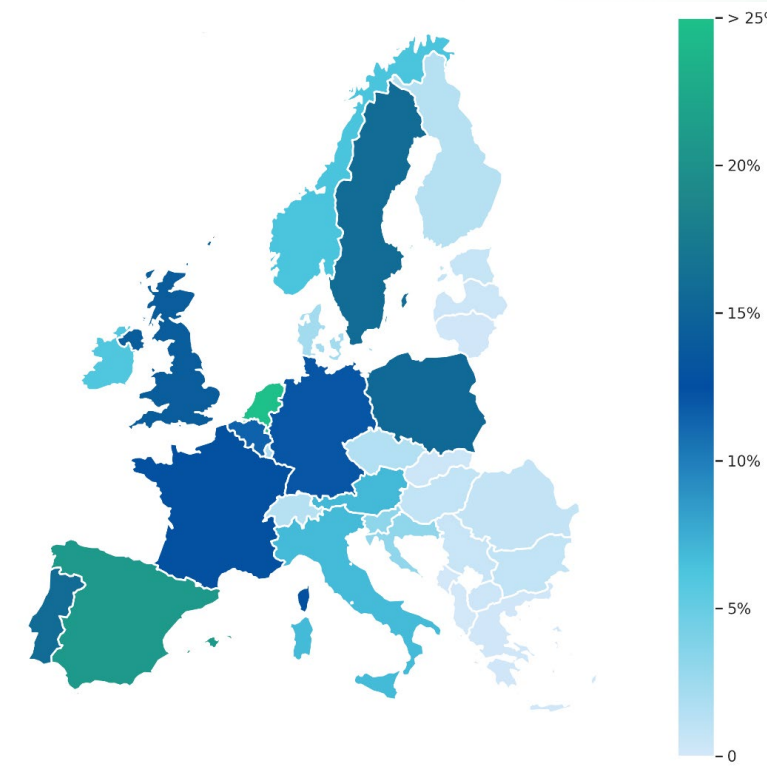
Investment: Steering better where we build infrastructure

- Adding locational component to existing and planned auctions (renewables, capacity markets, hydrogen) = no regret option.
- Locational grid charges.

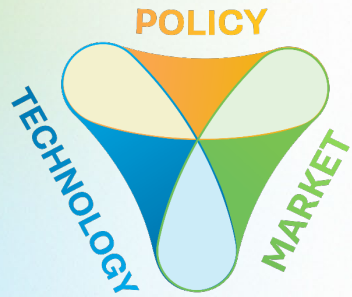
Operations: Optimizing how we dispatch

- Bidding zone splits can reduce congestion if they better represent the grid's physical reality.
- Locational marginal pricing can achieve far-reaching alignment between market operations with physical reality.

Investment *and* operational incentives need to be addressed



Redispatch volumes as share of total demand.
AGE scenario 2040.



ENERGY STORAGE

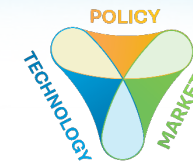
Global Conference

BRUSSELS, 15 - 17 October 2024

Market-based curtailment

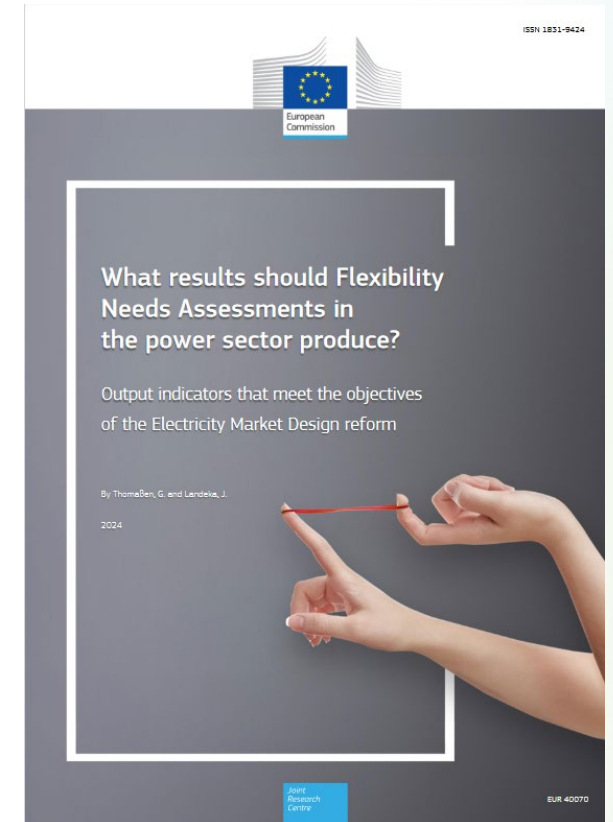
Bringing together the
world of **energy storage!**

Background :Flexibility Needs Assessment

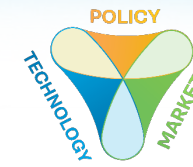


**ENERGY
STORAGE**
Global Conference
BRUSSELS, 15 - 17 October 2024

- EMD calls for the implementation of Flexibility Needs Assessment to assess how much flexibility (mainly storage and demand response) is needed to achieve decarbonization and supply security objectives.
- Currently, ENTSO-E and EU DSO draft Methodology, which ACER will amend/accept afterwards.
- JRC is consulting ACER throughout the process.
- Recent publication on which outcomes this assessment should produce

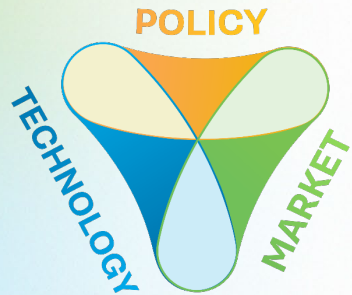


JRC proposal for the new Flexibility Needs Assessment



**ENERGY
STORAGE**
Global Conference
BRUSSELS, 15 - 17 October 2024

- **Full and detailed modelling exercise** necessary to fully capture inflexibilities in the system and derive meaningful flexibility needs.
- Should identify inefficiencies related to the provision of (1) clean electricity, (2) electricity in general and (3) reserves.
- Member States need to **define renewable integration target/curtailment standard** (similar to LOLE standard in adequacy assessments) to identify flexibility need for decarbonization. Only if a target exists, we can identify the flexibility needed to meet it.
- Gap analysis: Identify **how much flexibility Member States should procure** to plug the gaps.



ENERGY STORAGE

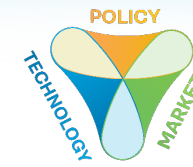
Global Conference

BRUSSELS, 15 - 17 October 2024

Conclusions

Bringing together the
world of **energy storage!**

Key take aways



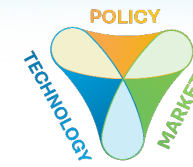
Grids

- **Massive volumes of renewable curtailment** and high redispatch volumes if grid congestion remains unaddressed.
- Can be addressed by **steering infrastructure to the right locations** (incentives in renewable auctions, capacity markets and for hydrogen)
- Implement bidding zone splits where they **improve representation of congestion in market coupling**. Assess costs and benefits of high resolution locational marginal pricing in low-carbon system.

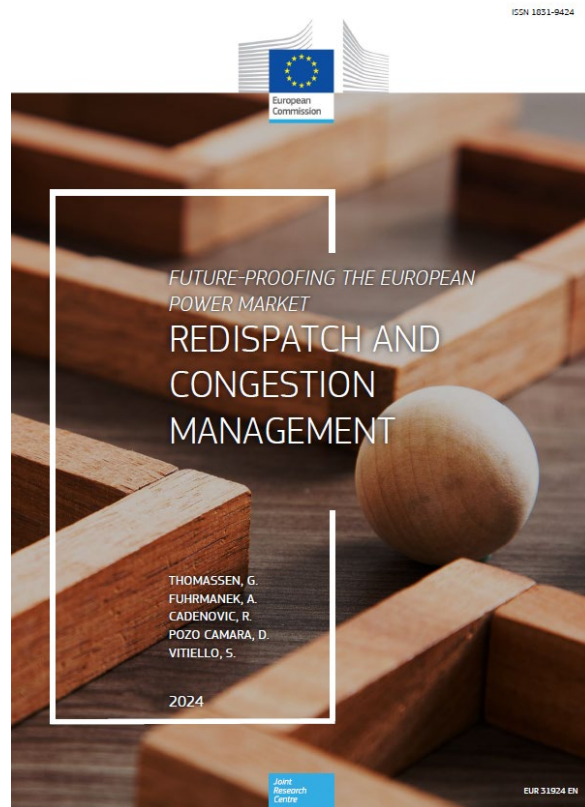
Markets

- A Flexibility Needs Assessment that is **fit for purpose**.
- Requires definition of **renewable integration target** to derive flexibility needs for decarbonization.
- Consider **all inflexibilities** present in the system. (Full unit commitment modelling)

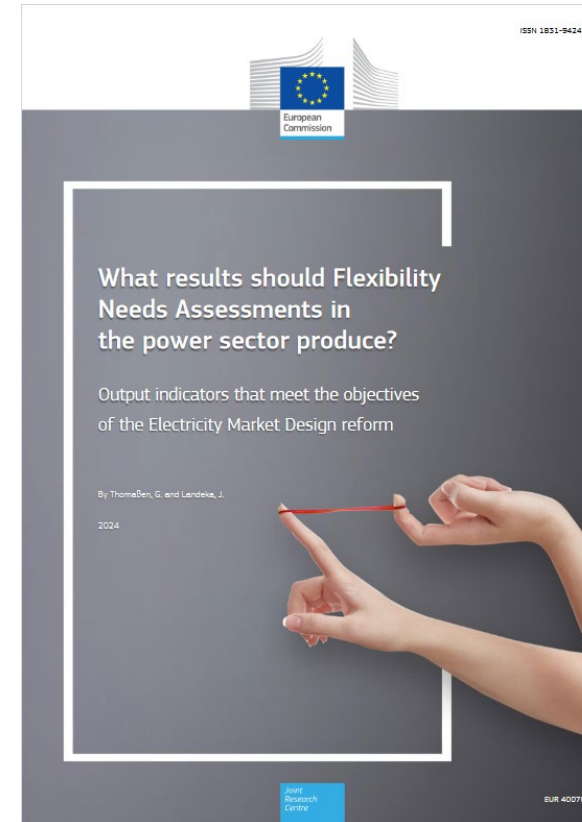
Reports



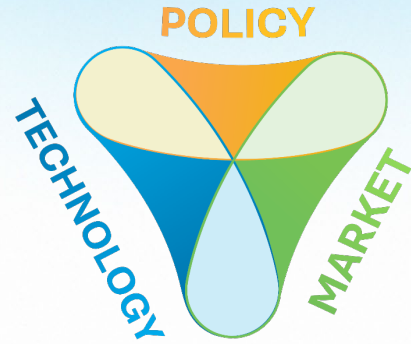
ENERGY STORAGE
Global Conference
BRUSSELS, 15 - 17 October 2024



<https://publications.jrc.ec.europa.eu/repository/handle/JRC137685>



<https://publications.jrc.ec.europa.eu/repository/handle/JRC139027>



ENERGY STORAGE

Global Conference

BRUSSELS, 15 - 17 October 2024

THANK YOU!



georg.thomassen@ec.europa.eu



www.linkedin.com/in/georg-thomaßen-a92992159