Rising electricity network costs and flexibility needs: A 'perfect storm' or a 'perfect match'?

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“The average network use is low. How to get it (much) higher?”
'Efficiency First' also applies to grid infrastructure

‘Getting more out of what you have’ requires flexibility ~ thus doubling-down on demand-response

Interconnectors will be key, too, for flexibility ~ but need further attention
‘Efficiency First’ also applies to grid infrastructure
Enhancing grid capacity is part of the solution.

Innovative grid technologies can help:

- 20-40% increase in overall network capacity by 2040
- 35% reduction in conventional expansion costs by 2040

Pop quiz: What savings for Italian consumers?

Arera (Italy’s energy regulatory authority) incentivises innovative solutions to increase grid capacity, making for …

- Innovative technology cost ~ € 5 M for 1450 MW
- Same result by building new lines ~ approx. € 950 M
- Making for ~ 190-fold difference

Source: Arera and ACER calculations based on the 2021 PCI list.
A portfolio of innovative technologies offers options

Superpowers:

- Capacity increase for a given line
- Better understanding of actual line limits
- Dynamically controlling power flows on the grid
- Better understanding of actual inertia limits/stability limits

Innovative Grid Technologies:

- Advanced conductors
  - High Temperature Superconductor
  - Storage as a transmission asset (SATA)
- Dynamic line rating (DLR)
- Advanced Power Flow Control (APFC)
- Grid inertia measurements
- Digital Twin, Flexibility Management Systems

- Incentivising cheaper investments to increase grid capacity
  - Cost-based remuneration is not always effective
  - Benefit-based incentives hold promise

Source: ACER consultancy study by the Florence School of Regulation on incentivising efficient investments in electricity grids, June 2024.
An elephant in the room perhaps?
'Small may well be beautiful’ – yet sometimes may not

‘Getting more out of what you have’ requires flexibility ~ thus doubling-down on demand-response
Flexibility needs double by 2030

Source: ACER-EEA report: Flexibility solutions to support a decarbonised and secure EU electricity system, October 2023.
Barriers to demand response are often ‘hiding in plain sight’. The sum of many small obstacles can add up to significant barriers, impeding system flexibility.

A detailed and updated report on the first three barriers listed above will be released by early 2025.

Source: ACER report: Demand response and other distributed energy resources: what barriers are holding them back?, December 2023.
What problem are we keen to solve?

Governments need to factor in ‘the full picture’

Interventions to pursue policy objective A, B or C ...

Raising barriers to demand response, new technologies or participation of all assets?

For consideration: Comprehensive ‘flexibility check’ at national level
Interconnectors will be key, too, for flexibility ~ but need further attention
Future flexibility needs also point to interconnectors

As coal and conventional gas plants increasingly are phased out, flexibility portfolios will transform, gradually relying more on cross-border exchanges, storage, demand-side response and low-carbon technologies.

Interconnections can play a key role, not least in multi-day/multi-week flexibility time frames.

Beyond flexibility, providing also security of supply

Small reductions in cross-zonal capacity triggered price spikes in the Baltic region, 17 August 2022

Hourly variations in load, import capacity and day-ahead price in the Baltic region on 17 August 2022 (MW, MW and EUR/MWh, respectively)

France became a huge importer of electricity during the energy crisis

2019 and 2021 mean net cross-border flows

2022 net cross-border flows

Note: The length of the arrow is directly proportional to the amount of electricity imported or exported.

Well-interconnected markets are key to mitigate the impact of national price shocks and enable Member States under strain to import surplus electricity from abroad or export excess generation.

However, improvements are needed …

Increasing cross-border capacity is needed to unlock benefits, incl. more flexibility. Necessary steps are:

- TSOs to make **optimal and coordinated use of remedies to relieve congestions** in the grid
- TSOs to undertake **targeted grid developments**
- TSOs to complete the **bidding-zone review** process and Member States / European Commission to decide

Source: ACER’s report on capacities for cross-zonal trade of electricity and congestion management, July 2024.
RES-E development can be optimised through cross country collaboration mechanisms targeting least cost areas combined with transmission capacity expansion.
Taking it further? **Trust** becomes name-of-the-game
Translating ‘trust’: What might it take to get there?

1. **It starts & ends with political will**: Commitment to structurally integrate energy markets; a commitment that is anchored institutionally

2. Coordinated infrastructure planning and cost-/benefit-sharing across borders, done or verified by public authorities

3. Coordinated renewable and flexibility deployment across borders

4. Closer integration of real-time operation (especially offshore)

5. Rigorous enforcement by public authorities to ensure trust in the whole framework; why else accept increased interdependence?
“The average network use is low. How to get it (much) higher?”

‘Efficiency First’ also applies to grid infrastructure:
Several options available
‘Getting more out of what you have’ requires more demand-response ~ and thus targeting its barriers
Interconnectors are key for future flexibility needs:
But more attention is needed, incl. politically, to make sure capacity is made available
Enhanced EU energy independence will likely require more energy interdependence amongst Member States. This starts & ends with political will
ACER is hiring!

Join us in powering Europe’s energy future.

Check out our job vacancies (in many areas).
Supply built to meet demand, right ... or wait, was it the other way around?
It’s the supply. No, it’s the demand. No, it’s the ...
Grid build-out per future demand ~ always a ‘no-regret’?

IEA: “EU electricity consumption is not expected to return to 2021 levels until 2026 at the earliest”

ACER: “… according to the ongoing adequacy assessment of ENTSO-E (ERAA 2024) demand in some Member States would have to grow at an annual rate of up to 12% every year from 2024 to 2026.”

Source: IEA Electricity 2024, ACER reply to the ERAA 2024 public consultation.
Annex
ACER role and governance

- **Supporting the integration of energy markets in the EU** (by common rules at EU level). Primarily directed towards transmission system operators and power exchanges.

- **Contributing to efficient trans-European energy infrastructure**, ensuring alignment with EU priorities.

- Monitoring energy markets to ensure that they function well, **deterring market manipulation and abusive behaviour**.

- Where necessary, **coordinating cross-national regulatory action**.

- Governance: **Regulatory oversight is shared** with national regulators. **Decision-making** within ACER is collaborative and joint (formal decisions requiring 2/3 majority of national regulators). **Decentralised enforcement** at national level.

- Headquartered in Ljubljana, Slovenia. **Engaged across the EU**.
Good practices to reduce system costs

“Beat the Peak” initiative to empower to reduce their demand during peak times

Consumption electricity off peak and reduce system costs

Procurement of local services to improve cost-efficiency of network development and operations
Learning lessons from the more recent past

Unprecedented record of negative prices

Day-ahead negative prices in EU Member States in 2023 (number of occurrences)

Yearly occurrences of negative prices in the EU

Source: https://capaciteitskaart.netbeheernederland.nl/, April 2024.

Source: ACER’s report on key developments in the electricity market, March 2024.
Import and export patterns vary, yet confirm interdependence

In 2023, every Member State benefitted from imports at times, showing the importance of cross-border capacity being available for trading with neighbours.

Source: ACER's report on key developments in the electricity market, March 2024.
On the one hand, scale & speed may require more risk-taking.

The level of demand (un)certainty deemed appropriate determines the investment risk borne by consumers.

Regulators will need to endorse somewhat riskier ‘anticipatory investments’ than in the past because of an accelerated energy transition and because network deployment is often slower than generation deployment.


Source: Making hybrids happen (Elia, Orsted), March 2024.
On the other hand, full ‘de-risking’ may prove ‘risky’

In the past, full de-risking for renewables led to adverse consequences for the electricity system (as well as additional funds needed for support schemes):

- “Build and forget”: no incentive to react to (negative) short-term prices
- No incentive for system-friendly design nor system-friendly siting choices

Hence, now is the time to learn lessons from the more recent past.
Current financing framework not fully fit for (future) purpose

Networks are funded through various scattered financial streams involving many stakeholders:

- Cross-border cost allocation (CBCA) focuses on bilateral cost-sharing
- Inter-TSO compensation (ITC) as a scheme covers close-to-negligible amounts
- Congestion income (‘rents’) is primarily used to reduce national network tariffs

Infrastructure cost-sharing is currently mainly bilateral, thus not reflecting the wider (regional) distribution of benefits from infrastructure build-out.

EU funding can help cover some of these wider benefits but is unlikely to be a ‘silver bullet’ to fund all/most offshore-related infrastructure.
Financial institutions will fund infrastructure costs provided they trust the related benefits/revenue flows (alternatively, if someone else covers the risks).

The same holds for Member State Treasuries.

Hence, fully trustworthy/trackable/transparent/replicable cost-benefit analyses (CBAs) of infrastructure investment – meaning, performed or at least validated by public authorities – can enhance this trust.
Balancing risks and incentives remains key

**Regulated networks:**

- *Investment risk* → subject to regulatory oversight, taken by public authority. Low-to-no risk. (Co-funding regionally going forward?)

- *Availability risk*, i.e. using existing infrastructure to its full extent → TSOs/DSOs should maximise available network capacity. If not, accountability/ penalties should ensue.

**Renewable generation:**

- *Offtake risk* may be impacted by actions in other Member States → regional support schemes or Member State co-funding renewable tenders (i.e. sharing risks and rewards).

- Incentives to react to *short-term price signals* → ‘smart CfDs’ (role for EU-level guidance?).

- Incentives for *better design and siting choices* → ‘upstream’ choices play a role (e.g. designating renewable acceleration areas), thereby inviting more regional coordination on siting.
A genuinely strategic EU energy debate awaits

Unity in power, power in unity: why the EU needs more integrated electricity markets

Electricity market integration has substantial benefits that will improve the resilience and enable the transition of Europe’s energy system