The EU's big picture

Renewables, flexibility and energy security

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Electrification Academy
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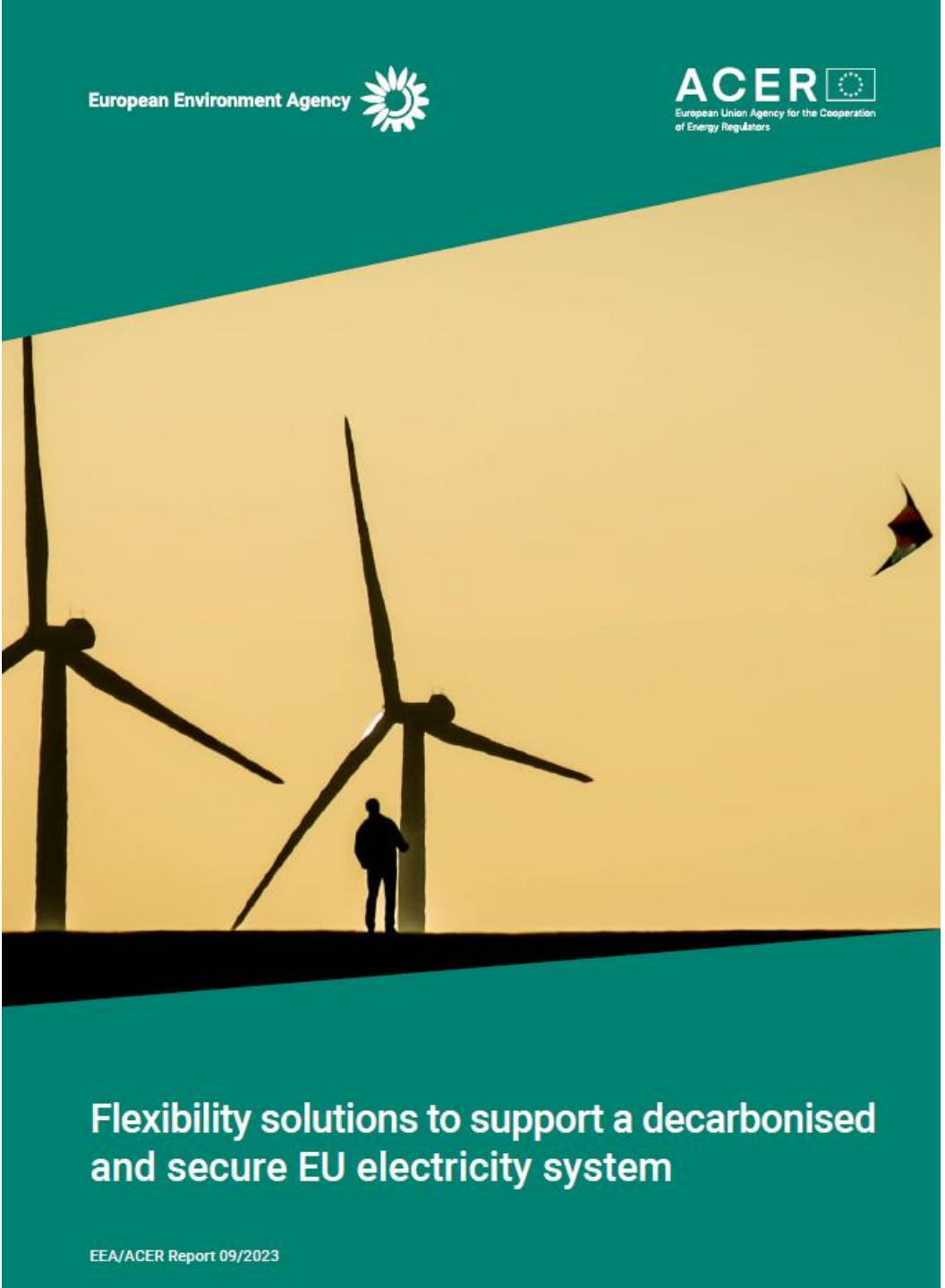

The EU power system must keep pace with the growth in renewables.

Step up Governance Regulation tools-use to assess and coordinate developments

- National Energy and Climate Plans
- National GHG projections with energy parameters (= forecast of energy system developments)

(Download report)

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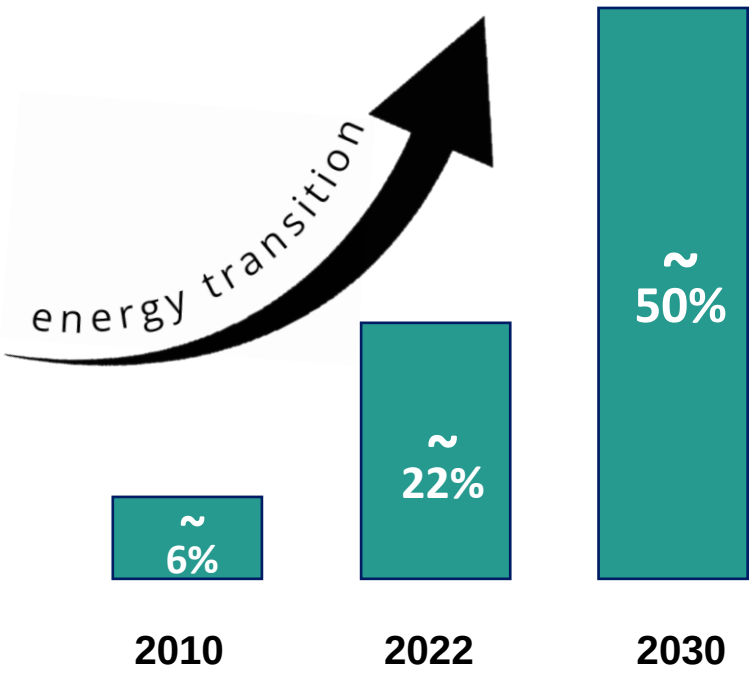
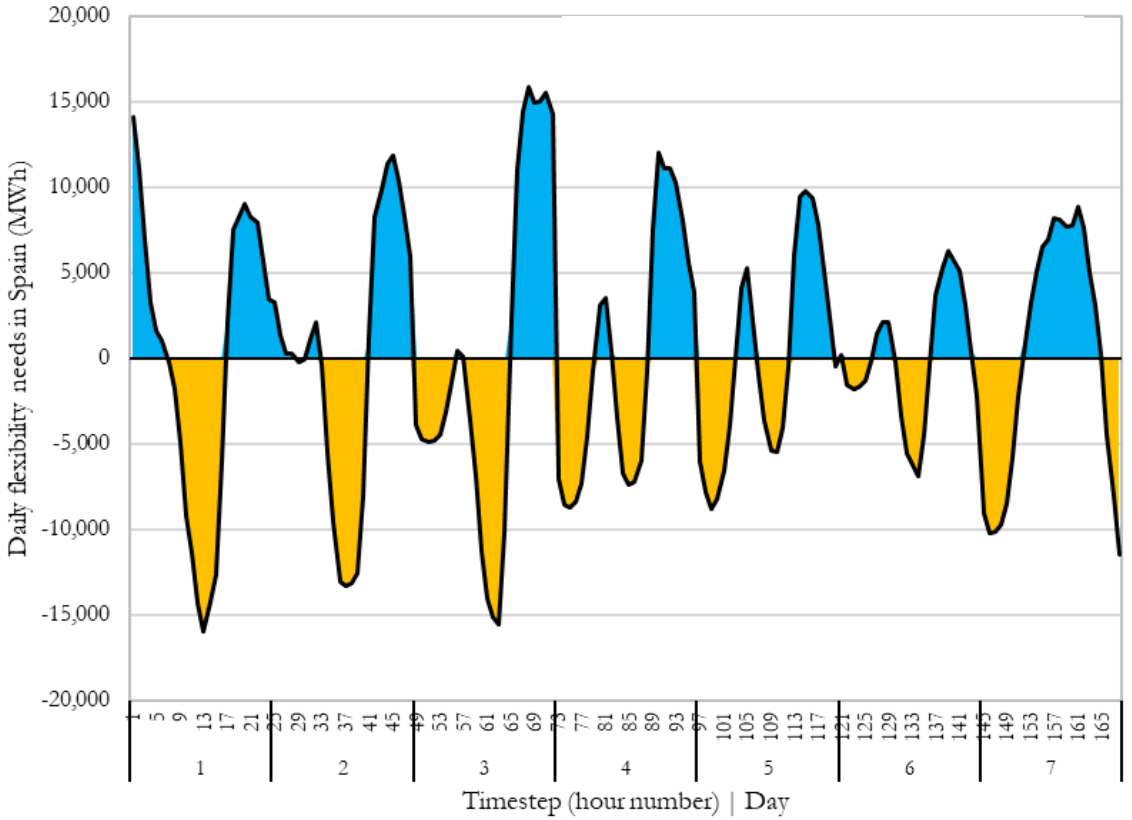
Great benefits from variable renewables, but also challenges

Share of electricity produced by wind & solar in the EU



Example: Forecast daily flexibility needs in Spain in January 2030



- Increasing shares of variable wind and solar power
- By 2040, 80% less fossil fuels in energy supply than in 2021
- Need for more 'flexibility' in EU electricity system

Positive residual demand – daily average
Negative residual demand – daily average
Residual demand – daily average

Source: Ramboll, Background Report for EEA-ACER report

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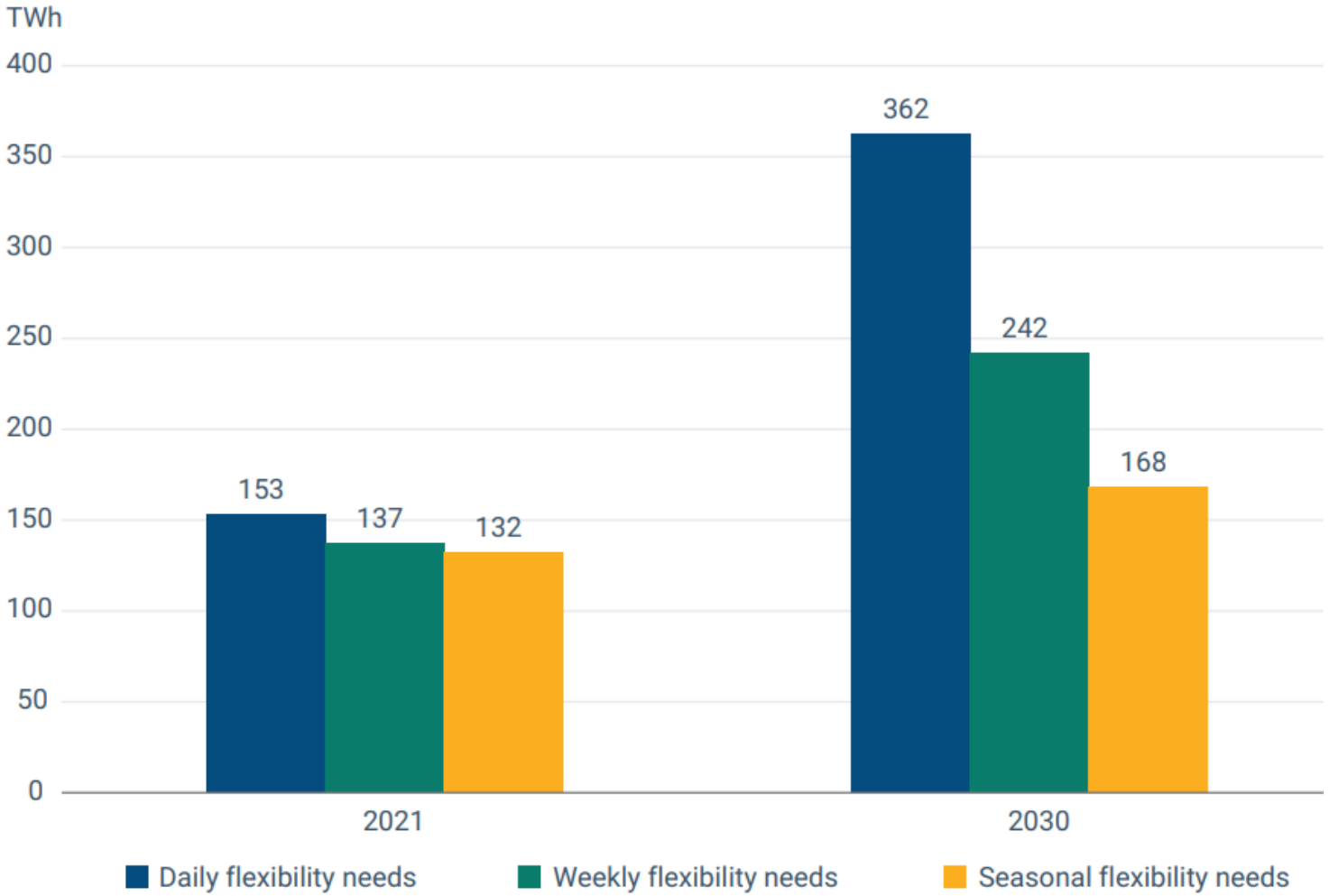
Flexibility must double to keep up with renewables (right amount, right time)

Daily, weekly and annual flexibility needs in 2021 and 2030 in Europe



- Increased solar generation requires substantial daily flexibility
- Wind generation mostly requires weekly flexibility
- Increased electrification of heating (via heat-pumps) requires more seasonal flexibility, but it unlocks demand-side flexibility and cheaper thermal energy storage.

Source: ACER-EEA - Flexibility solutions to support a decarbonised and secure EU electricity system

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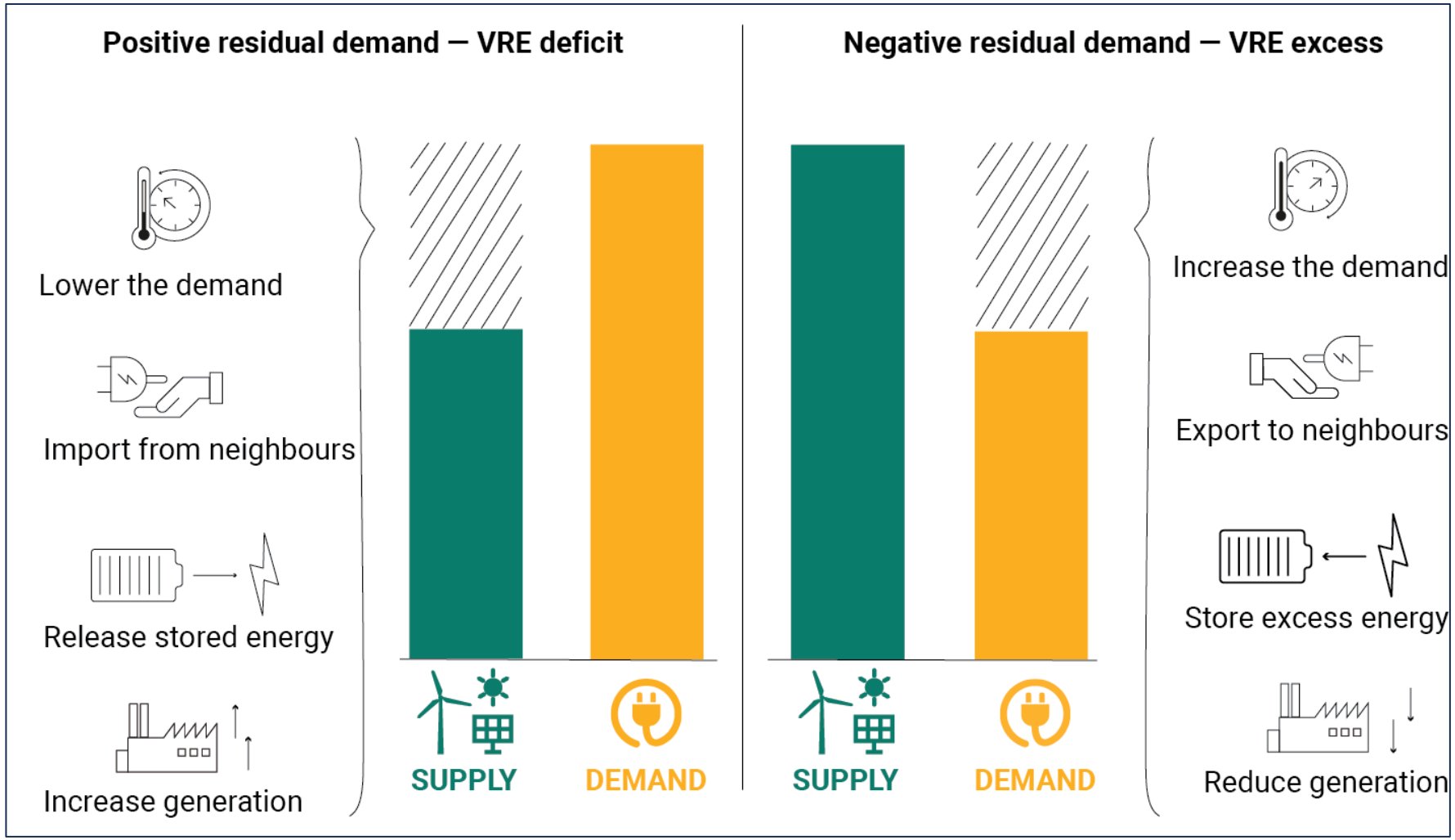
Climate-compatible flexibility solutions exist



- Increasingly, home-grown climate-compatible flexibility resources are needed.
- Facilitate the switch to these low-carbon flexibility solutions.

Source: ACER-EEA - Flexibility solutions to support a decarbonised and secure EU electricity system

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Main Takeaways – Flexibility

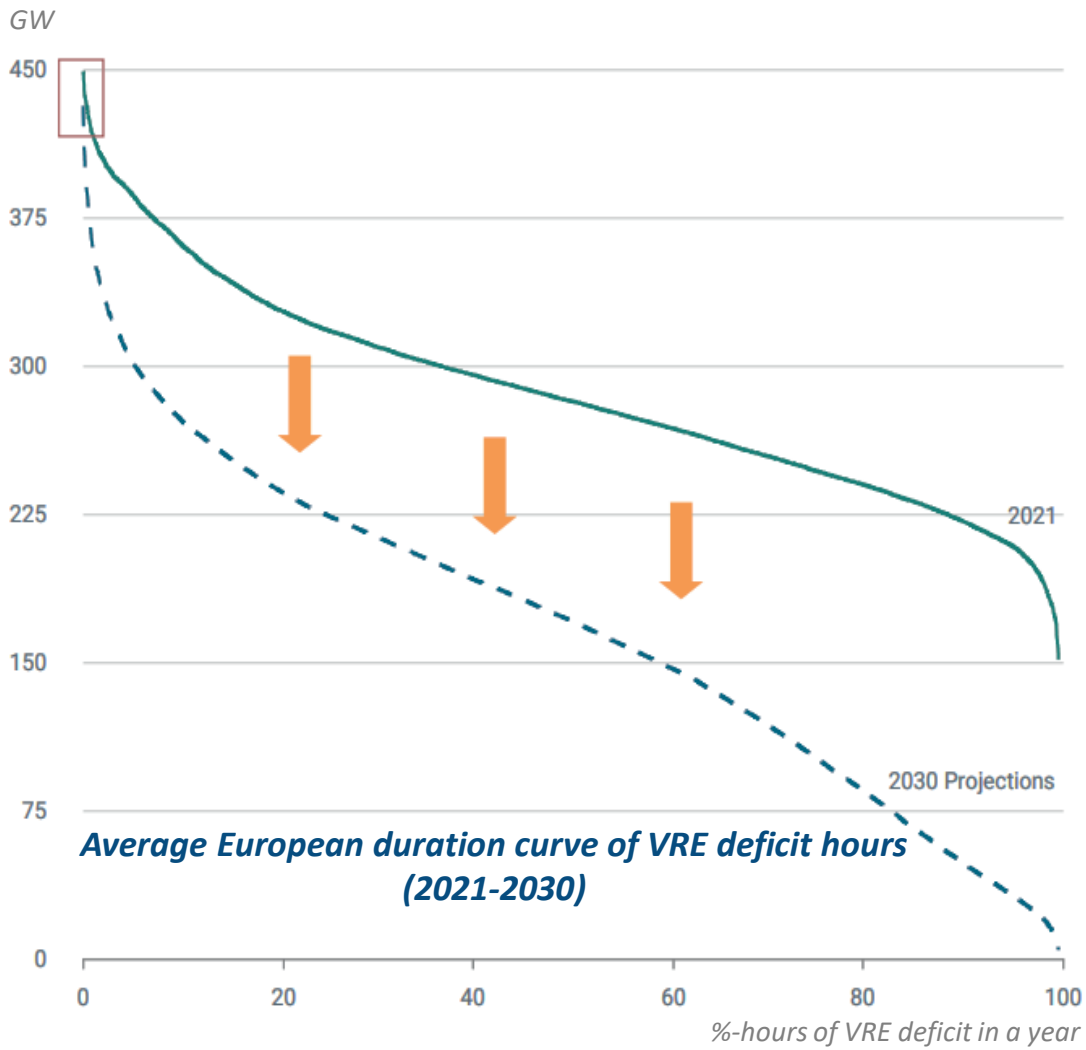
1. An annual growth of Variable Renewable Electricity (VRE) generation of 250% leads to a 42% lower annual VRE deficit by 2030 (around 1,047 TWh/a ⇔ annual generation of 182 🏭).

2. Existing and planned interconnectors can reduce 133 TWh of annual VRE deficit (and excess), compared to no interconnectors (⇔ annual generation of 21 🏭).

3. An annual demand reduction of 7% (231 TWh) means a 16% reduction of the VRE deficit in the scenario with the reference demand (⇔ annual generation of 37 🏭).

4. W/O demand savings, peak VRE deficit is barely reduced by 2030 (from 449 GW in 2021 to 432 GW in 2030). But very infrequent situations of very low VRE generation relative to demand (few hours in a year).
   - Demand response (peak shaving, demand shifting) or other time-flexibility resources like storages are effective to face these peak events.

5. From 2021 to 2030, annual VRE excess increases from 0.2 TWh to 118 TWh (⇔ annual generation of 19 🏭).
   - The adequate electricity consuming resources must be in place for such events to avoid VRE generation curtailment



Average European duration curve of VRE deficit hours (2021-2030)

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Demand savings and shifting reduce daily, weekly and annual flexibility needs

A 5% peak shaving and 10% demand savings could, in 2030:

- Cut flexibility needs equivalent to Austria's current power consumption;
- Cut backup supply needs for solar and wind power equivalent to Spain's current consumption.

Enabling infrastructure will be crucial:

- to increase flexibility, further efforts are needed to unlock smart metering, a wider participation of users, demand aggregation, grids and sector coupling

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Rapid growth in renewables calls for improved interconnection and better policy planning, benefitting from enhanced Member State cooperation.

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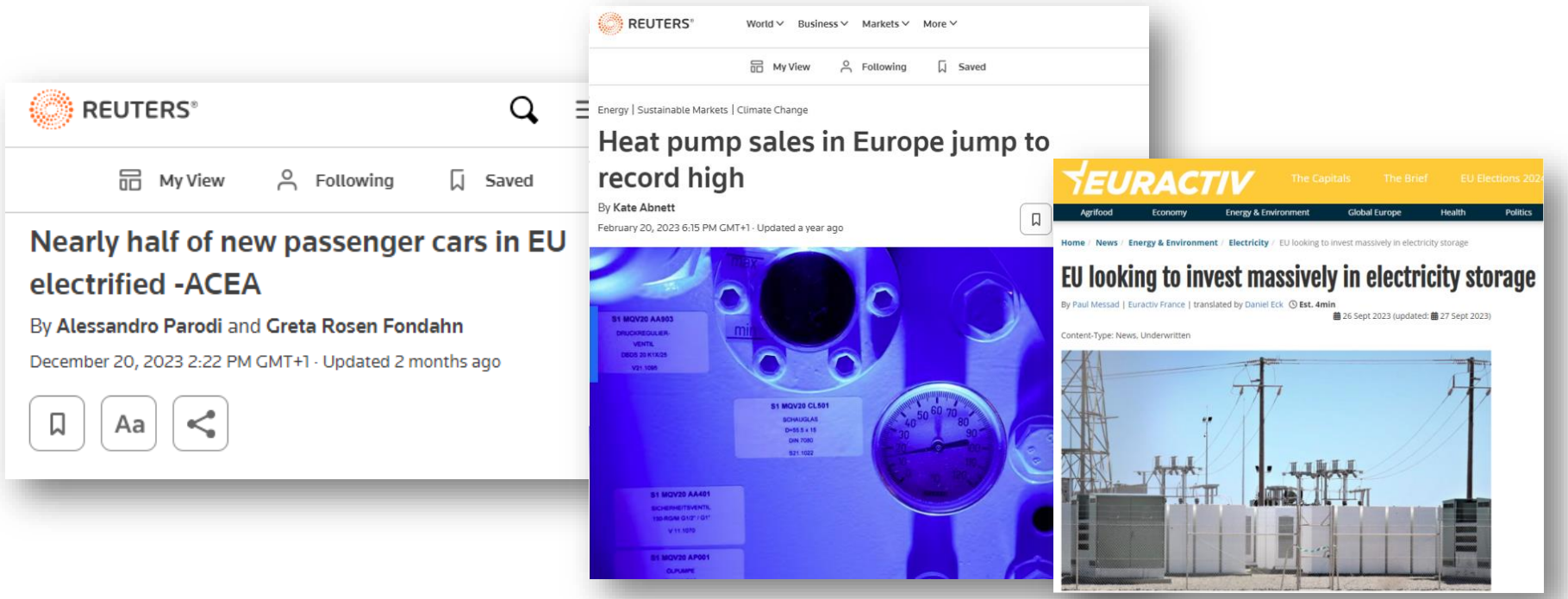
Facilitate the connection and entry of all distributed flexibility resources



Electric vehicles

Heat pumps

Energy storage

- Harmonised connection rules for *electromobility* and *heat pumps* provide economies of scale and facilitate integration *en masse*. Connection rules must be well-suited to harness the advanced capabilities of *storage* technologies.
- Remove barriers: such as prohibitive prequalification criteria, so even small resources can enter the market and provide demand response services via aggregation.

Read about ACER's work to amend grid connection rules

Read about ACER's work on demand response barriers

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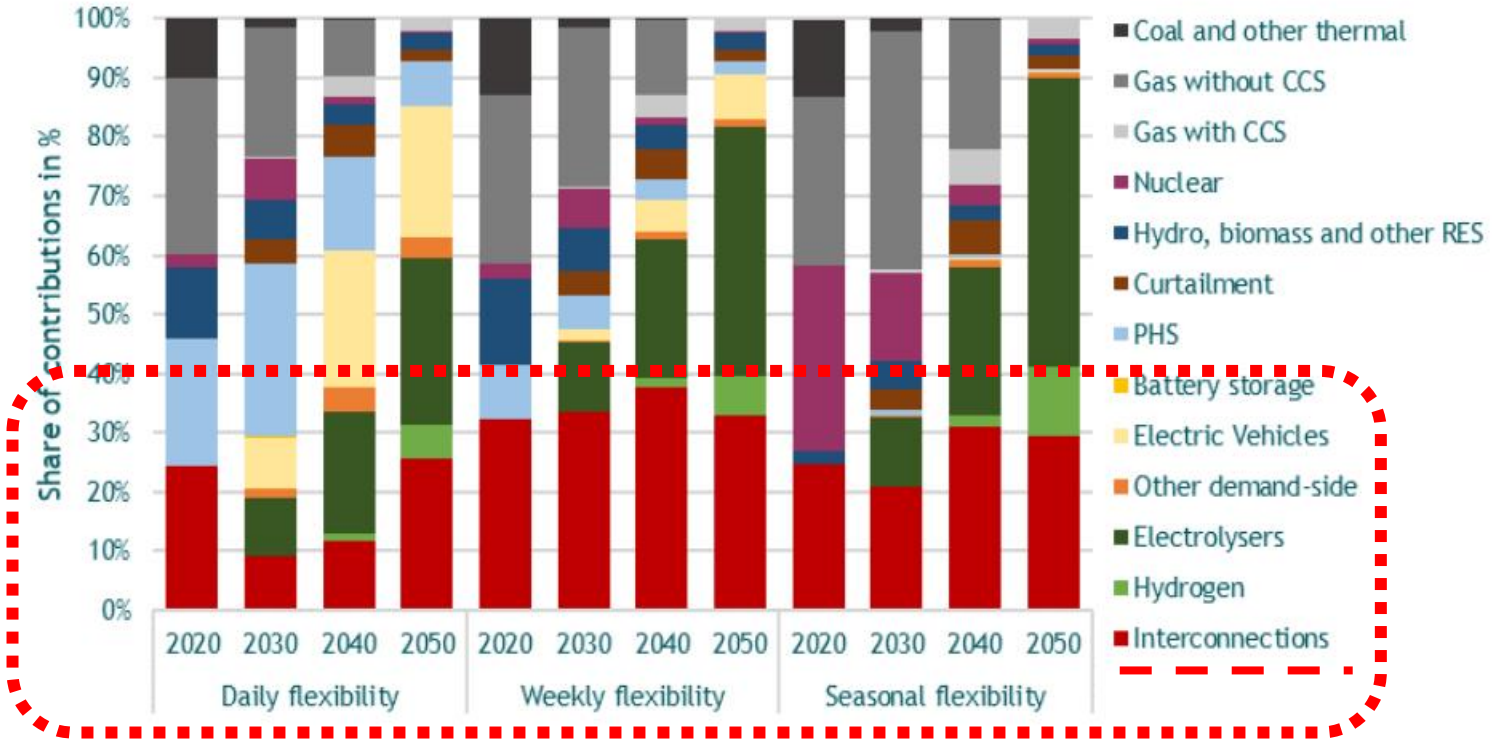
Future flexibility needs point to the role of interconnectors

- As coal and then 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.

Share of technologies providing system flexibility in the Pentalateral countries for daily, weekly and seasonal timeframes



Source: Artelys & Trinomics, Power System Flexibility in the Penta region, March 2023

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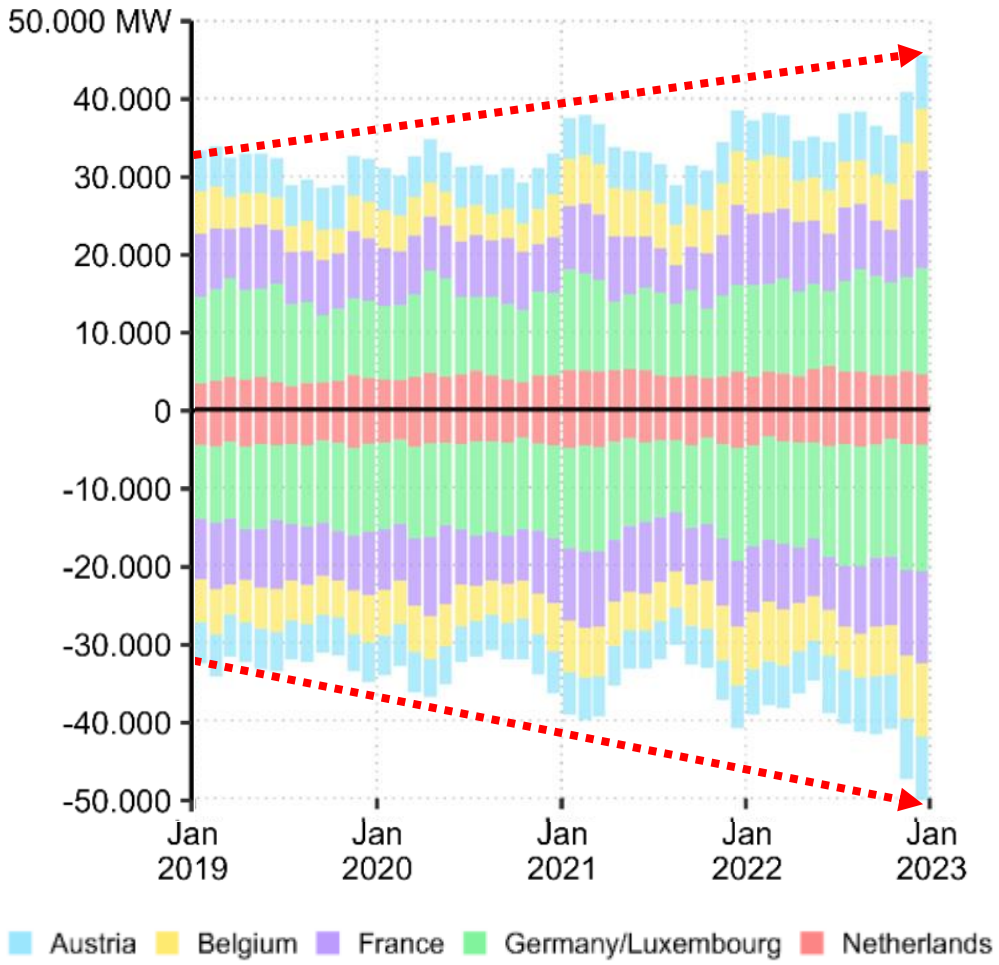
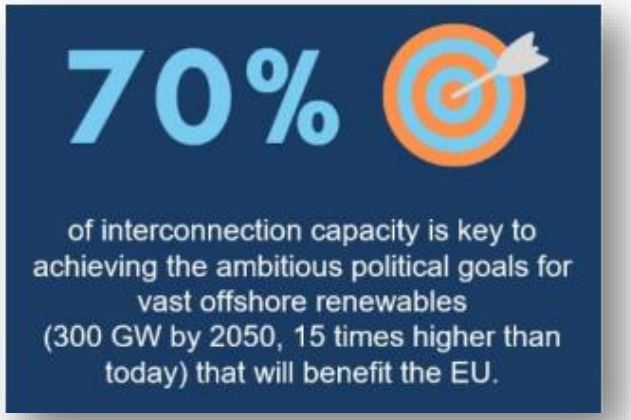
Beyond a build-up – common rules to better use what we have

Evolution of the monthly average power interconnector capacities for `Central West Europe` *





- **Capacity allocation (once capacity is available)**: `Flow-based` **market coupling** provides for efficient capacity allocation, increasing electricity flows both in the intra-day and day-ahead timeframes.
- **Making more capacity available**: Grid operators are required to make min. **70%** of interconnection capacity available for cross-border electricity trade. Here, progress is uneven, giving rise to concerns.

efficiency enhancers

*Source: based on ACER - Cross-zonal capacities and the 70% margin available for cross-zonal electricity trade

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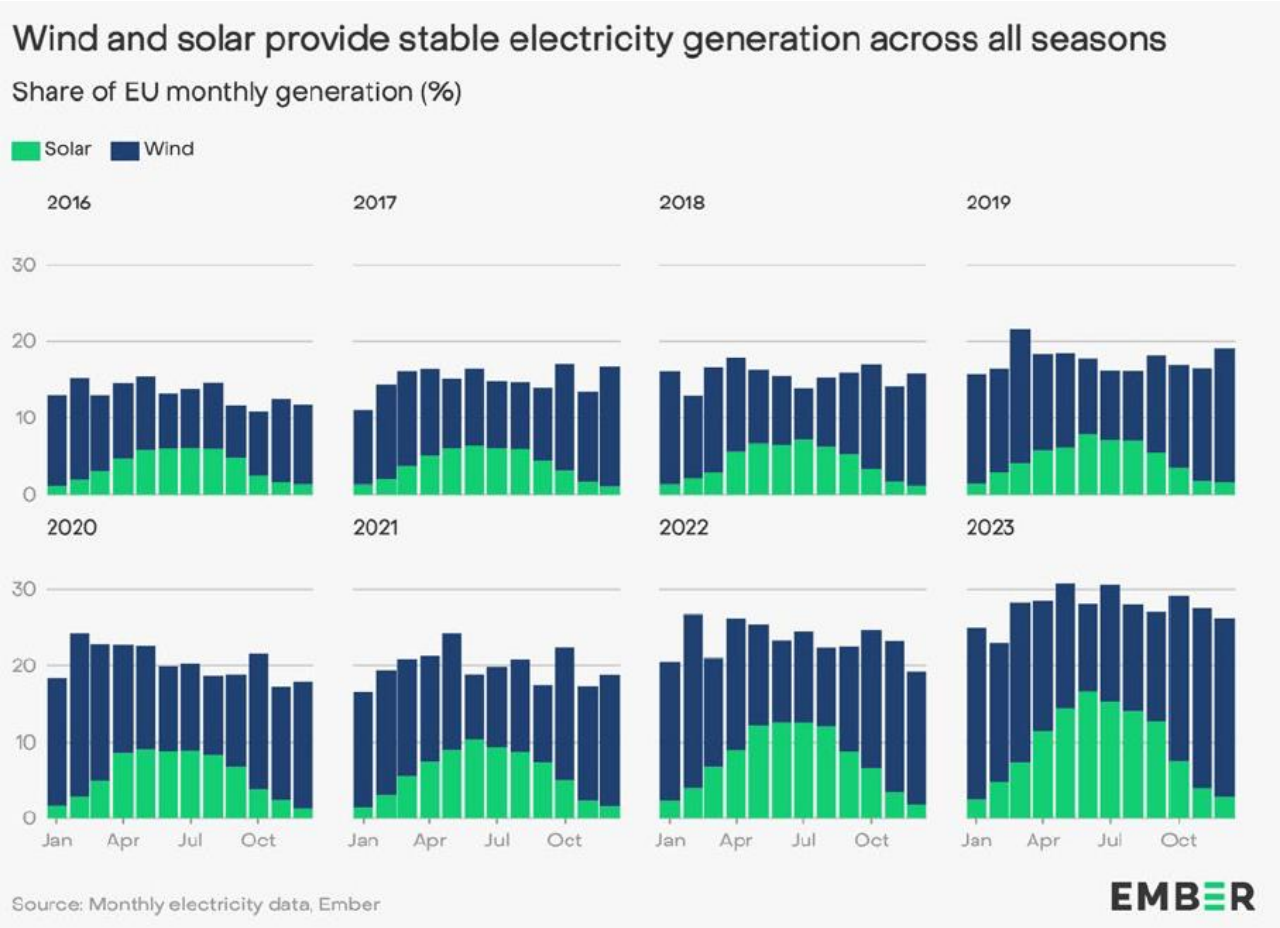
Wind and solar availability complement each other across the EU seasonally

Dunkelflaute - a meteorological condition when little or no energy can be generated using wind and solar power for a whole day or longer*

- Seasonal variations of solar and wind outputs are limited on average in the EU.
- *Dunkelflaute* is usually confined to specific regions and hardly ever happens on a larger geographic scale. It has not occurred at the European level in the 2015-2021 period.*
- Solar and wind complementarity does not substitute for required flexibility resources

Deploying different resources across geographies and considering resource plans of others will deliver a more efficient energy mix.



*Source: * based on EEA-ACER - Flexibility solutions to support a decarbonised and secure EU electricity system, 2023*
Ember, European Electricity Review 2024

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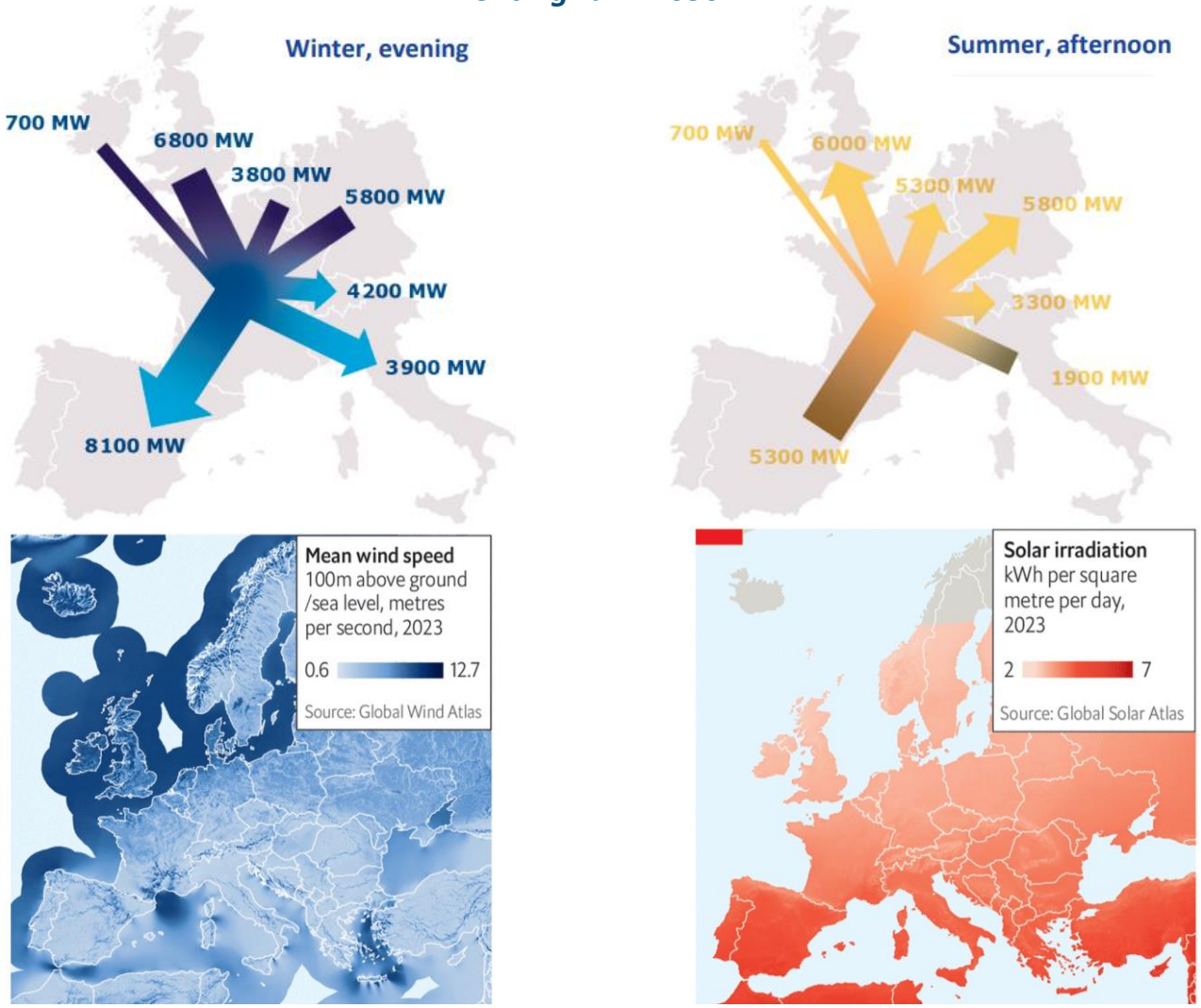
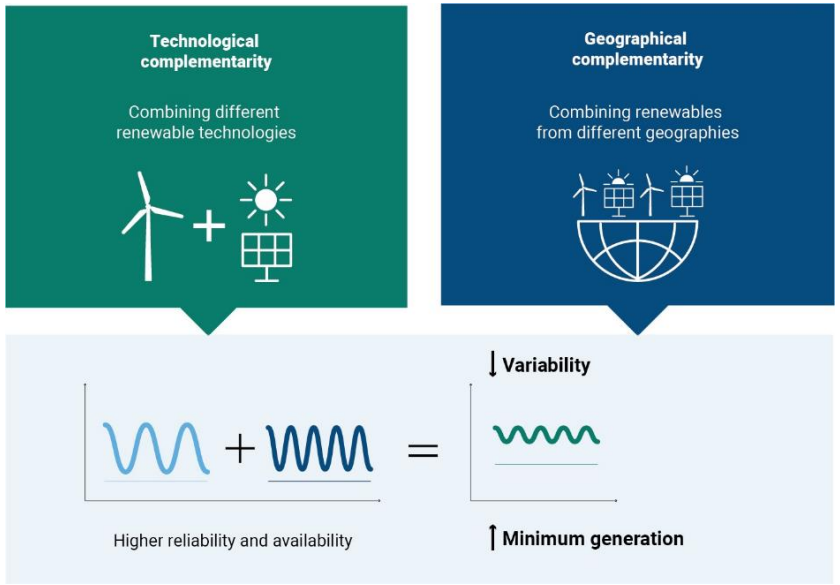
Integration to smoothen variability and maximise renewable potential

Projected trans-European flows transiting through the French grid in 2050





*"Sharing renewable resources among well-interconnected Member States enhances the certainty of availability."**

*Source: *EEA-ACER - Flexibility solutions to support a decarbonised and secure EU electricity system, 2023*
Artelys, Building blocks for a common vision for a decarbonised electricity system in the Penta region, March 2023; The Economist, Jan 1st 2023, Nov 13th 2023

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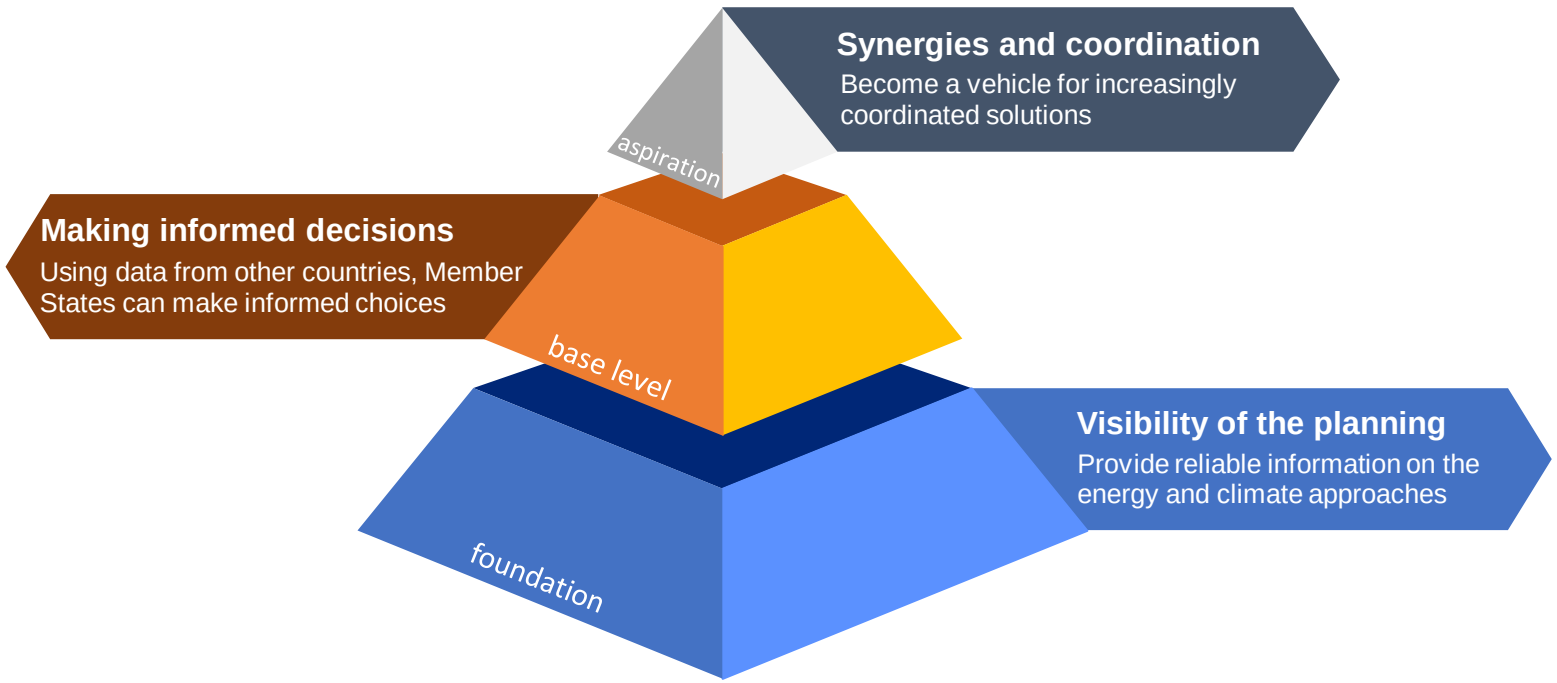
Planning and benefitting from enhanced Member State cooperation




European Commission

PRESS RELEASE | 18 December 2023 | Brussels

Commission calls on Member States to improve their National Energy and Climate Plans to ensure collective achievement of the EU´s 2030 targets

Few Member States refer to the role of regional cooperation with their neighbours in the updated draft National Energy and Climate Plans.

- **Foster common flexibility policies/ initiatives**, potentially using Member States' National Energy and Climate Plans

Source: Press release, https://ec.europa.eu/commission/presscorner/detail/en/ip_23_6622

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New European flexibility framework is around the corner

2+ years after

Optional: Flexibility **support schemes**

- Where investments in non-fossil flexibility are insufficient
- Capacity payment schemes limited to new resources
- Awarded in an open, transparent, competitive, non-discriminatory process

2 years after

National **flexibility reports**

- Assess flexibility needs at the national level
- Biennial reporting by the regulators or other entity

1 year after

European **methodology**

- Draft by ENTSO-E and EU DSO Entity
- Approval by ACER

European **flexibility report**

- ACER to analyse the national reports biennially
- Assesses the flexibility needs at the Union level
- Recommends on removing barriers to entry of flexibility resources

3 years after

Indicative **national objectives** for non-fossil flexibility

- Based on the national flexibility reports and reflected in the NECPs
- Include contribution of demand response and storage

2.5 years after

Indicates the *estimated* due time **after the reform** comes into force

Source: Text of the provisional agreement, https://data.consilium.europa.eu/doc/document/ST-16964-2023-INIT/en/pdf

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Conclusions

Flexibility in the EU power system
needs to double
by 2030 to keep pace with renewables.

Clean flexibility resources are needed, such as demand response, batteries, hydropower

Demand response & savings are essential this decade:

5% peak shaving & 10% demand savings could in 2030:

- cut flexibility needs equivalent to Austria's current power consumption;
- cut backup supply needs for solar & wind power equivalent to Spain's current power consumption.

Further enhancing interconnections is key

to enable flexibility across borders.

In 2030, interconnectors could avoid switching off (to balance the system) as much renewables as the current electricity consumption of Sweden.

Let's enable consumers to reduce energy bills & support climate goals.

Give consumers:

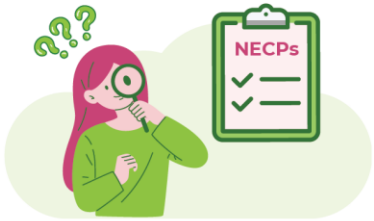
- price signals to adapt their consumption;
- reliable information, to make informed decisions.

Power grid operators must:

- coordinate planning and operation to support both EU climate and security of supply goals;
- maximise grid capacity available for cross-border trade with neighbours.

ACER & EEA call for Member States to:

- develop national and EU-wide assessments of flexibility needs;
- foster common flexibility initiatives starting from their National Energy and Climate Plans (NECPs) and projections.



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Thank you!

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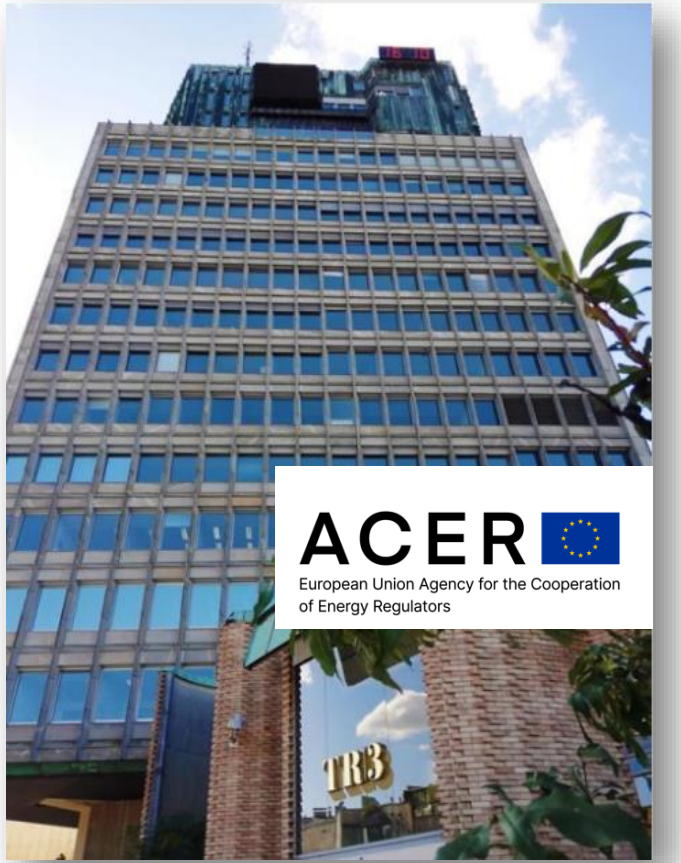
Annex



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ACER: Role & 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 the well-functioning and transparency of energy markets, **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.