

# Flexibility in the power system – A critical aspect to enable the energy transition

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# Topics covered

1. ENTSO-E Vision on flexibility
2. Roles and responsibilities as per EMDR articles

# ENTSO-E Vision for the future of the European Power System

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## Guiding principle

- A shared political goal for a fully **carbon-neutral European economy**

## Our Vision

- A **comprehensive analysis** of what is necessary to achieve a power system fit for a carbon-neutral Europe
- As a contribution to the debate on the **European Energy Transition**
- Including **TSOs shared intelligence** on trends, scenarios, challenges, technology & innovation

## Developed by a strong project team

- 23 experts from 14 European TSOs and ENTSO-E secretariat



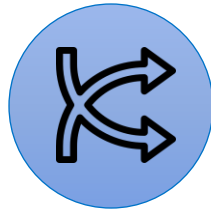
# Key Messages

Electricity will be the **main** and most **efficient** energy carrier

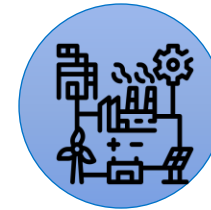
To be **sustainable, resilient** and **affordable**, the system will be based on:



Mostly weather-dependant, **Carbon Neutral Energy Sources**



**System Flexibility Resources**, complementing weather dependant generation

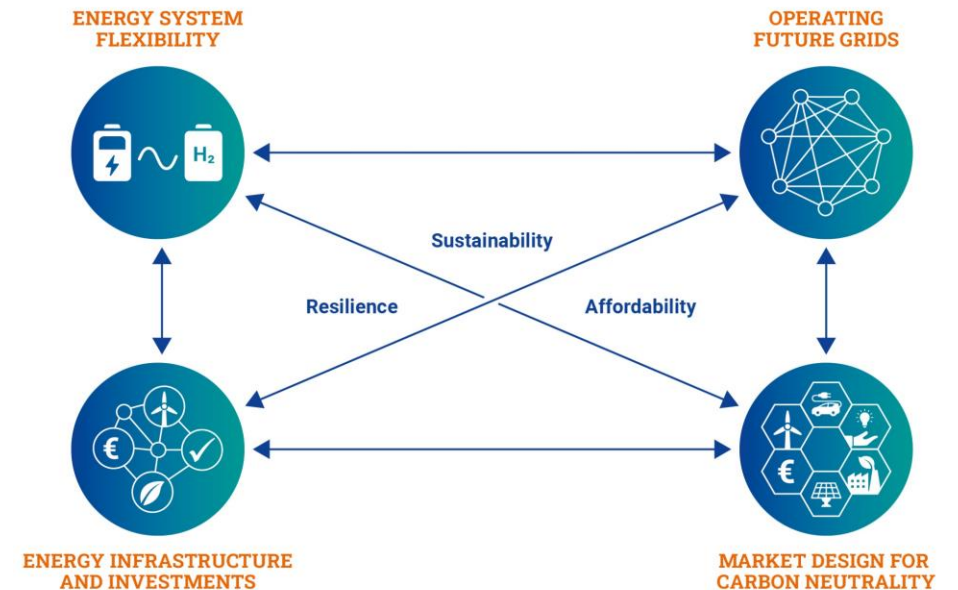


The **Power Grid**, connecting generators, consumers and flexibility resources across Europe, and enabling a fully integrated European Energy Market

How to achieve this:

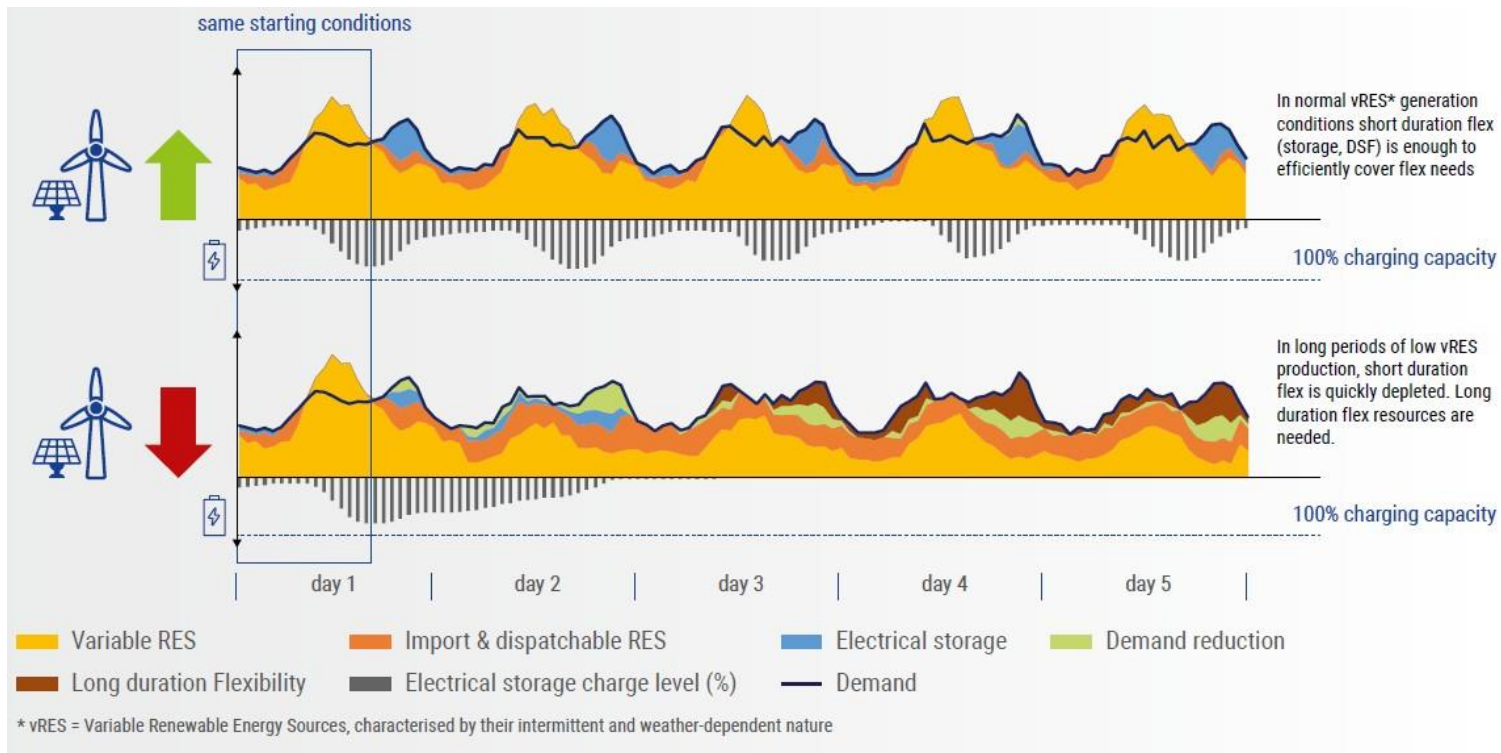
1. Invest in large scale short and long duration flexibilities\*
2. Invest in grid infrastructure
3. Improve operations for the system of systems paradigm (including sector coupling)
4. Implement new Market Designs and adapt existing ones

\*See next slide



# Energy System Flexibility – Evolving needs and cost-efficient resources

Flexibility needs will grow both in nature and volume, as the system evolves towards carbon neutrality based on variable renewable energy sources



- **Short duration flexibility**

(From milliseconds to a few hours, to cope with uncertainty)

- **Long duration flexibility**

(Up to several weeks, to cope with long wind/solar/hydro shortages)

# Flexibility needs and promising flexibility solutions

Based on TSO survey

Source	Need	Periods of vRES shortage	Balancing/ congestion management	Stability/ inertia	Voltage control	Reliability/ restoration
<b>Generation</b>						
Fossil thermal generation		↓	↓	↓	↓	↓
Hydrogen power generation		●				○
Dispatchable RES (hydro, bio)		●	○	○	○	●
Variable generation			●	●	●	○
<b>Demand</b>						
Smart charging EVs/small DSR		○	●	●	○	○
Large DSR		○	●	●	○	●
<b>Storage</b>						
Chemical batteries/V2G			●	●	●	●
Supercapacitors				○		
Hydro pumping storage		○	●	●	●	●
Flywheels				○		
LAES/CAES, thermal storage		○	○	○		
<b>Coupling</b>						
Power-to-hydrogen			●	○	○	
Power-to-heat			○	○		
<b>Grid</b>						
<b>Interconnections</b> (incl. HVDC & conversion stations)		●	●	○	●	○
<b>Grid flexibilities</b> (power flow, voltage control)			●	●	●	●

↓ Phase-out by 2050    ● Most promising    ○ Contributing

## ENTSO-E Vision: Key messages on flexibility

- Each type of flexibility need shall be covered by the **most suitable and cost-efficient** set of flexibility resources
- Grid interconnections** will be key to **attenuate overall flexibility needs** as national needs may partly offset each other
- ENTSO-E is investigating system needs to build internal knowledge

# National Flexibility Needs report

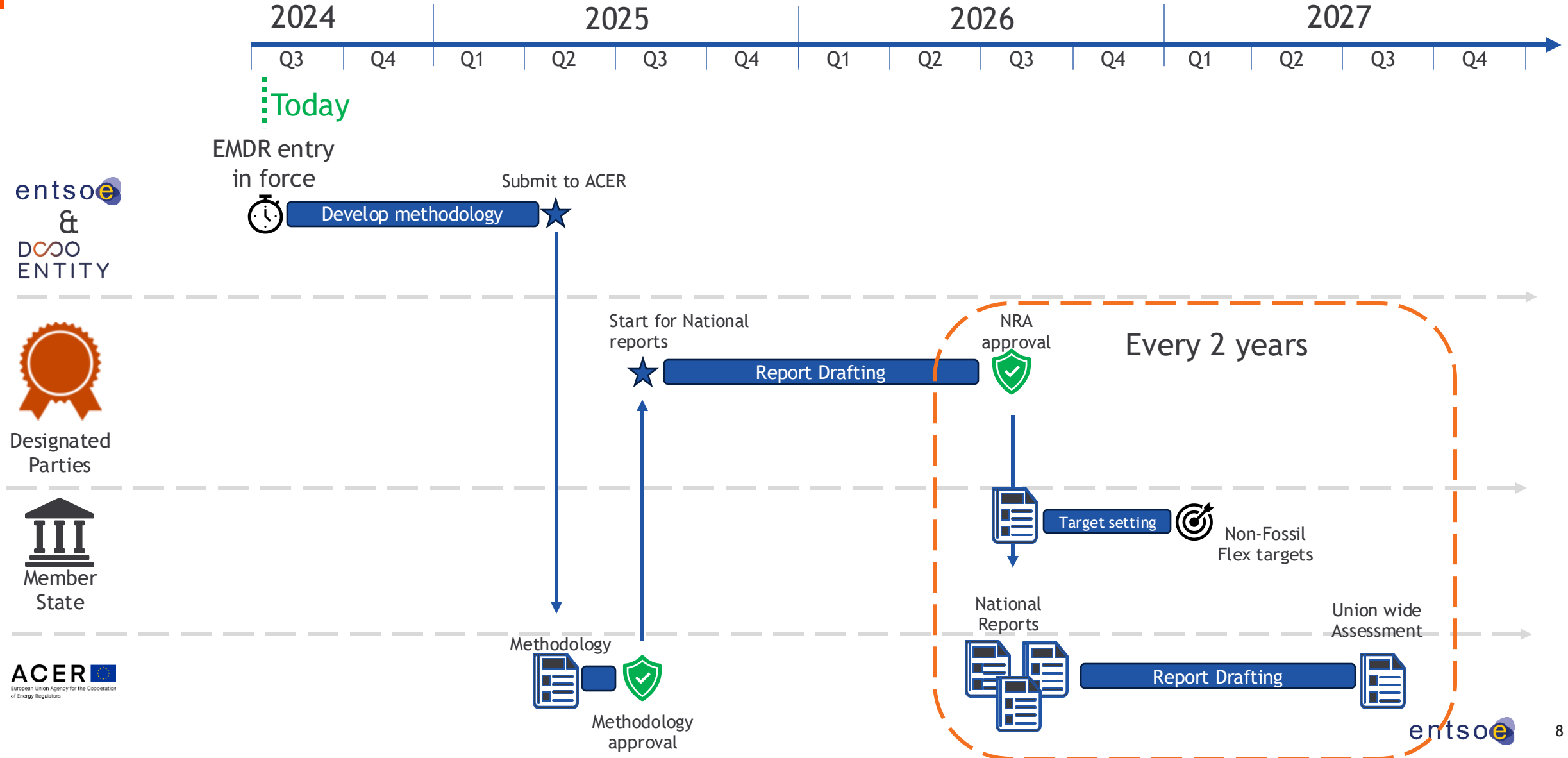
## Art. 19e. Paragraph 2

- Performed by designated parties based on methodology drafted by the ENTSO-E and the EU DSO Entity
- Evaluate/quantify non-fossil flexibility needs on different timescales (seasonal, daily, ...) based on guiding criteria contained in the methodology and accounting for flexibility available in other member states. In addition:
  - Address market barriers
  - Evaluate contribution of digitalisation

## Art. 19f

- Support Member States in defining national targets/objectives for non-fossil flexibility and achievable either by:
  - Removing identified market barriers or
  - Non-fossil flexibility support schemes

# Timeline & roles





# Principles for the methodology development

