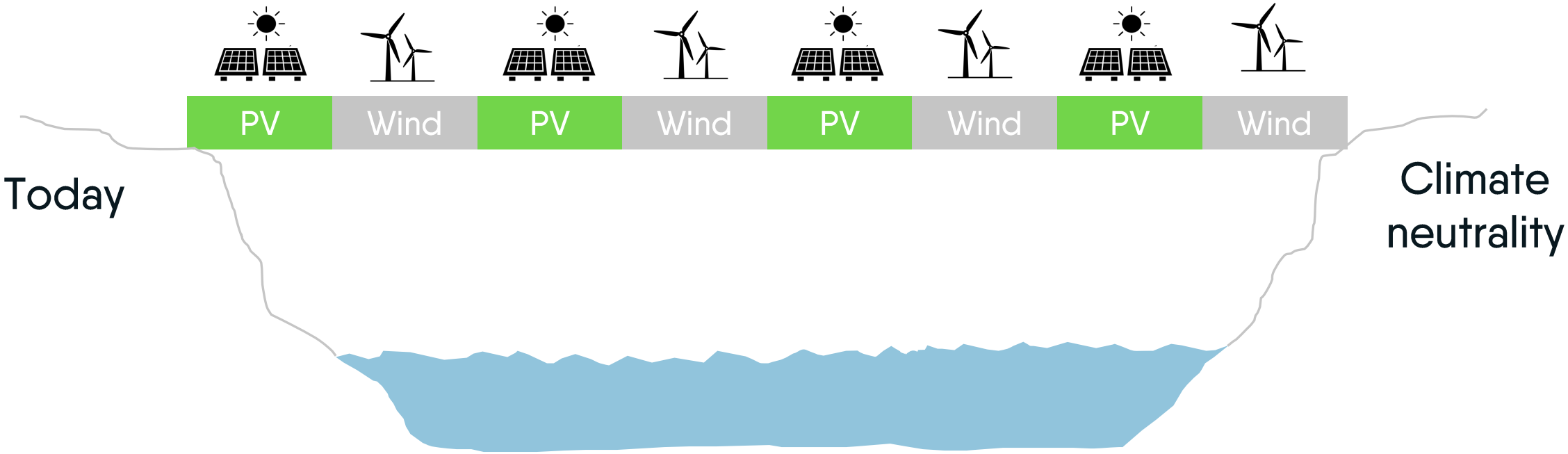
eurelectric

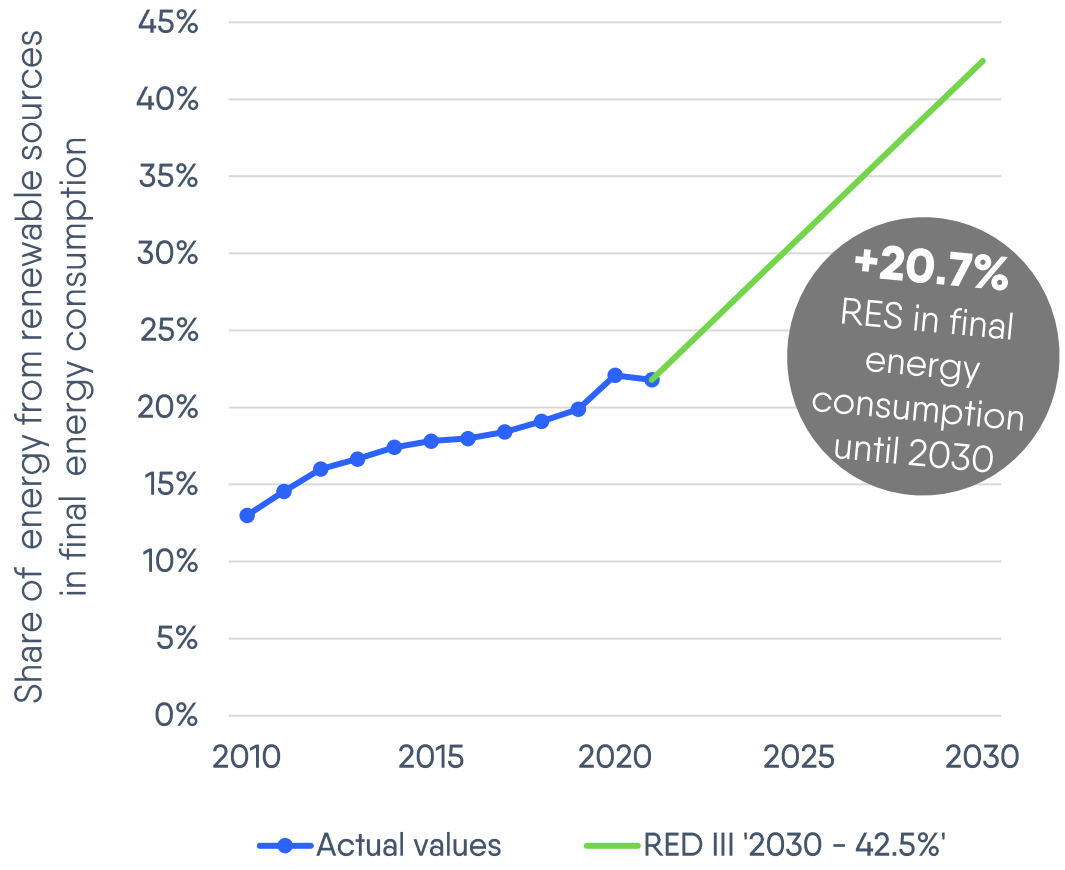
# Powering the Green Deal: HYDROPOWER's Vital Role in EU's Sustainable Success

# The European Green Deal – Paving the way to climate neutrality

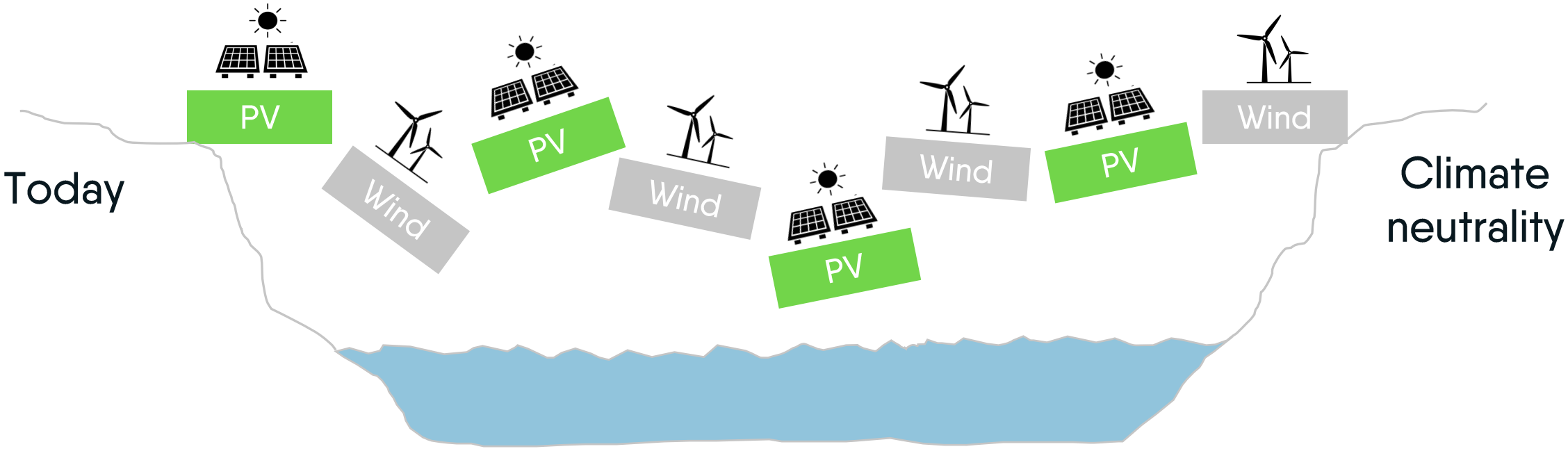



Combating the climate and biodiversity crisis by expanding renewable energies and transitioning to a modern, resource-efficient and competitive society.

# +621 GW capacity is required to achieve the EU's RES 2030 targets

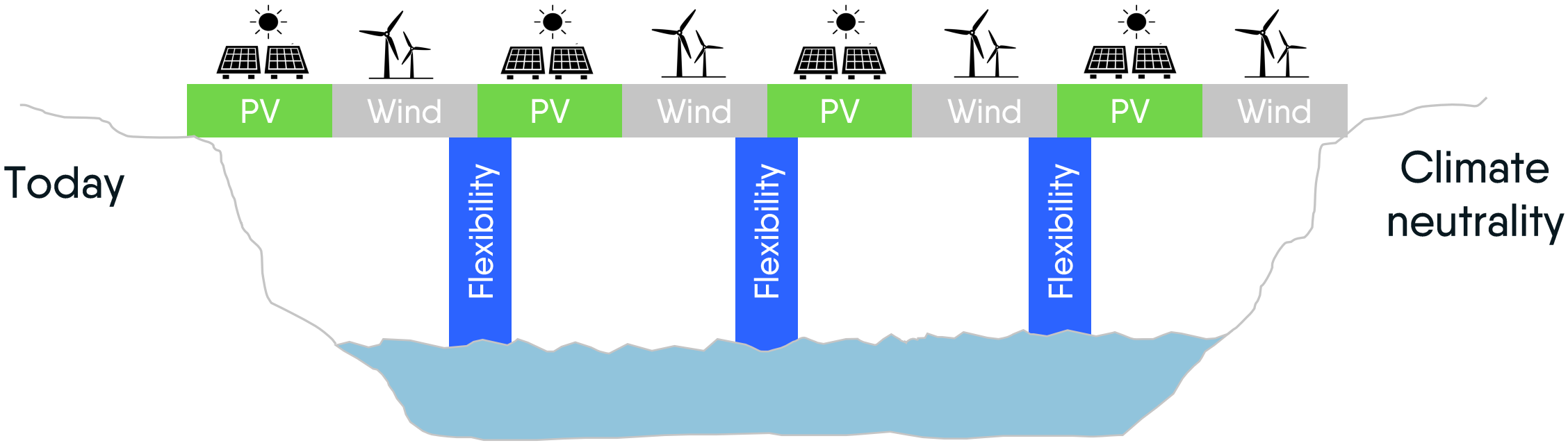



# But increasing wind and PV capacity is not sufficient



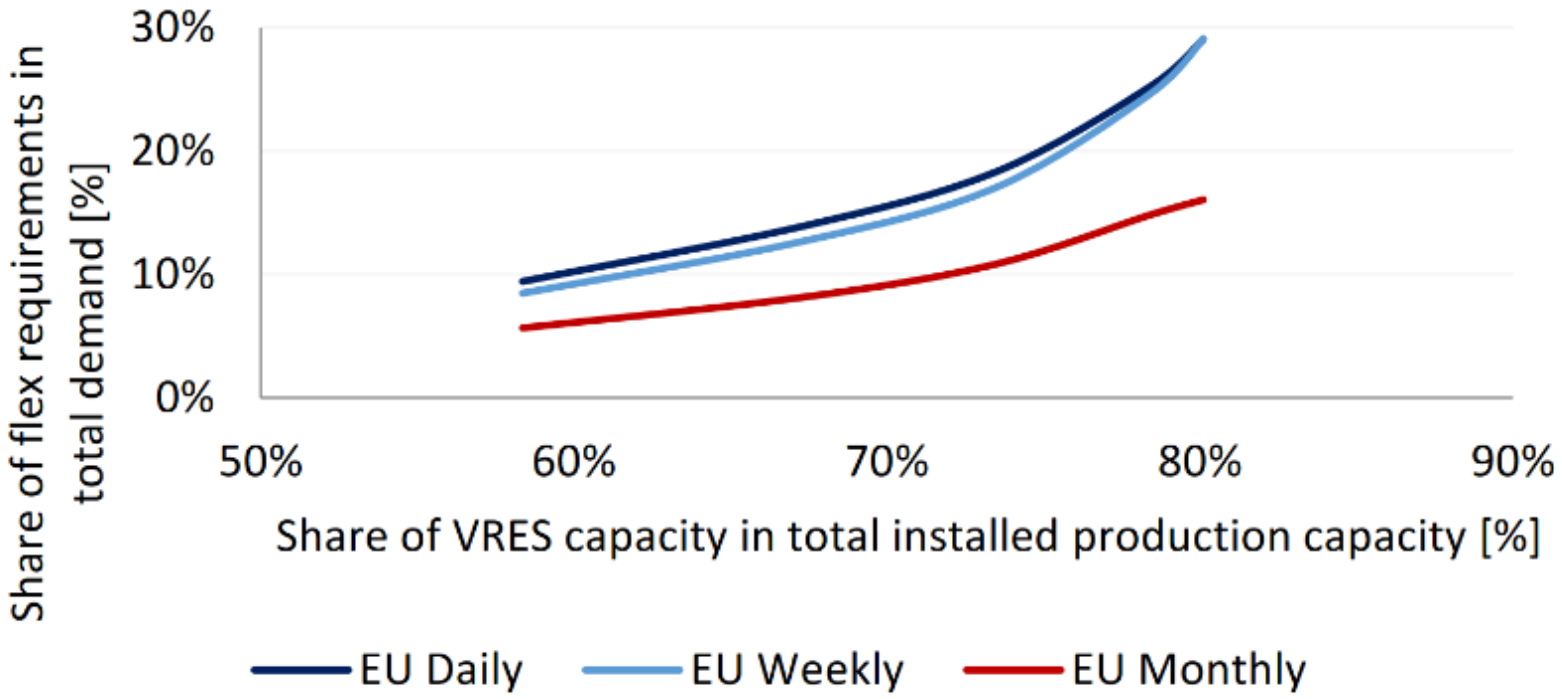

Because these technologies are highly dependent on weather, gaps will occur in the power system between electricity supply and demand.

# To integrate variable electricity generation flexibility is crucial



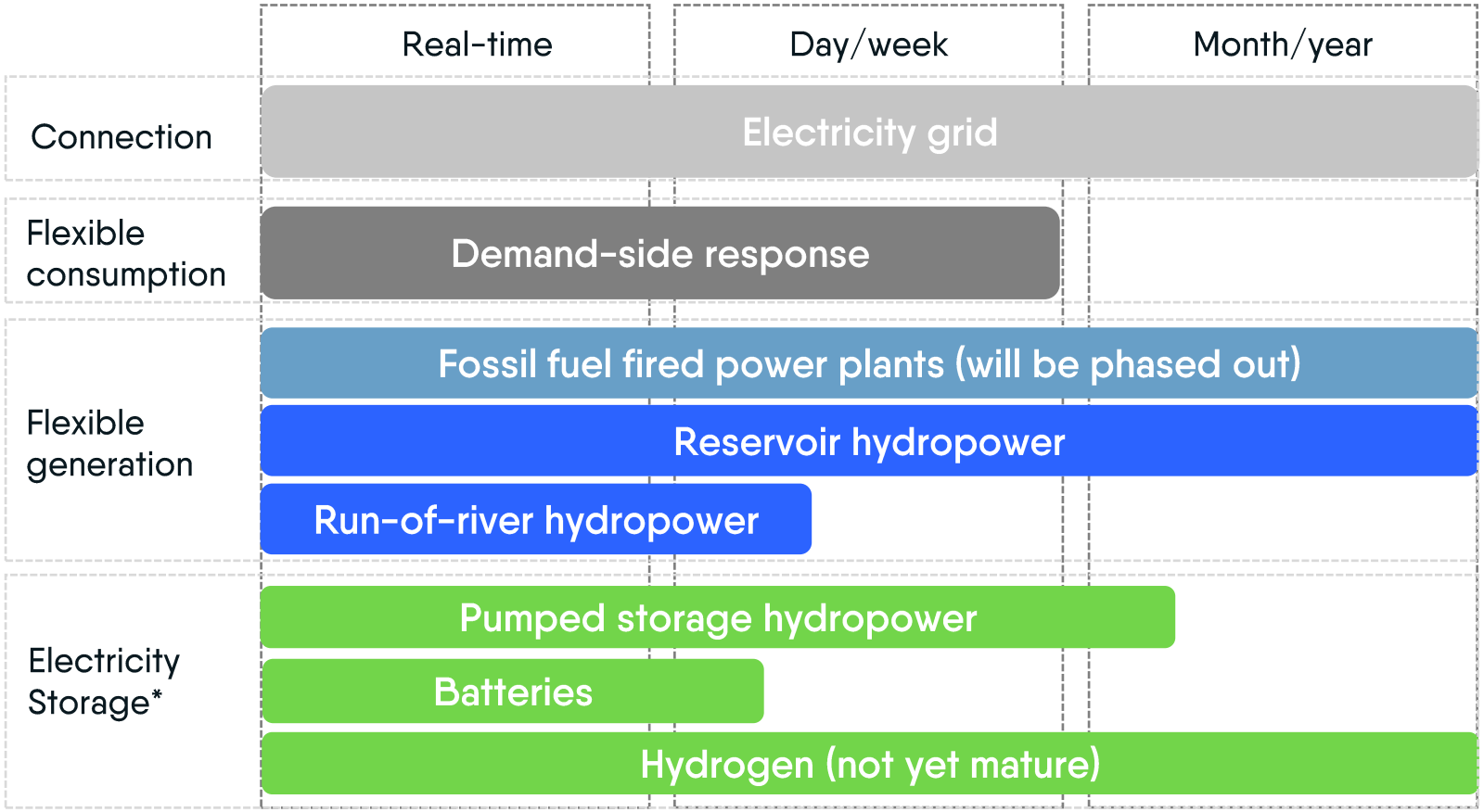

To ensure a stable power system, a continuous balance of electricity supply and demand is imperative.

# Flexibility demand increases exponentially with growing shares of wind and solar capacity




Share of daily, weekly and monthly flexibility requirements in total demand in relation to increasing share of variable renewable energy sources (VRES) capacity in total installed production capacity in the EU.[1]

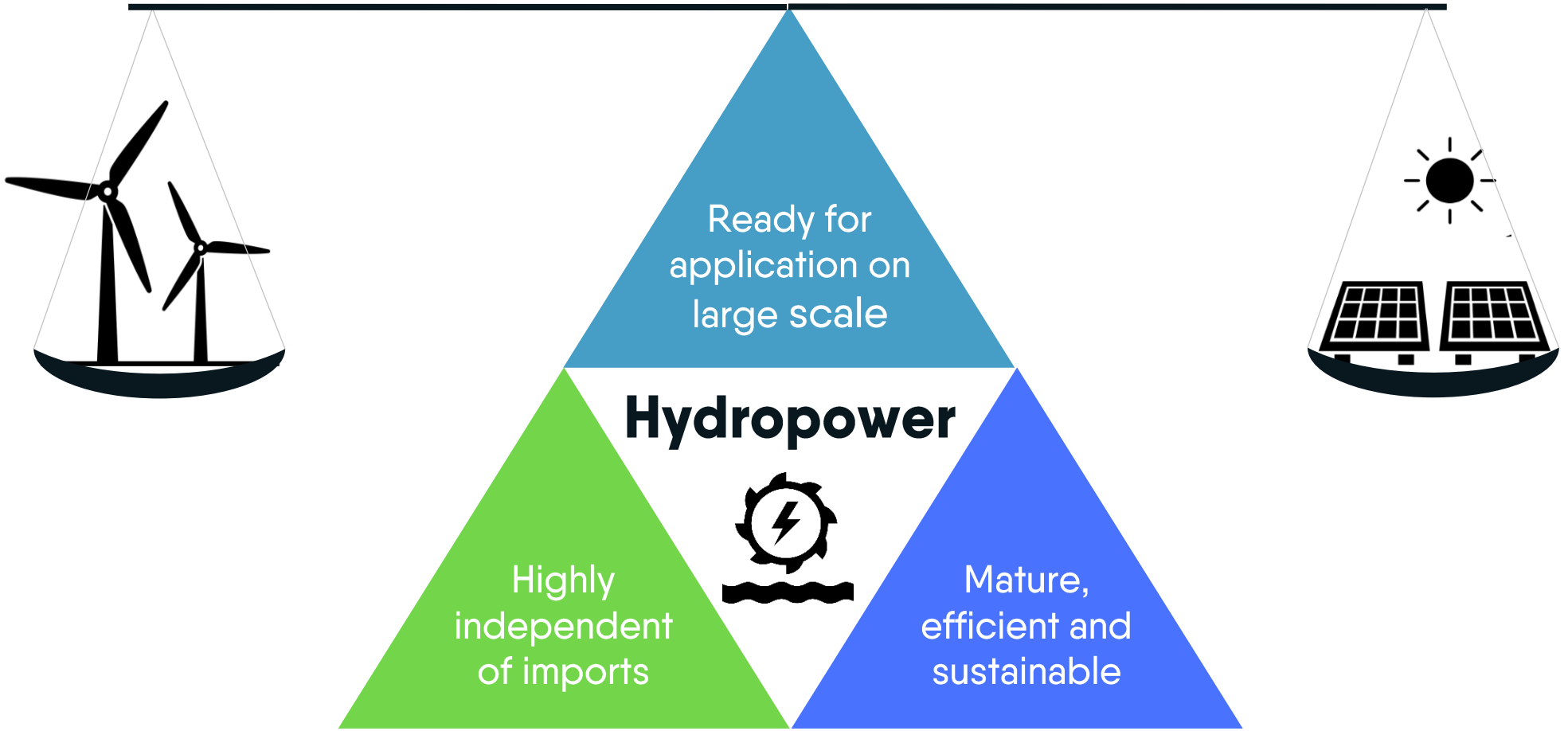
# Flexibility can be provided by different sources and technologies




*Electricity storage facilities provide flexible consumption and generation

To meet the flexibility needs of an increasingly decarbonised EU power system, all sources and technologies are required.

# Hydropower stands out



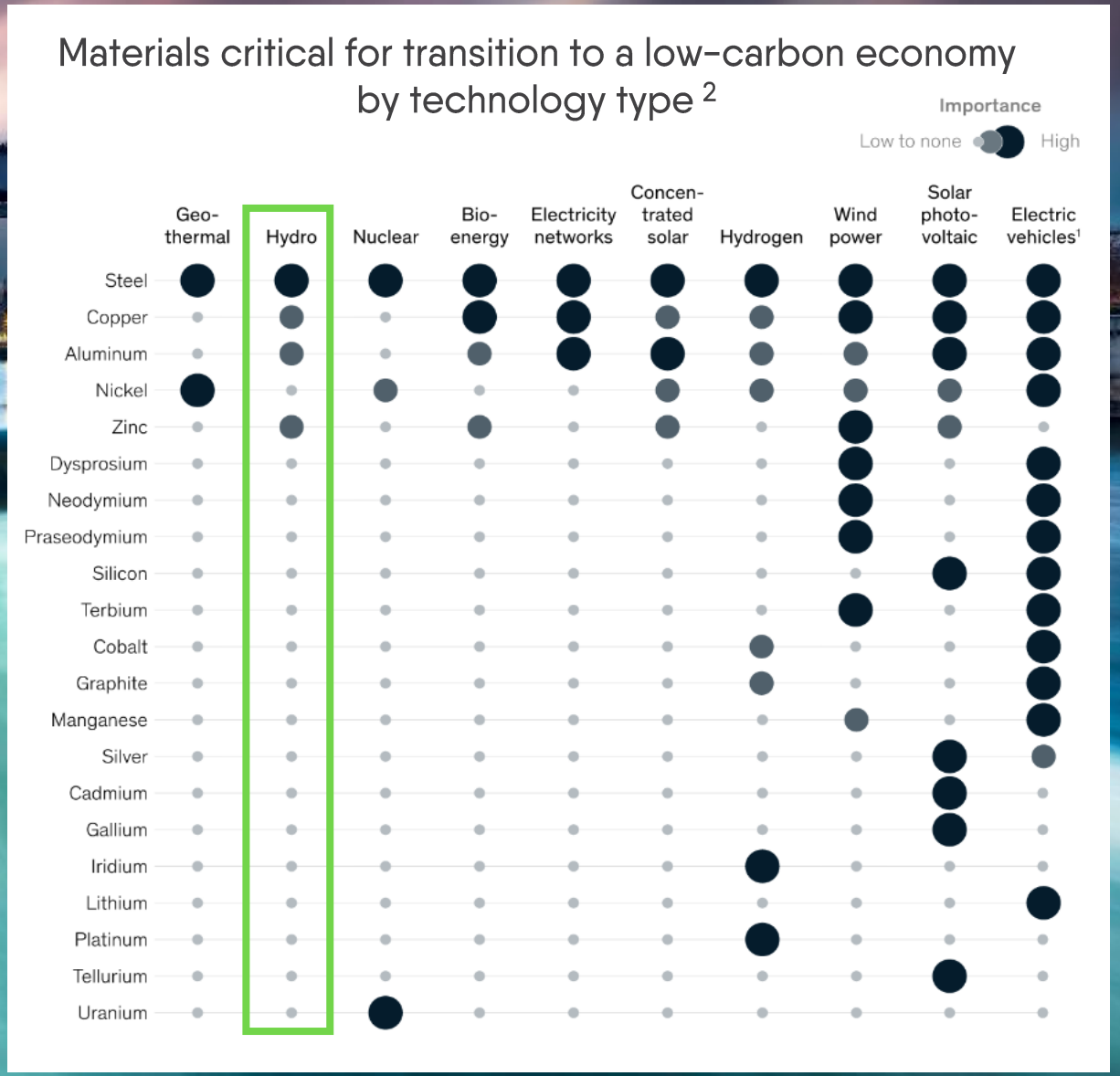

Hydropower is the only renewable technology providing flexible electricity generation and storage on large scale.

# Hydropower is European

Building on a transparent and clean value chain, hydropower is highly independent of imports of

- **Raw materials**
- **Fossil fuels**
- **Skilled labour**
- **Technological competence**

Materials critical for transition to a low-carbon economy by technology type [2]



# Hydropower is large scale

Electricity generation by run-of-river and reservoirs hydropower is **the 2nd biggest renewable source** in the EU [3]

- Wind: 398 TWh
- **Hydropower: 375 TWh**
- Solar PV: 145 TWh

However, when it comes to flexibility, hydropower is **the most important dispatchable renewable electricity source** in the EU.

Pumped storage hydropower (PSH) is **the major electricity storage source** in the EU [4,5]

- PSH provides **more than 90%** of the available storage capacity
- PSH is the only mature technology that **allows up to seasonal storage** of electricity

# Hydropower is mature and highly efficient

**Hydropower plants have an outstanding lifetime** providing electricity for generations [6]

- **Hydropower: 50–100 years**
- Wind: 15–20 years
- Solar PV: 30–40 years

**Hydropower shows the highest energy payback ratio** (energy generated compared to energy expended to build, operate, maintain and decommission the plant) of all electricity generation technologies [7]

- **Hydropower: 205–267 times**
- Wind: 30 times
- Solar PV: 9 times

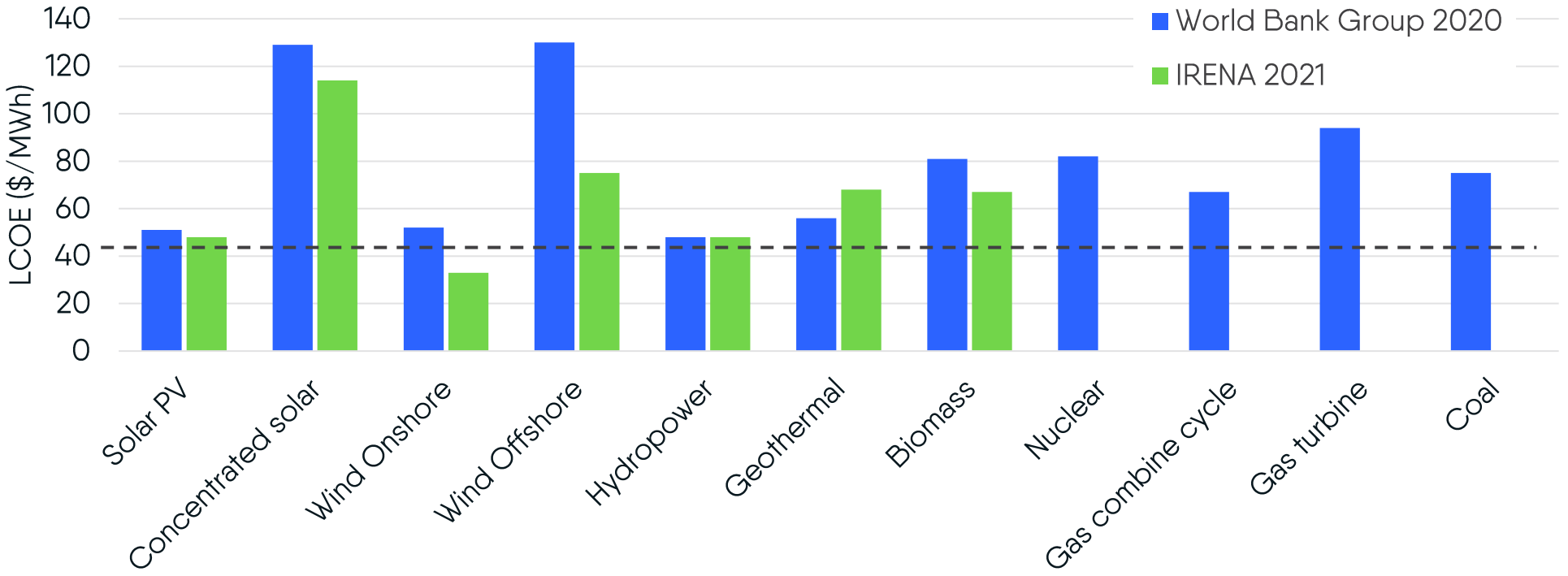
**Pumped storage hydropower is best in class** considering round trip efficiency and lifetime [8]

- **Pumped storage: 50–100 years, 80% efficiency**
- Hydrogen: 25 years, 30% efficiency
- Lithium-Ion battery: 15 years, 88–95% efficiency

# Hydropower is sustainable

# Hydropower is affordable

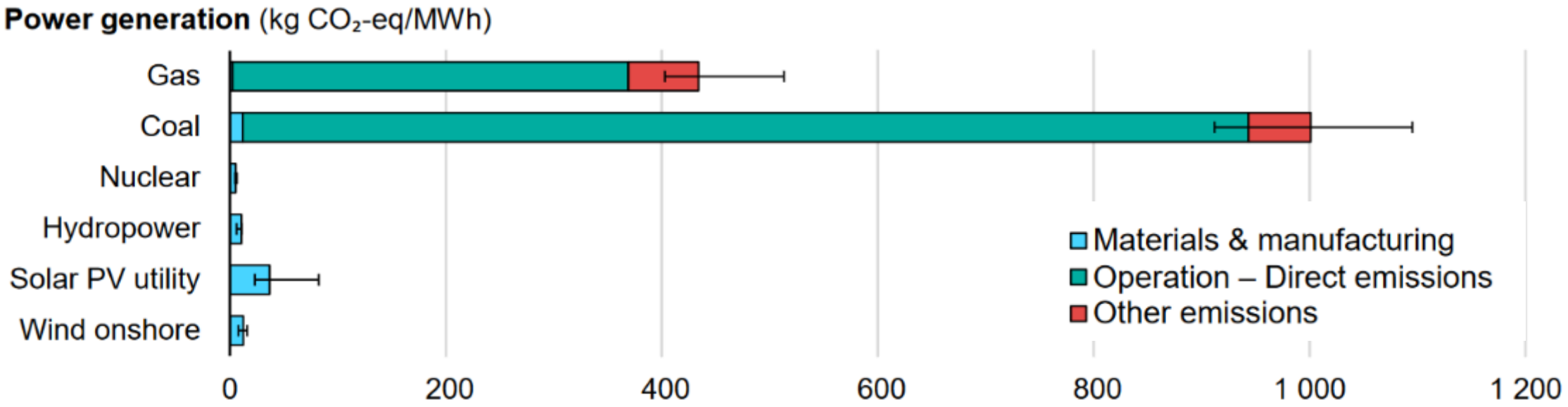
Hydropower has one of **the lowest LCOE values** of all electricity generation technologies ($48/MWh)




Levelised cost of electricity (LCOE) for different utility-scale power generation technologies [9,10]

# Hydropower is protecting the climate

Hydropower shows **the lowest life-cycle greenhouse gas emission** of all renewable energy technologies




Global average life-cycle greenhouse gas emissions intensity of selected power generation technologies.[11]

# Hydropower is preserving the environment

The hydropower sector has **extensive experience in minimising impacts on the environment** and is committed to achieve a net positive outcome for biodiversity based on the following approach:

- **Avoidance** of negative impacts
- **Restoration** of existing habitats
- **Creation** of new habitats

Have a look at a number of case studies in **Eurelectric's #PowerPlant**

# Hydropower is more than electricity generation and storage

Hydropower offers **additional socio-economic benefits**:

1

FLOOD AND DROUGHT MITIGATION

2

WATER SUPPLY FOR DRINKING

3

WATER SUPPLY FOR IRRIGATION, INDUSTRIAL NEEDS AND FIREFIGHTING

4

PROMOTION OF TOURISM

5

PROMOTION OF NAVIGATION

# EU legislation recognises hydropower's vital role

**Taxonomy Regulation** (adopted 2020)

- ✓ Hydropower contributes significantly to climate change adaptation and mitigation

**Nature Restoration Regulation** (proposed 2022)

- ✓ Structures used for hydropower generation should be excluded from the provisions of obsolete barrier removal to achieve 25,000 km of free-flowing rivers

**Renewable Energy Directive** (adopted 2023)

- ✓ Hydropower is a renewable electricity source
- ✓ Hydropower is eligible for accelerated permitting procedures
- ✓ Hydropower is presumed to be of overriding public interest

**Electricity Market Design Review** (proposed March 2023)

- ✓ Role of flexible generation and storage is emphasised

# 5 essential actions to fully unlock the potential of EU Hydropower

1. **Ensure a stable legislative environment to strengthen long-term visibility and investor confidence as hydropower plants require large capital investments.**

2. **Remove obstacles and accelerate permitting procedures for all hydropower projects alongside wind and solar PV.**

3. **Preserving market principles is essential for efficient dispatch and storage of electricity** (i.e., flexible sources are activated when they offer the most value to the power system).

4. **Acknowledge hydropower‘s contribution to climate change mitigation and the efforts taken to minimise impact on the environment.**

5. **Champion the multi-purpose benefits of hydropower beyond electricity generation** (i.e., mitigating floods and droughts; providing water for drinking, irrigation and industrial needs; promoting tourism and navigation).

## References: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[4] European Commission, Directorate-General for Energy, Andrey, C., Barberi, P., Nuffel, L., et al., *Study on energy storage : contribution to the security of the electricity supply in Europe*, Publications Office, 2020, https://data.europa.eu/doi/10.2833/077257;

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[9] World Bank Group, Govinda R. Timilsina (2020). *Policy Research Working Paper 9303 - Demystifying the Costs of Electricity Generation Technologies*;

[10] International Renewable Energy Agency (2021), *Renewable Power Generation – Cost in 2021*;

[11] International Energy Agency (2023). *Energy Technology Perspectives 2023*;


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