



# Upgrading EU Hydropower for future needs

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# Hydropower is the EU's leading source of renewable flexibility and storage

Europe's energy system is undergoing a profound transformation to achieve its climate and energy targets. The massive and rapid deployment of variable renewable energy generation from wind and solar PV increases the need for **flexibility** and **storage** to match supply and demand.

## On the supply side, two solutions exist:


1. Dispatchable power plants allow electricity generation to be adjusted to demand.
2. Storage units soak up surplus electricity and feed it back into the grid as needed.

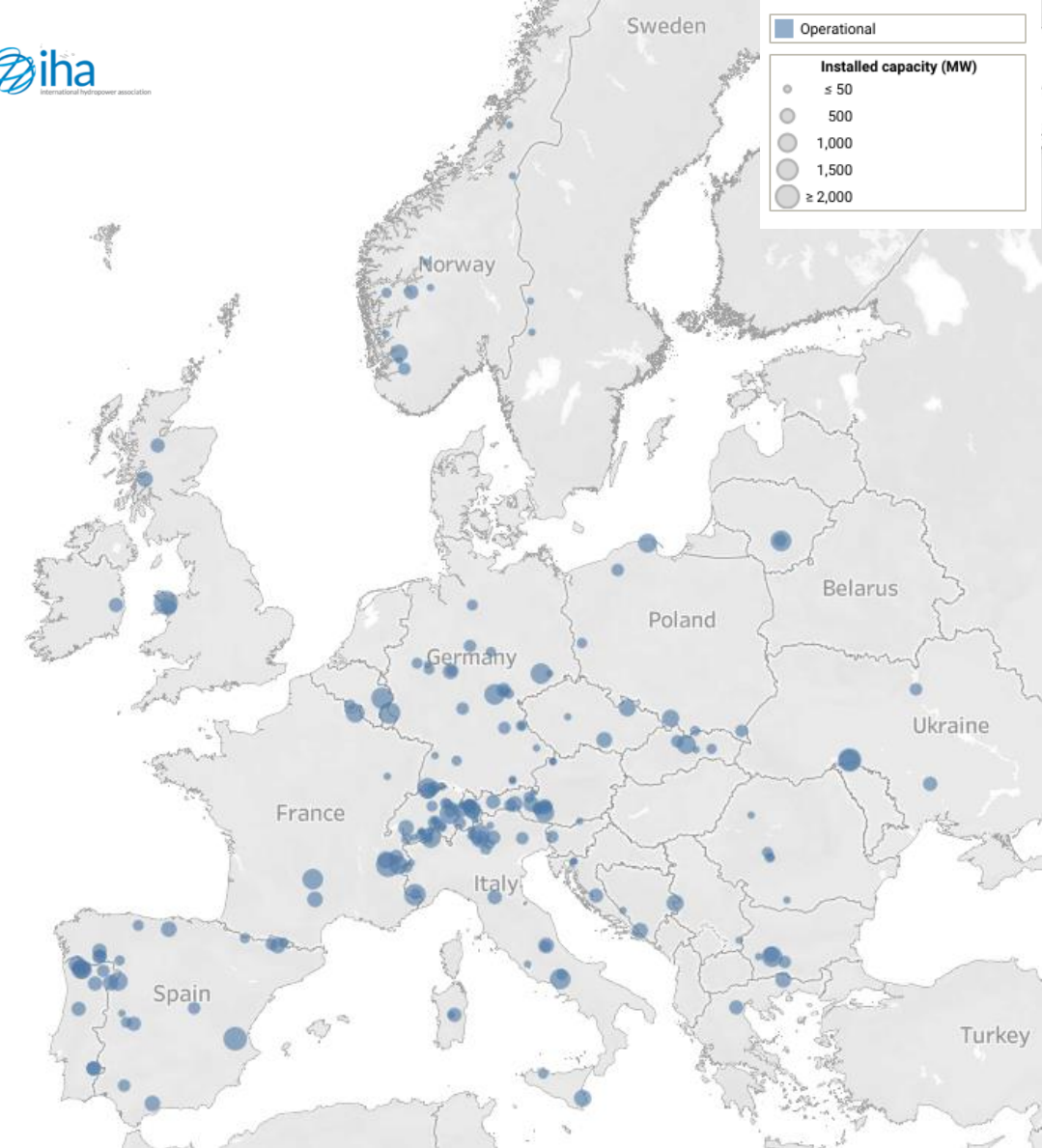
## Hydropower acts as both:

By upgrading existing flexible hydropower schemes to highly efficient pumped storage plants, the European power system can be decarbonised while ensuring security of supply.



# 6 Essential facts to know

-  **1 We need much more flexibility and storage:** The decarbonisation of the electricity system requires a massive increase in flexible generation and storage capacity to balance supply and demand.<sup>1,2</sup>
-  **2 Hydropower has delivered for decades:** Hydropower plants have been delivering flexible and renewable electricity at an affordable and competitive price for generations.<sup>3</sup>
-  **3 Large-scale and most mature:** Although different technologies are available, pumped storage hydropower provides more than 90% of the EU's storage capacity today.<sup>4,5</sup>
-  **4 How pumped storage plants work:** When surplus electricity is available, water is pumped from a lower to an upper reservoir. During high demand, the stored water is converted back into electricity.
-  **5 Hydropower is European:** Building on a transparent and clean value chain, hydropower is independent of imports of raw materials, skilled labour, and technological competence.
-  **6 Hydropower preserves the environment:** Upgrading hydropower plants allows for a minimal impact on the environment, while maximising the output of the existing facilities.

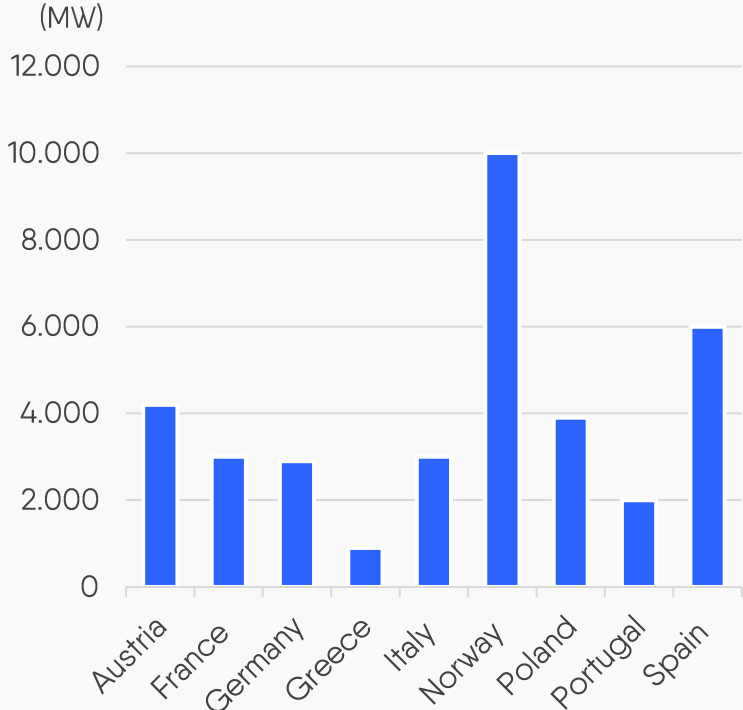


Map of existing pumped storage plants in Europe by International Hydropower Association <sup>6</sup>



# Pumped storage projects are waiting to be unleashed across Europe

## Potential capacity of selected European countries\*



**Total: 36.000 MW**

\*Potential capacity of new pumped storage plants using existing hydropower schemes based on information provided by Eurelectric Members



**Accounts for 80% of installed pumped storage capacity in the EU**



**Equivalent to 11.5 million electric cars**

## Examples of planned projects



### Lünarseewerk II (Austria)

- ✓ A new pumped storage plant will be built using an existing reservoir
- ✓ Generation capacity: **1.000 MW**
- ✓ Pump capacity: **1.000 MW**
- ✓ Starting operation: **2037**
- ✓ Investment: **€ 2 bn**



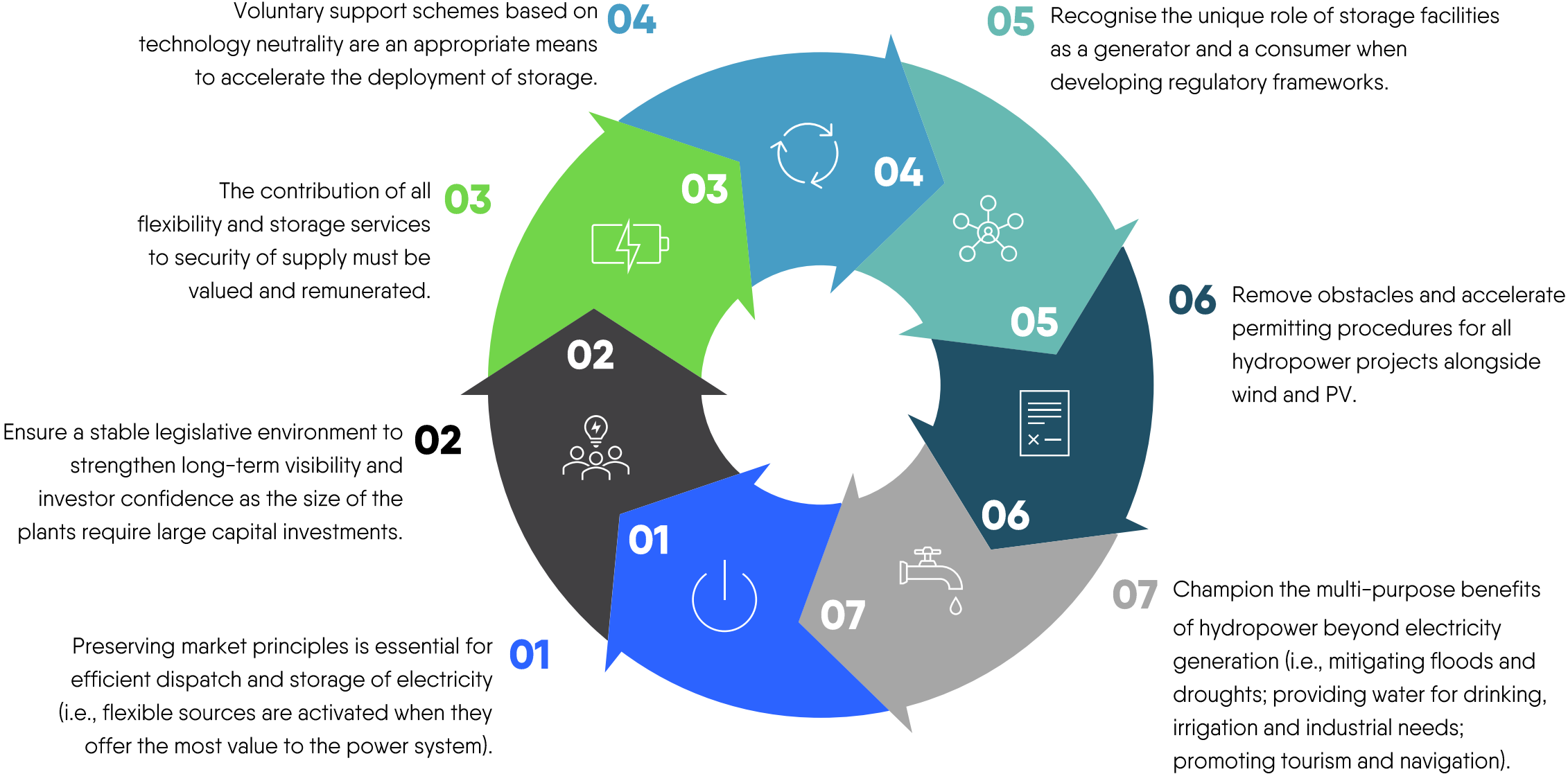
### Alto Lindoso (Portugal)

- ✓ An old turbine is replaced with a reversible unit able to pump and generate
- ✓ Generation capacity: **630 MW**
- ✓ Pump capacity: **315 MW**
- ✓ Starting operation: **2027**
- ✓ Investment: **€ 96 mn**

Photo Lünarseewerk II (Austria) - credits: illwerke vkw AG, Stefan Kothner Photography  
 Photo Alto Lindoso (Portugal) - credits: EDP Produção



# 7 Actions for today to meet tomorrow's needs



## References:

<sup>1</sup> European Commission, Joint Research Centre, Koolen, D., De Felice, M., Busch, S., Flexibility requirements and the role of storage in future European power systems, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2760/384443>

<sup>2</sup> European Union Agency for the Cooperation of Energy Regulation, [ACER's Final Assessment of the EU Wholesale Electricity Market Design](#), 2022;

<sup>3</sup> International Renewable Energy Agency (IRENA), The changing role of hydropower: [Challenges and opportunities](#), Abu Dhabi. 2023;

<sup>4</sup> 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>;

<sup>5</sup> European Parliament, ITRE Committee, [Report on a comprehensive European approach to energy storage \(2019/2189\(INI\)\)](#), 2020;

<sup>6</sup> Source: International Hydropower Association, Hydropower Pumped Storage Tracking Tool, <https://www.hydropower.org/hydropower-pumped-storage-tool>, 2023;

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