

HYDRA Project Advances Hydrogen Sustainability Research with Key Milestones Achieved at Month 22

Delivering data-driven insights for a sustainable hydrogen economy

September 3, 2025 - The HYDRA project, funded under the Horizon Europe program, has successfully completed its first 22 months of activities, marking significant progress toward understanding the environmental impacts of hydrogen technologies.

CARTIF Technology Center led the project policy analysis mapping and comparing hydrogen-related strategies at European, national, and global levels. Key outcomes include:

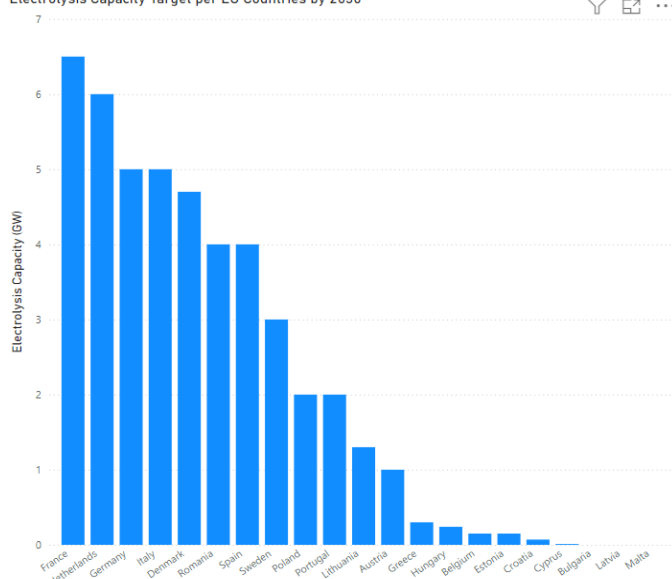
- A **consolidated review** of hydrogen policies and targets worldwide.
- A **harmonised classification system** to compare measures by sector (industry, transport), value chain stage (production, transport, storage, supply), and type of instrument (regulatory, economic, research, voluntary).
- A **KPI framework** translating policy targets into measurable data for HYDRA modelling activities.

Some key insights include:

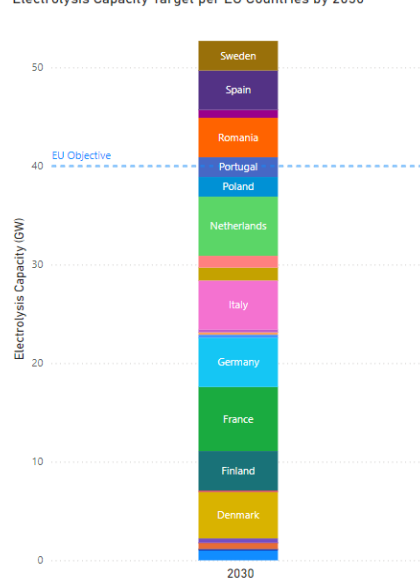
- increasing ambition supported by concrete targets, like the EU target of **40 GW electrolyzers by 2030** and **20 Mt hydrogen supply (domestic + imports)** under the Hydrogen Strategy and REPowerEU.
- Binding quotas for hydrogen-derived fuels in REDIII and ReFuelEU Aviation,.
- Infrastructure roadmaps, like the **European Hydrogen Backbone** initiative foreseeing 28,000 km of pipelines by 2030, expanding to 53,000 km by 2040.
- Ambitious targets beyond Europe, e.g. **Chile (25 GW by 2030)**, **India (5 Mt/year by 2030)**, **Japan (15 GW by 2030)**, **UK (10 GW by 2030)**.

This policy mapping ensures HYDRA future modelling and assessments are based on a **robust and realistic policy foundation**.

Electrolysis Capacity Target per EU Countries by 2030



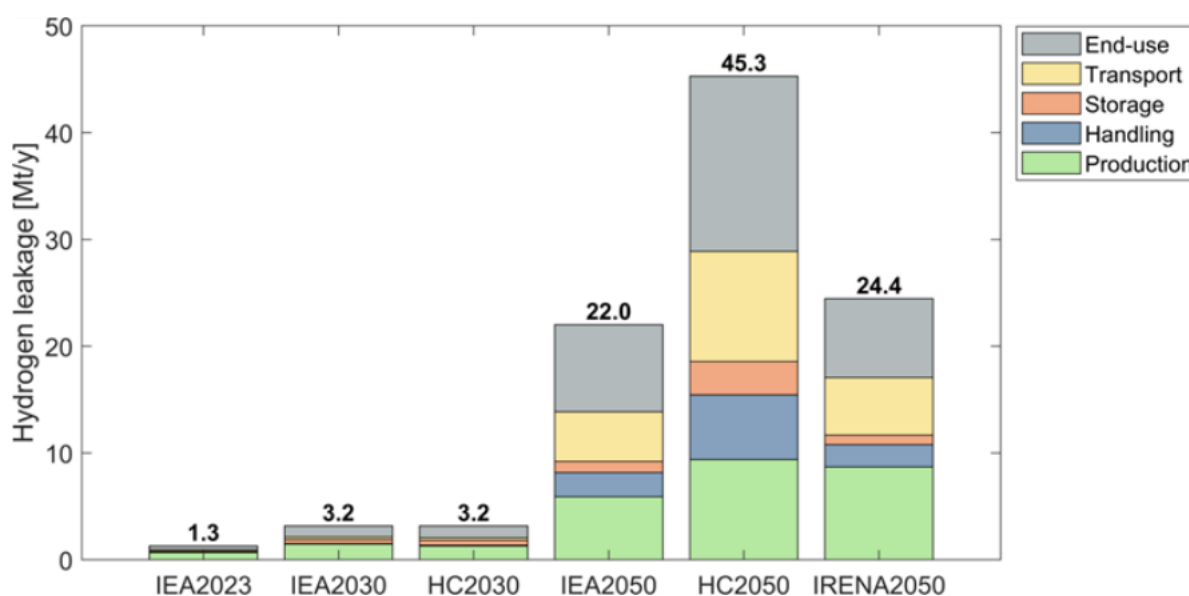
Electrolysis Capacity Target per EU Countries by 2030



Politecnico di Torino led the analysis of the **hydrogen value chain**, assessing technologies, markets, and leakages. Key achievements include:

- **Comprehensive Mapping of the Hydrogen Value Chain:** A structured evaluation of hydrogen technologies (TRL > 5) and their energy requirements, water usage, efficiency, and their role across sectors such as industry, mobility, and power generation.
- **Global Market Analysis:** A thorough study of current and projected hydrogen production, trade flows, and demand using international scenarios from IEA, IRENA, and the Hydrogen Council. This assessment also covered hydrogen derivatives like ammonia and methanol, crucial for enabling long-distance hydrogen trade.
- **First-of-its-Kind Leakage Estimations:** Quantification of hydrogen leakages across the entire value chain – from production to end-use – under present conditions and future scenarios (2030 and 2050).
- **Environmental and Safety Insights:** Preliminary evaluation of other associated emissions (methane, ammonia, methanol) and a review of current hydrogen detection technologies, setting the basis for the development of advanced monitoring tools in HYDRA.

These results, detailed in a recent peer-reviewed publication in the **International Journal of Hydrogen Energy**, provide the analytical backbone for subsequent modeling activities and impact assessments in HYDRA.



Minimum-maximum variation in the leakage rates of the hydrogen supply chain (D. Trapani, P. Marocco, M. Gandiglio, and M. Santarelli, "Hydrogen leakages across the supply chain: Current estimates and future scenarios," *Int J Hydrogen Energy*, vol. 145, pp. 1084–1095, Jul. 2025, doi: 10.1016/j.ijhydene.2025.06.103.)

By integrating political, technological, market, and environmental perspectives, HYDRA is positioning itself to deliver robust, science-based recommendations for a safe and climate-responsible hydrogen economy development.

Looking ahead, the consortium will leverage these outputs to advance modeling efforts, refine environmental impact assessments, and support policy design for sustainable hydrogen deployment in Europe.

About HYDRA

HYDRA is a Horizon Europe-funded project aiming to evaluate and minimize the environmental and climate impacts of hydrogen technologies across their entire value chain. The project brings together leading European research institutions and industry partners to ensure a responsible and efficient energy transition.

Learn more at: www.hydraproject.eu

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CONTACTS

Isella Vicini (beWarrant) | HYDRA Project Coordinator

isella.vicini@bewarrant.be

Noelia Ferreras (Fundacion CARTIF) | HYDRA Scientific Coordinator

noefer@cartif.es

