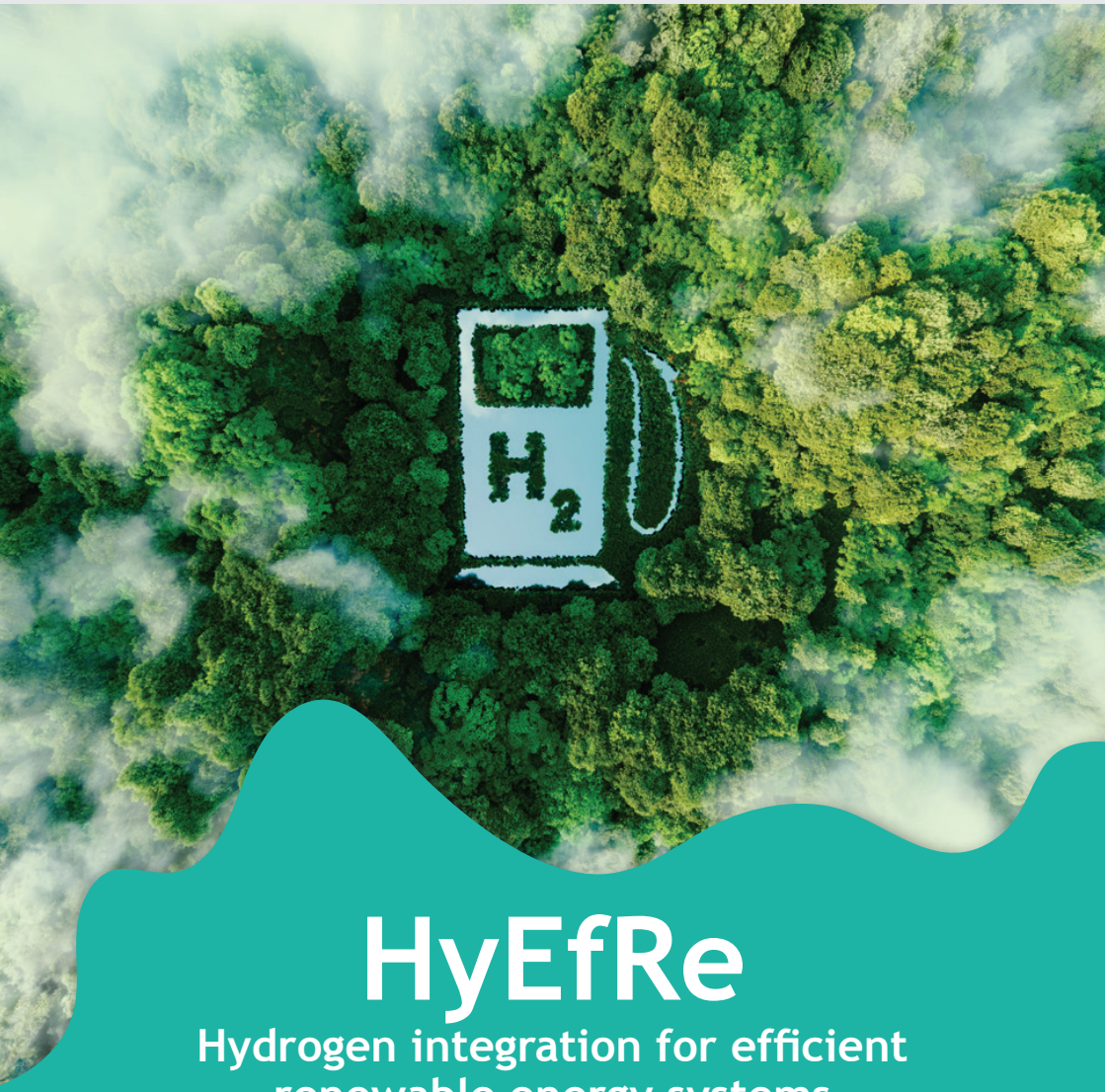
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HyEfRe



HyEfRe

Hydrogen integration for efficient renewable energy systems

Project period: December 2022 - November 2026

8 regions • 8 countries • 11 partners • 3 pilot actions

WHY HYEFRE?

The challenge. Central European energy systems face several structural challenges, including the limited integration of variable renewable energy sources such as wind and solar, insufficient energy efficiency, and slow progress towards carbon neutrality. These challenges contribute to higher energy costs, continued environmental pressures, and persistent greenhouse-gas emissions, highlighting the need for more integrated, flexible, and sustainable energy solutions.

The opportunity. HyEfRe promotes hydrogen-based sector coupling as a pathway to increase energy-system flexibility, improve overall efficiency, and accelerate the transition to clean energy systems. However, regions face a range of technical, economic, regulatory, and social barriers to the deployment of green hydrogen. The HyEfRe project addresses these challenges by supporting the development of green hydrogen ecosystems in eight regions, fostering an investment-friendly environment for renewable energy and hydrogen technologies.

THE FLAGSHIP TOOLS

HYDROGEN POTENTIAL MODEL

To support evidence-based planning and investment decisions, HyEfRe developed an innovative model to assess regional hydrogen potential, including storage and grid-balancing opportunities. Based on hourly data on renewable energy generation and electricity demand, the web-based model identifies supply-demand imbalances and estimates the potential for producing hydrogen from surplus renewable electricity. It provides maps of areas with high potential for renewable energy and hydrogen production, estimates associated emissions reductions, and enables the simulation of future renewable-energy scenarios. Hydrogen Potential Model is fully integrated with the HyEfRe Decision Support Tool.

DECISION SUPPORT TOOL

Feasibility studies are expensive, technical expertise is scarce outside major cities, and the gap between national hydrogen strategies and local project development remains wide. HyEfRe addresses this gap with a free, open-access Decision Support Tool that helps planners, municipalities and other stakeholders design and assess renewable energy and hydrogen systems without advanced modelling expertise. Using data from the Hydrogen Potential Model, it provides recommendations on system sizing, technologies, operation and CAPEX/

OPEX, including options for waste-heat utilisation and grid flexibility. By turning complex technical and economic analysis into practical project concepts, the tool helps reduce planning risks and accelerate viable hydrogen investments.

FROM TOOLS TO REGIONAL ACTION

HyEfRe combines digital tools with practical approaches for governance, policy and investment. The project's implementation outputs address three connected questions: who needs to work together, what conditions need to change, and how can projects become viable?

1 HYDROGEN ECOSYSTEMS

Connecting the actors needed to make hydrogen projects happen. HyEfRe uses a systems-thinking approach to help regions establish functioning hydrogen ecosystems. It maps stakeholders across the hydrogen value chain, their roles, interactions, benefits and concerns, and provides step-by-step guidance for municipalities, regions and sectoral agencies on how to establish and govern local hydrogen ecosystems. The approach supports stakeholders in coordinating investments, aligning policies and building partnerships, while connecting local ecosystems into a wider transnational network.

Want to become part of the H2 Ecosystem?

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2 POLICY RECOMMENDATIONS

Creating conditions for investment and implementation. Even technically feasible hydrogen projects can be delayed by complex permitting, unclear regulations, limited infrastructure and uncertain market conditions. HyEfRe developed policy recommendations and an action plan for policy-makers, adressing key areas:

- Faster and clearer permitting procedures
- Clear definition and certification of hydrogen
- Hydrogen infrastructure development
- Financial incentives and investment security
- Market development and demand creation
- Integration of electrolyser waste heat into district heating and local energy systems
- Short-, medium- and long-term actions

3 BUSINESS MODELS

Matching hydrogen projects to regional conditions. HyEfRe developed five business-model archetypes for hydrogen hubs, covering different combinations of hydrogen demand, infrastructure, applications and financing. Rather than prescribing one solution, the framework helps regions identify the model—or combination of models-best suited to their local resources, infrastructure, demand and stakeholder ecosystem:

- **Industrial decarbonisation** - stable hydrogen demand from hard-to-abate industries.
- **Port & logistics hubs** - multiple hydrogen applications around ports and industrial areas.
- **Transnational corridors** - connected production, demand and transport infrastructure.
- **Captive mobility fleets** - predictable demand from buses, trains and municipal fleets.
- **Decentralised supply & system services** - renewable hydrogen combined with grid flexibility, heat and other local energy services.

Explore the HyEfRe tools and outputs:

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