

## What is Hydrogen4EU?

A cross-sectoral research project to inform the potential contribution of low-carbon and renewable hydrogen in achieving the EU's 2050 climate neutrality objective.

The 2022 edition considers the impact of a progressive substitution of Russian natural gas imports and reduction of methane emissions along the natural gas value chain.



# What does the study say?

Hydrogen4EU explores 2 pathways for a mix of hydrogen technologies to be deployed across sectors in Europe. Both pathways meet the EU's 2030 55% GHG emission reduction and 2050 climate neutrality targets. The difference lies in the mix of technologies deployed.

#### **TECHNOLOGY DIVERSIFICATION PATHWAY**

Based on approved national targets

Assumes no obstacles to the deployment of different technologies & accurate market foresight.

Looks at decarbonisation technologies that enable a more competitive and cost-efficient energy system

#### **RENEWABLE PUSH PATHWAY**

Prioritises the use of renewable energy beyond current policy goals.

Hydrogen considered key to help absorb, store, and transport the additional energy resulting from higher renewables generation.

Total energy system costs are €40 billion per year lower in the Technology Diversification pathway

Total share of renewable energy in the final energy consumption in 2050



(750 Mtoe by 2050)





(853 Mtoe by 2050)



**1,230** gw



Cumulative hydrogen production capacity roll-out from now to 2050

**1,800** gw









declines to by 2050



of total primary energy demand 1,750 GW solar and 1,500 GW wind

installed capacity





declines to **11%** by 2050





share of primary energy demand in 2050 442 bcm by 2050



Declining role with a

share of primary energy demand in 2050 321 bcm by 2050



Hydrogen import potential



of total hydrogen supply in 2050



of total hydrogen supply in 2050

## Key sectors impacted by hydrogen









### **TRANSPORT**

In 2050 hydrogen-based solutions in transport require more than 50 Mt of hydrogen and represent more than 40% of the sector's energy demand.

### **INDUSTRY**

Industrial hydrogen demand reaches some 43 Mt by 2050 (nearly 40% of the sector energy demand).

### **BUILDINGS**

The amount of hydrogen in final consumption is between 2 and 4 Mt (up to 3% of market penetration).

### **POWER**

Electrolysis from solar and wind power helps integrate renewable electricity and mitigate curtailment and grid congestion. Peak hydrogen-fuelled units show potential to generate more than 50 TWh by 2050 (2 to 3 Mt).

### Methodologu

MIRET-EU. A model that encompasses the entire lifecycle of an energy system from primary resource to utilisation. Integrate Europe. A model that analyses the impacts of technology learning on the cost effective transition to an emission-free European Energy system. Hydrogen Pathway Exploration. This provides the MIRET-EU and Integrate Europe model with low-carbon renewable hydrogen imports from neighboring EU countries. Methane emissions module calculates the upstream, midstream and downstream methane footprint of natural gas and all of its products, providing MIRET-EU and HyPE with CO<sub>2eq</sub> methane emissions of natural gas, LNG and low-carbon hydrogen.