European Hydrogen Week

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Opportunities from the inclusion of Hydrogen in NECPs

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Project Objective and Scope

Objective: based on **information in NECPs and other sources**, identify **and evaluate national opportunities for hydrogen deployment** and perform **analysis for 2 hydrogen deployment scenarios**

Scope:

- EU27 (+ UK), with Member State focus
- Up to 2030
- Renewable & low-carbon hydrogen

Hydrogen in NECPs - Key Findings

- Nearly all NECPs mention hydrogen; final NECPs pay much more attention to hydrogen than draft versions, which shows increasing interest and awareness for hydrogen.
- Hydrogen considered as short term and seasonal flexibility provider, and solution to green fossil fuel use in hard to decarbonise energy uses in industry and transport.
- National initiatives referred to in NECPs mainly focus on research, pilot and demonstration projects for hydrogen production, transport/distribution and storage, and end-use, in particular for transport purposes.
- Several NECPs comprise expected or targeted hydrogen demand for 2030, while a few NECPs also include targets for hydrogen production.
- Due to NECP structure, info on hydrogen is scattered in different parts of NECP.

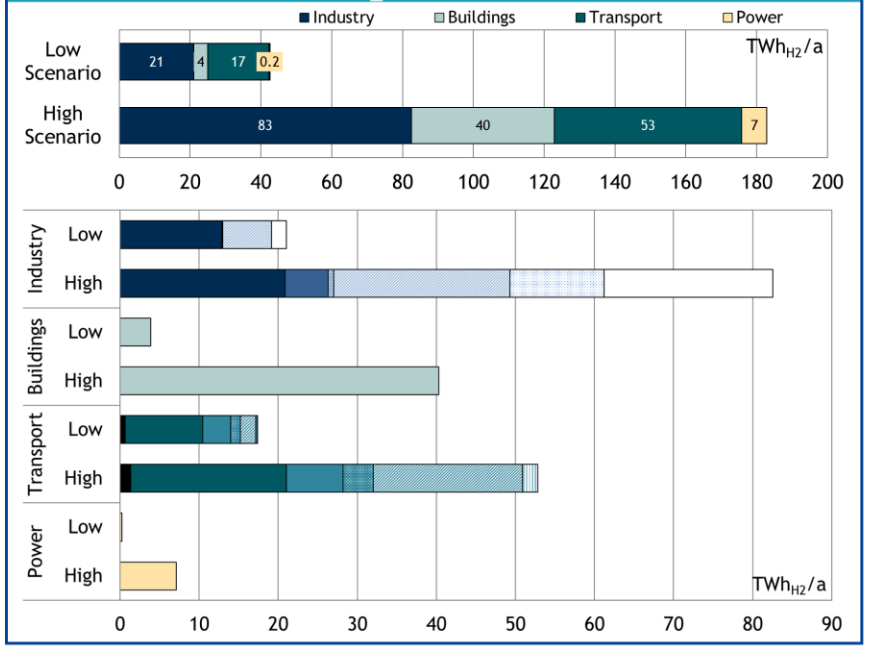
National Opportunities for Hydrogen Deployment - Key Findings

- Most EU Member States have technical potential for variable renewable electricity that exceeds their expected electricity demand in 2030. Building up additional renewable electricity generation capacity for hydrogen production using electrolysis is hence technically possible.
- Flexibility needs in the electricity system are in most Member States increasing and can be covered by hydrogen deployment.
- Availability of existing gas infrastructure is stepping-stone for hydrogen deployment. Hydrogen can be transported via existing networks (as admixture to natural gas) or existing gas pipelines can be refurbished for dedicated hydrogen transport. Several Member States also dispose of gas storage sites or salt layers that are suitable for underground hydrogen storage.
- Significant hydrogen demand opportunity in most countries, in particular for hard-to-decarbonise industrial processes and heavy-duty transport.
- Enabling environment for hydrogen deployment in several countries: national hydrogen association, participation in research programmes, pilot projects, financial or fiscal incentives, etc.

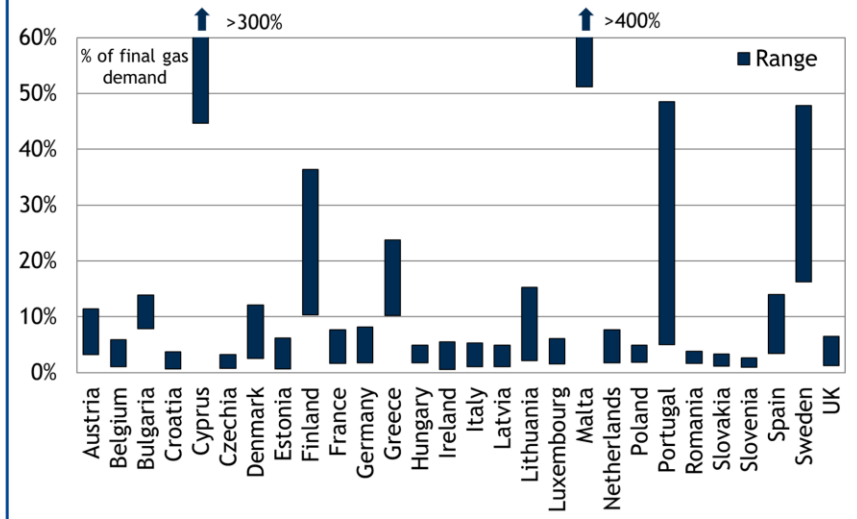
Estimated Impact of Hydrogen Deployment

Demand for renewable hydrogen in EU28 by 2030 : 42 and 183 TWh_{H2}/a respectively in low and high scenario, mainly for use in industry and transport

Renewable H_2 per sector in EU28



Renewable H_2 as % of final gas demand



EU28: 1.8%-7.6% (of final gas demand of 2,342 TWh/a*)
0.4%-1.6% (of energy demand of 11,120 TWh/a*)

* Based on the final energy and gas demand values provided by the EUCO3232.5 scenario

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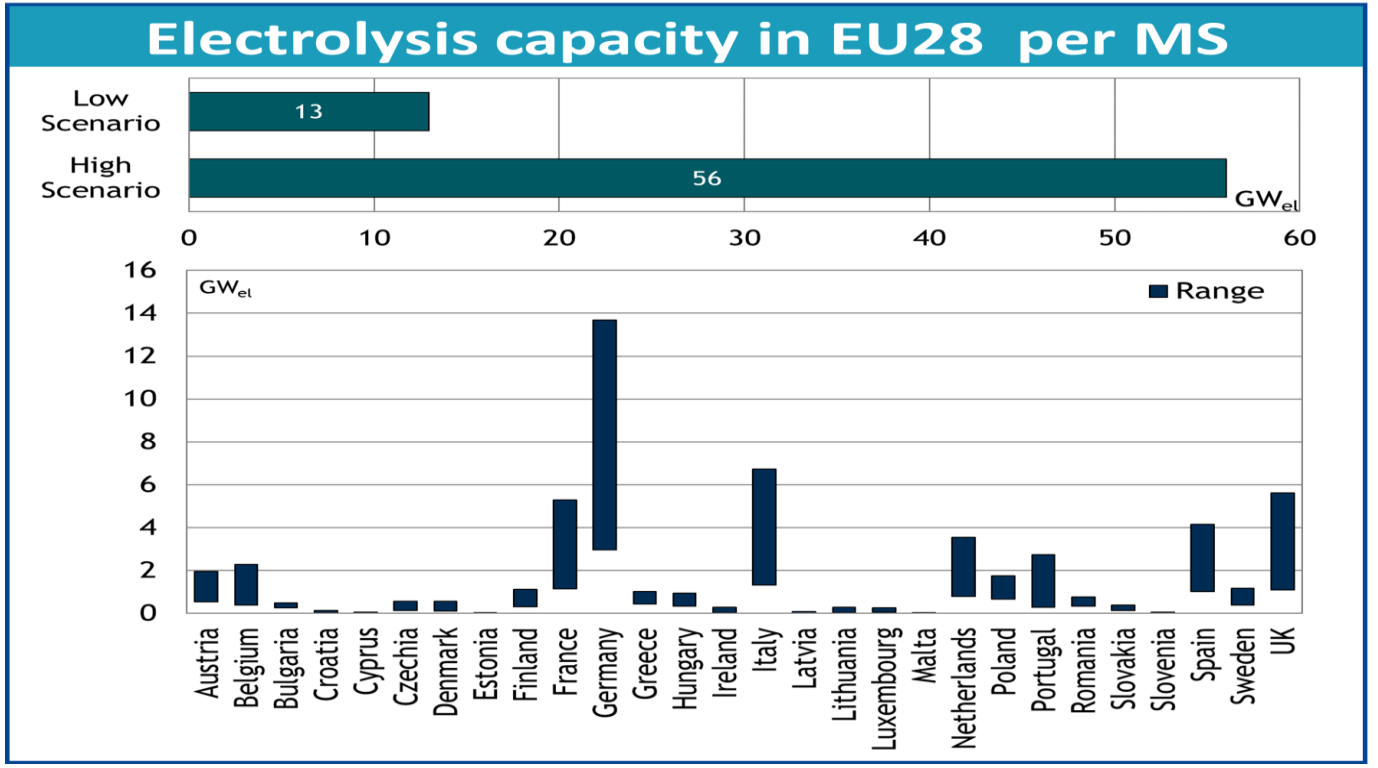
Estimated Impact of Hydrogen Deployment

Electrolysis capacity: 13 and 56 GW_{el} respectively, with average utilisation of 4,800 full load hours



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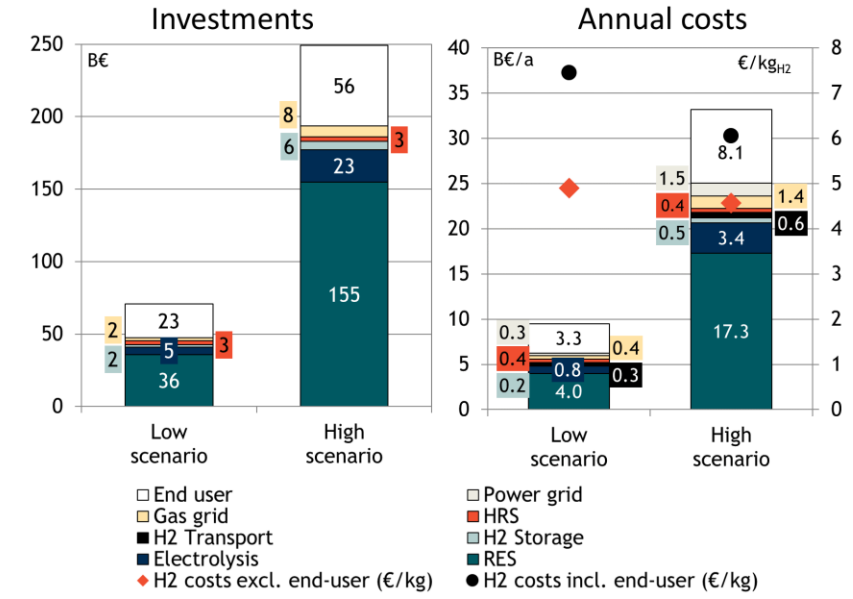
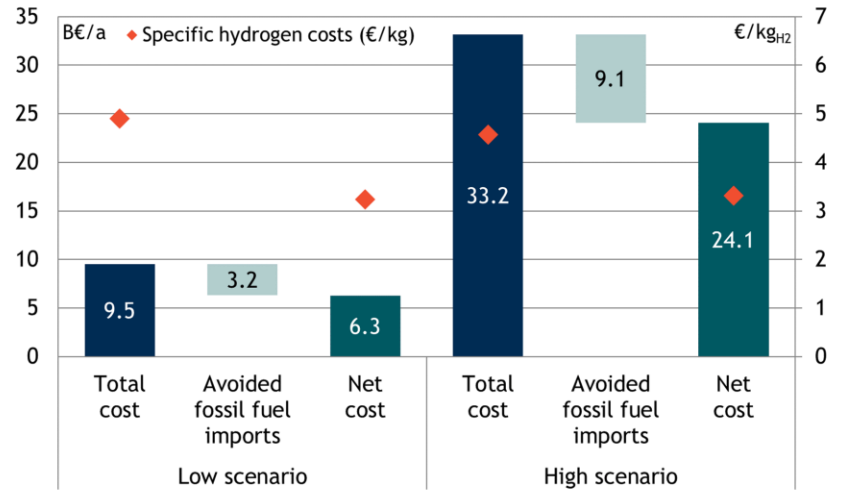
Estimated Impact of Hydrogen Deployment

6 and 24 billion EUR/a respectively of net costs for renewable hydrogen, taking into account annual costs of avoided fossil fuel imports of 3 and 9 billion EUR/a respectively

Investments and annual costs in EU28



Net* annual costs for renewable hydrogen



* Net of avoided imported fossil fuel

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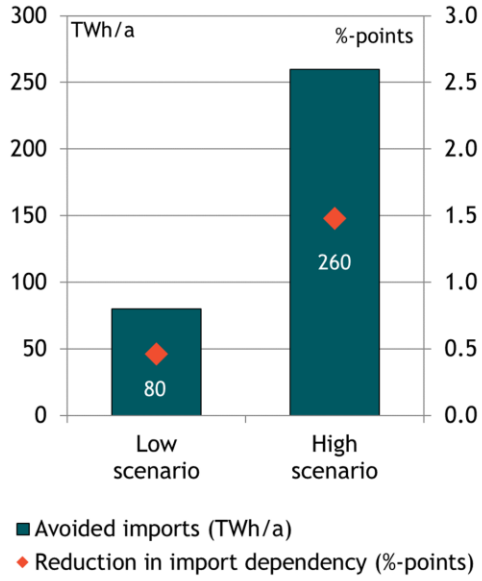
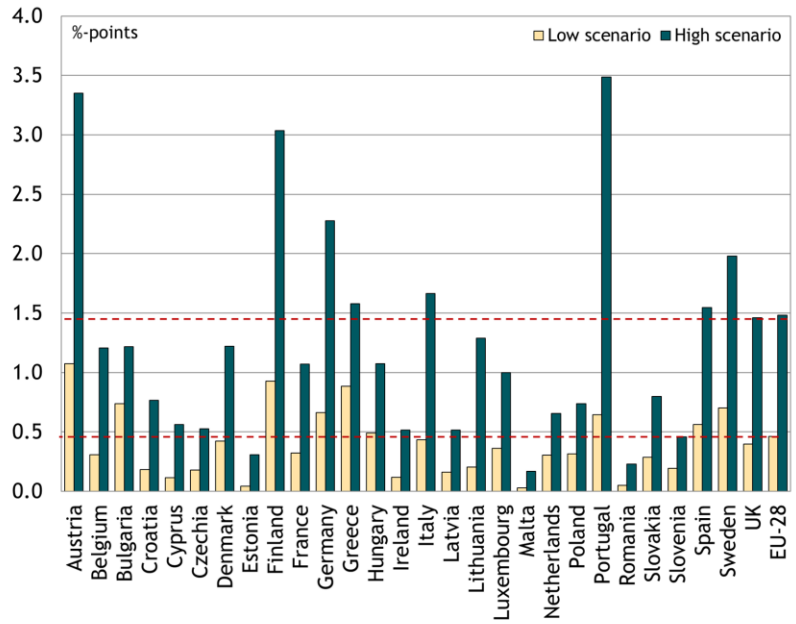
Estimated Impact of Hydrogen Deployment

Avoided fossil fuel imports by 2030 of 80 and 260 TWh/a respectively, improving security of energy supply (i.e. decreasing energy import dependence) by 0.5 and 1.5 %-points respectively

Avoided fossil fuel imports in EU28 by 2030



Improvement of security of energy supply



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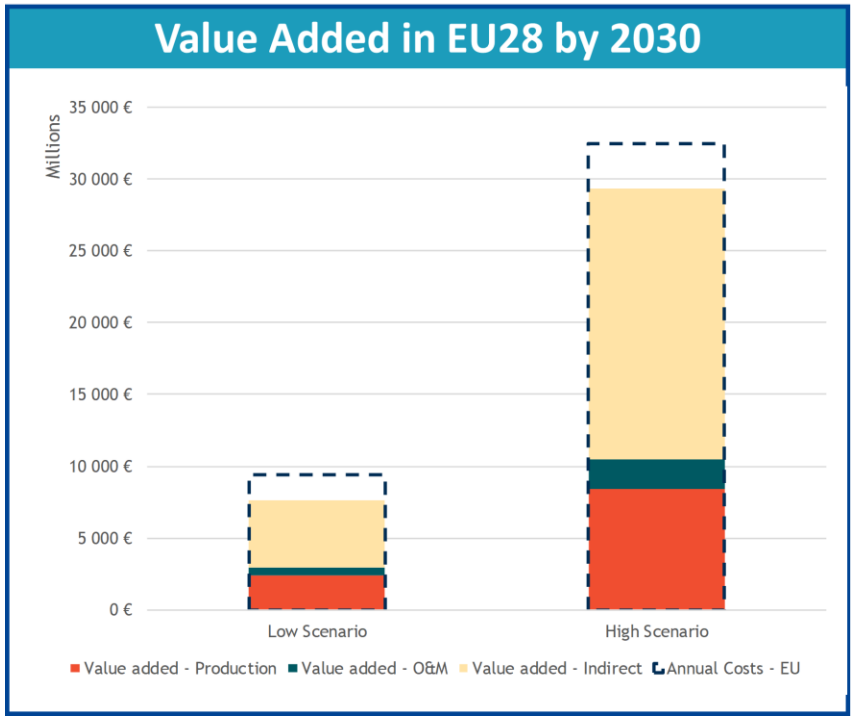
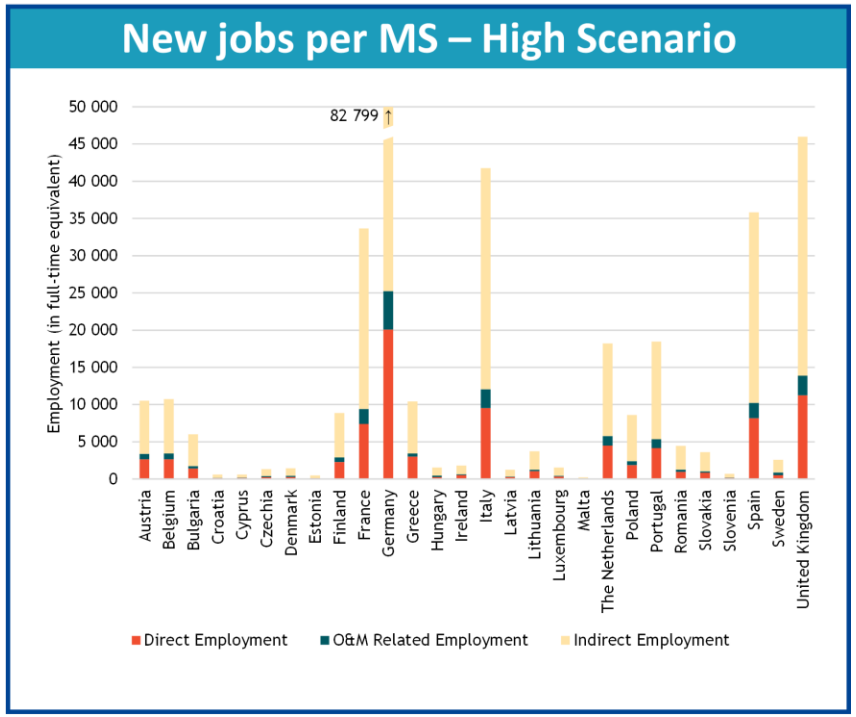
Estimated Impact of Hydrogen Deployment

Value added created in EU economy : 7.5 and 29 billion EUR/a respectively. Positive impact on employment: 104 060 and 357 630 new (direct or indirect) jobs respectively





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Estimated Impact of 2 Hydrogen Deployment Scenarios

- Demand for renewable hydrogen in EU28 by 2030 : 42 and 183 TWh/a respectively, with main use in industry and transport
- Electrolysis capacity : 13 and 56 GWel respectively with average annual utilization of 4 800 full load hours
- GHG emission reduction : 20 and 67 MtCO2/a respectively, corresponding to 1.4 and 4.5% of reduction gap towards 2030 targets
- Annual cost : 9 and 33 billion EUR/a respectively, including cost for end-user equipment
- Value added created in EU economy : 7.5 and 29 billion EUR/a respectively
- Job creation : 104 and 358 thousand indirect or indirect jobs respectively

EU28

Main results and impacts of renewable hydrogen deployment in EU28 by 2030 in two scenarios

Onshore Wind
18 280 - 75 850 MW
44 680 - 184 390 GWh/a

Offshore Wind
1 730 - 7 710 MW
6 430 - 28 600 GWh/a

Solar Photovoltaic
16 750 - 76 740 MW
16 570 - 77 380 GWh/a

Electrolysers
12 970 - 56 010 MW
42 540 - 182 830 GWh_{H2}/a

POWER
216 - 7 088 GWh/a

122 - 2 670 GWh/a
Electricity Produced

TRANSPORT
17 391 - 52 850 GWh/a

7 960 - 16 980
Buses

499 - 1 561
Trains

4 460 - 8 096
Refuelling Stations

208 990 - 427 170
Trucks

2 493 100 - 4 986 100
Cars

1 466 - 13 928 GWh/a
into Synthetic Fuels

BUILDINGS
3 871 - 40 320 GWh/a

177 628 - 803 417
Micro-CHP units
in buildings

224 - 2 516
Commercial-scale
CHP installations

INDUSTRY
21 063 - 82 573 GWh/a

3 230 - 11 630 kt/a
of Steel

12 910 - 20 870 GWh_{H2}/a
in Refineries

0 - 152 kt/a
of Aromatics

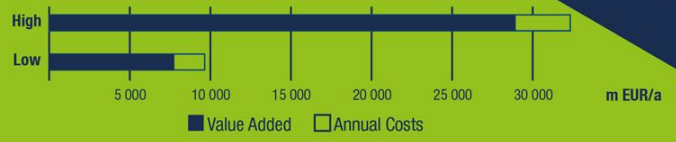
0 - 587 kt/a
of Olefins

12 090 - 97 120 t/a
of Methanol

0 - 762 kt_N/a
of Ammonia

7 590 - 29 330
m EUR/a
Value Added
in the domestic economy

Value Added as Share of Annual Costs

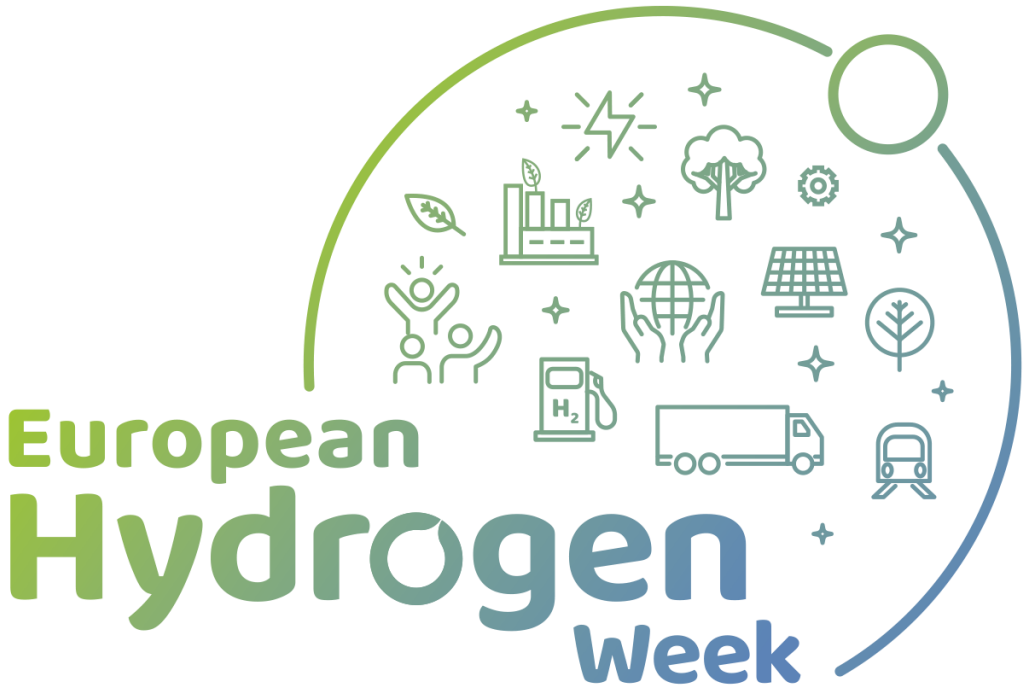


New Jobs
104 060 - 357 630

Emissions avoided
20 - 67 Mt CO_2/a

Thank you for your attention!

The study report and national fiches are available at the FCH JU website:
https://www.fch.europa.eu/publications/opportunities-hydrogen-energy-technologies-considering-national-energy-climate-plans



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