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„Hydrogen in Europe’s energy transition: EU partnerships, national ecosystems and the skills pipeline”

„Hydrogen – catalyst of society development”

„why hydrogen matters for Europe’s energy transition, how EU partnerships operate and interface with regions, and the skills needed to build a capable workforce”

Brussles, 10.28.2025.

Łukasiewicz – Institute for Industrial Chemistry

„Professor Moscicki Campus" project – National Reconstruction Program

Qualified staff, 170 scientists and specialists

Transfer of scientific knowledge to business

Technologies that optimize processes, increase efficiency, and drive industry growth

Product and process innovations: from pilot scale to production in our own technology halls

Process scaling: scale-up and scale-down of chemical, pharmaceutical and biotechnology processes

90 patented solutions

Cooperation with industry leaders

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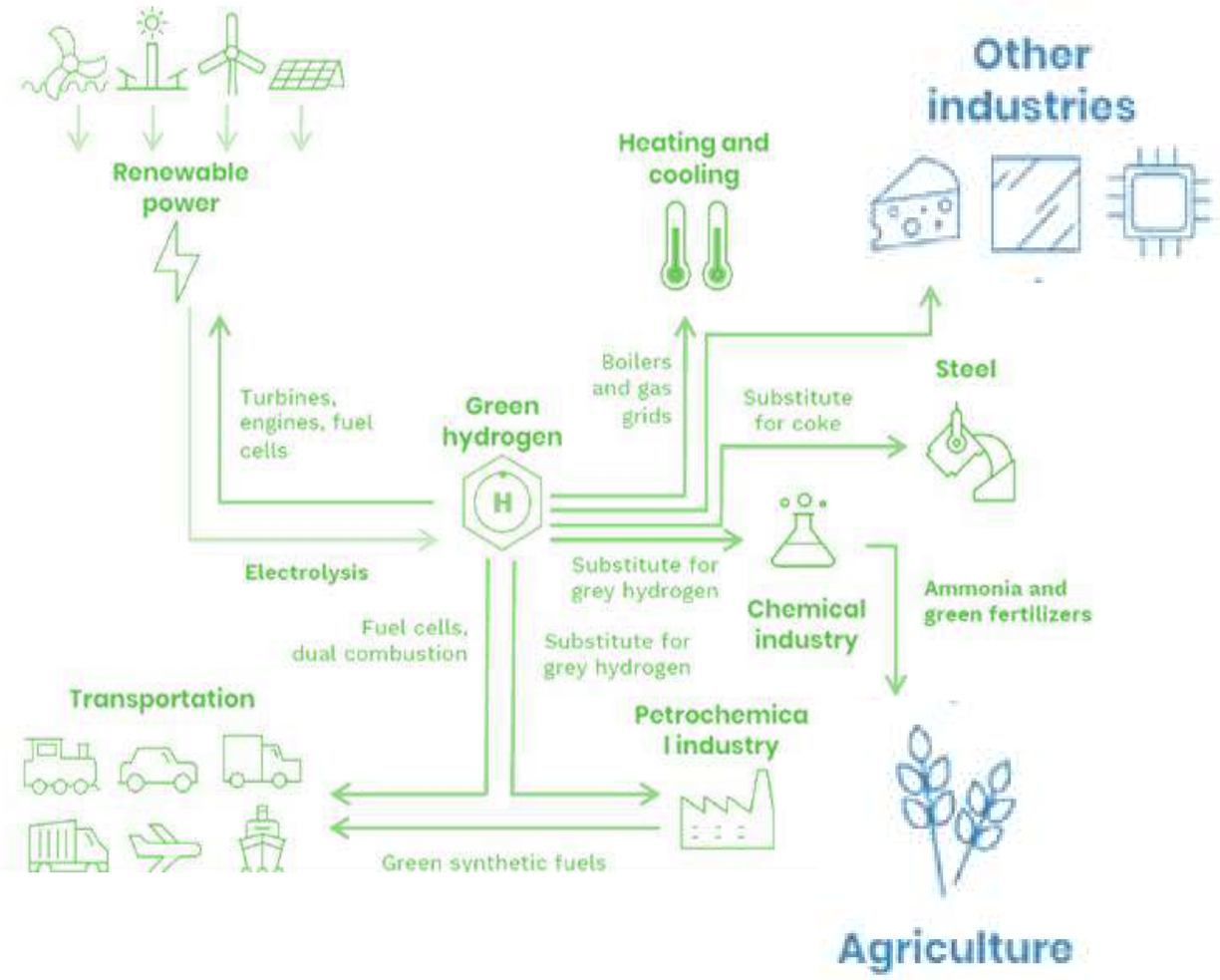
H_2 has heavier meaning than only fuels for the future. While mainstream of discussion concentrate on transportation and industrial hydrogen application, this molecule offers unpredicted opportunities for social transformation, building balance in Energy sector and creating of new communities



Source: SIEMENS

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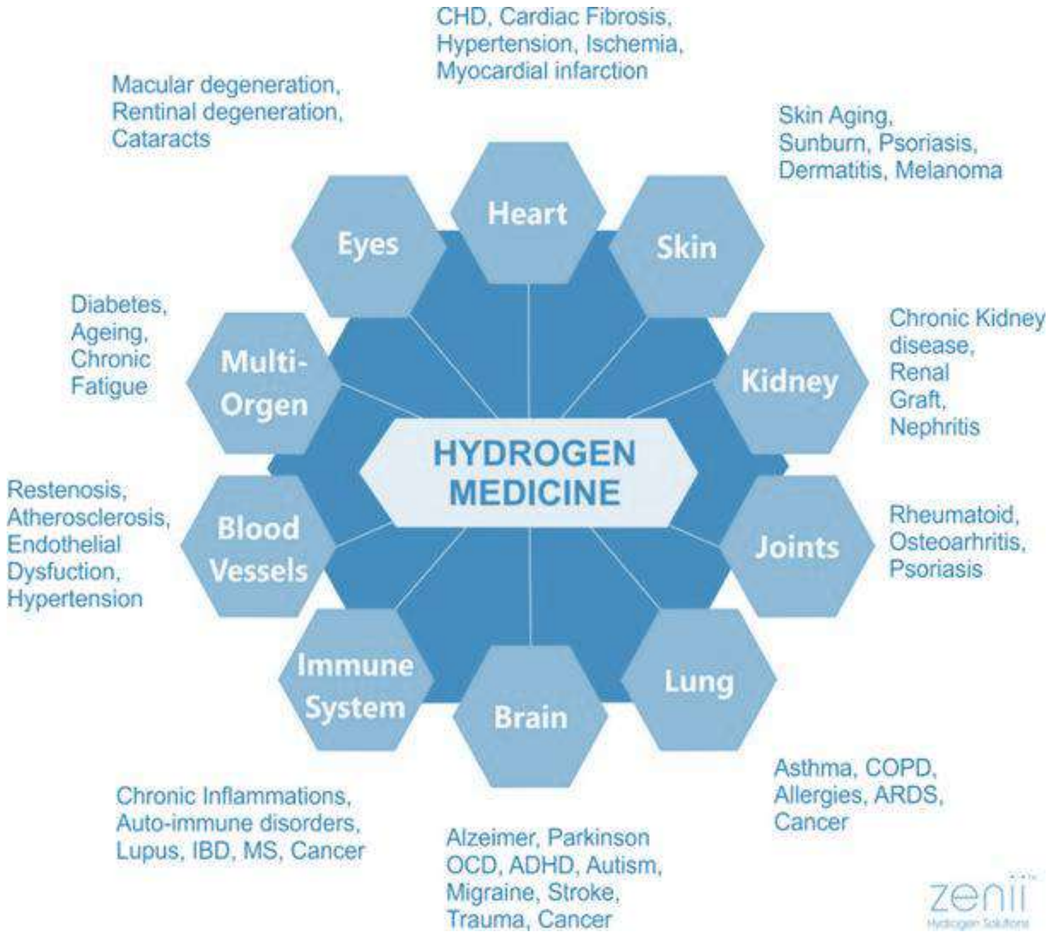
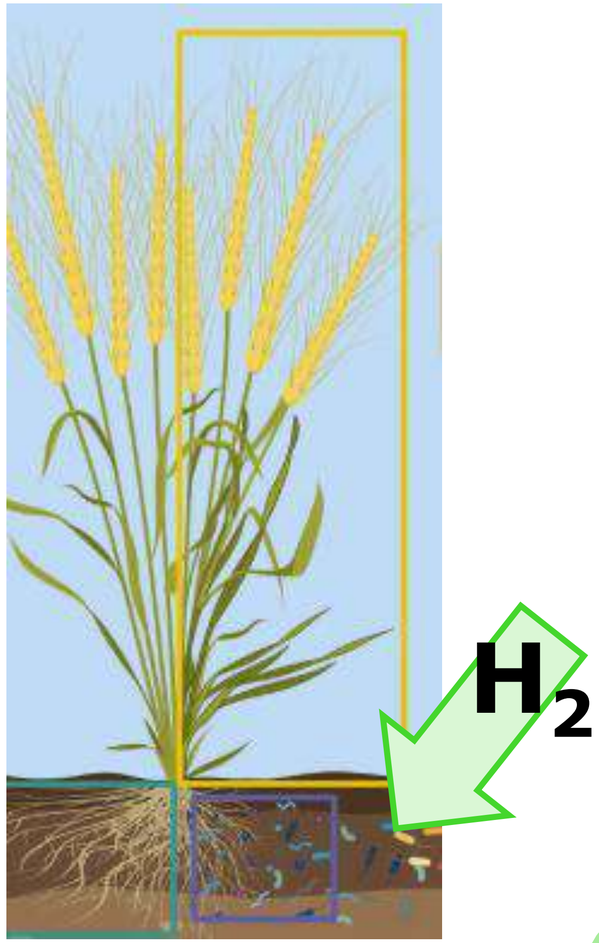
The use of hydrogen in medicine is not obvious, but it is also important for modern and conscious agriculture.

Hydrogen in medicine



Hydrogen in agriculture



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Hydrogen plays an important role in the development of the local community. A number of projects combine electricity generation and its conversion into hydrogen

Hydrogen is converted into an energy resource that can be safely stored. Building local hydrogen ecosystems.

Development of organized urban and rural transportation using buses and trains

Locally generated energy is transferred in the form of hydrogen for special use as public property.

Biogas and wastewater treatment plants are the first source of hydrogen on an industrial scale

Hydrogen energy sources are intended to power boilers in local public facilities (schools, hospitals).

Hydrogen projects already include biowaste and biomethane pyrolysis and biohydrogen purification processes

Demonstration projects and training courses carried out locally enable the development of knowledgeable and well-rounded personnel.

Numerous educational initiatives and scientific projects are addressed to pupils and students in order to build staff and retrain.

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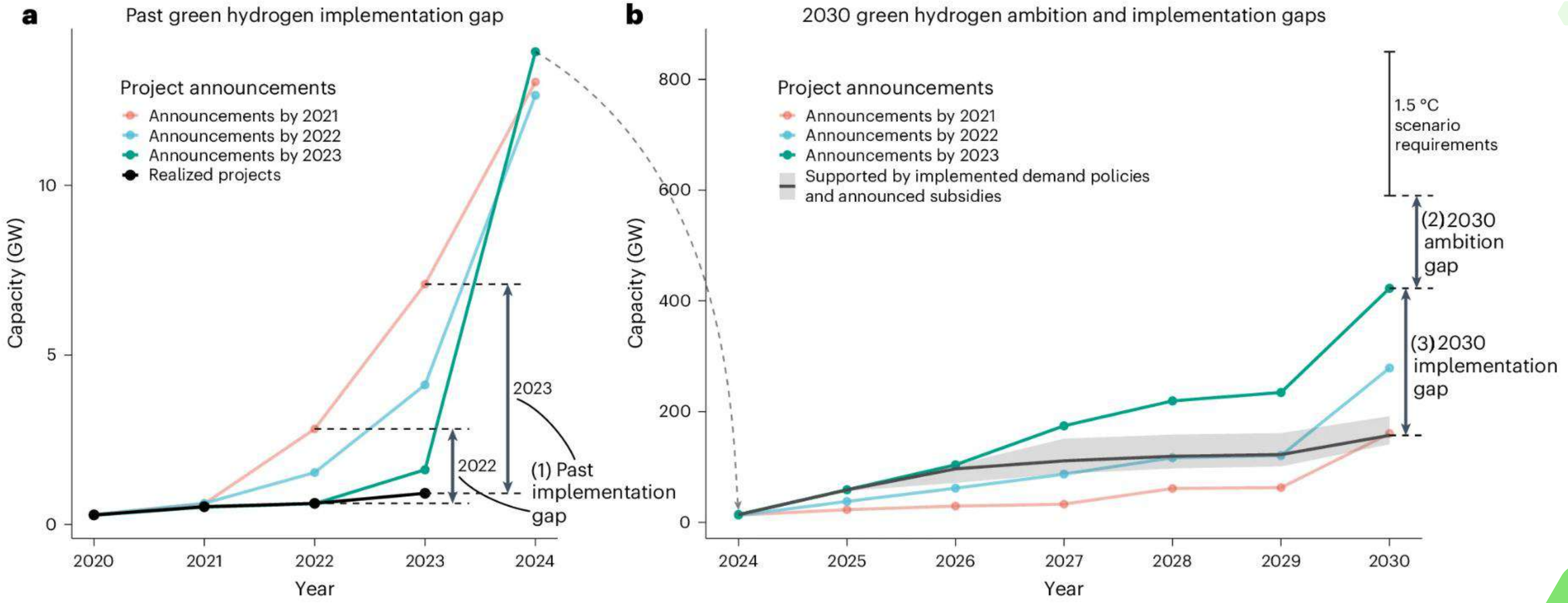
The implementation of hydrogen technologies is currently hampered by: a lack of consistent support, scattered initiatives, and an excess of small-scale projects, which makes it difficult to achieve economies of scale.



https://www.nature.com/articles/s41560-024-01684-7

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Replacing grey hydrogen with green hydrogen is a key step on the road to climate neutrality. The first stage is the transformation of existing assets and the use of bio-methane. Full decarbonization by 2050 requires the construction of new H_2 plants, transmission infrastructure, storage facilities and innovative fuel technologies

In recent years, the following has been achieved:

1. **Increase in employment by approx. 700 thousand jobs.**
2. **Global hubs: USA, UK, Germany, India and China.**
3. **Nearly 18 thousand patents filed.**
4. **Active role of startups: membranes, conversion, engines, storage, drives**
5. **Funding $6.4 billion.**
6. **Future directions are determined by social expectations and technological progress requires investment in R’n’D.**
7. **A 20% drop in costs for each doubling of the power of electrolysers (1.26Euro/kg$H_2$2050)**

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The first hydrogen station in Korea (2006) was built based on CNG technology – at that time, there were no standards in place

INNOVATION TRENDS:

NEW RAW MATERIALS (water foot print)

NEW FUEL CELLS (24%);

ADVANCED ELECTROLYSIS (15%);

X-HYDROGEN-X (11%);

CHEMICAL/PHYSICAL CARRIERS (9%);

ACCOMPANYING MATERIALS;

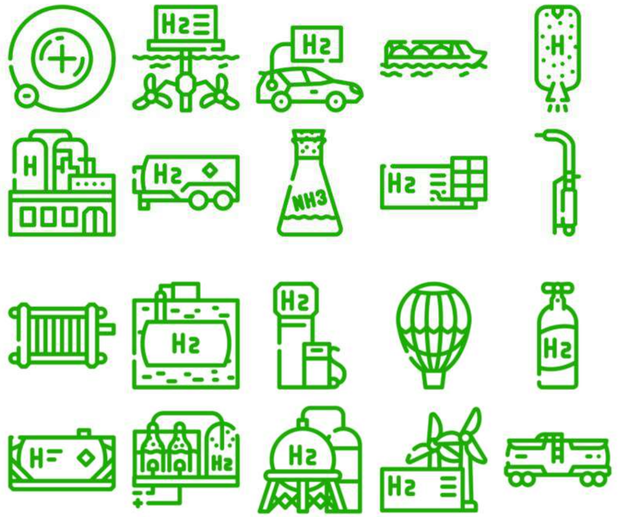
CCUS (8%);

COMPRESSION AND FUELING (6%);

COGENERATION AND PROPULSION (5%);

SAFETY;

CONFIGURATION AND DEVELOPMENT SCENARIOS;



AREAS OF OPPORTUNITY:

NEW FUELS FOR AVIATION;

DIFFICULT ELECTRIFICATION;

E-FUELS AND RFNBO;

DEEP DECARBONIZATION;

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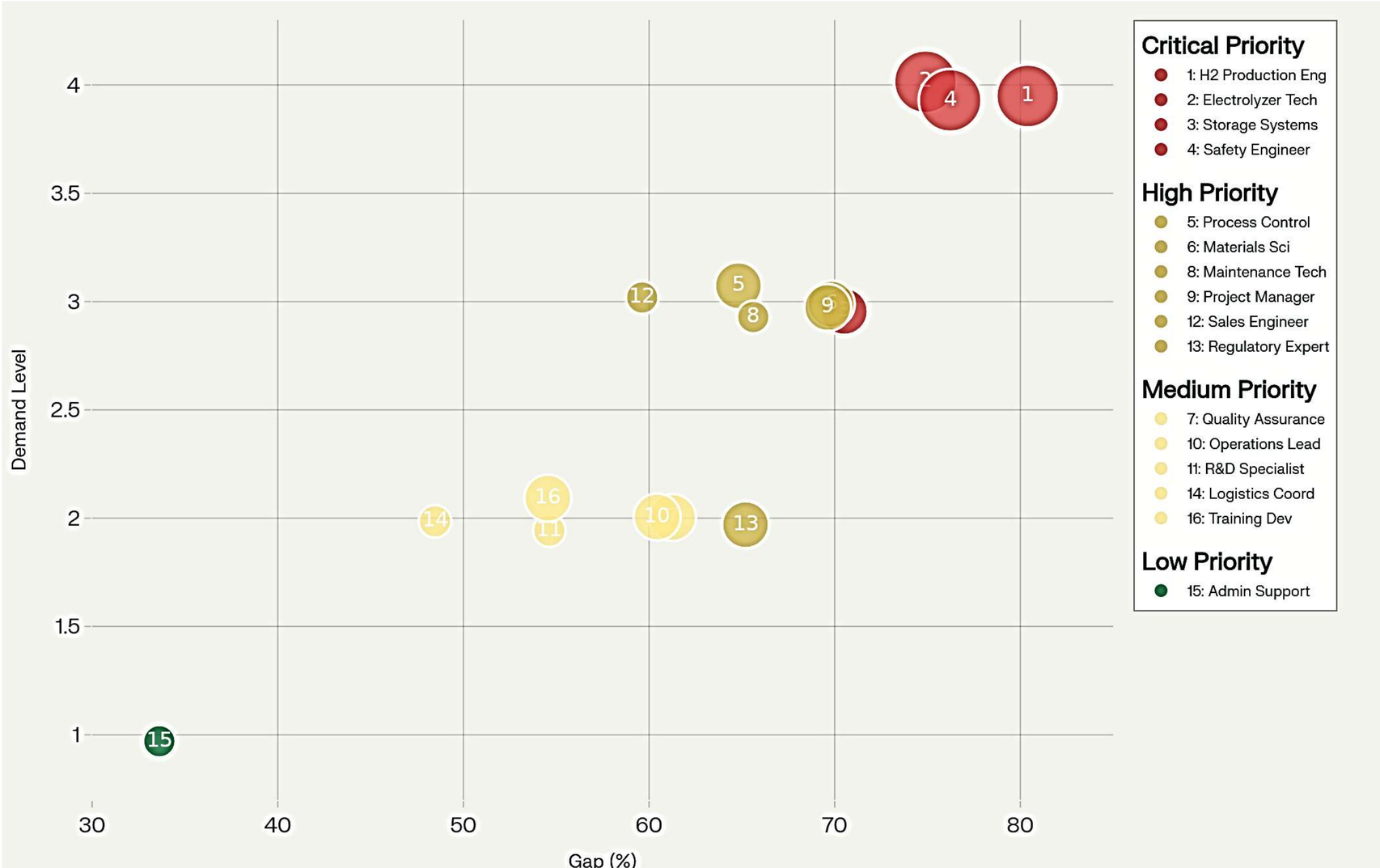
The development of hydrogen technologies requires employees with skills in production, logistics, and safety. Similarly, hydrogen production through reforming and its transport within plants helps to meet this demand, but only in the short term.



The challenges for securing human resources include competition between energy sectors, demographic challenges in the labor market, and rapid sector growth coupled with a skills shortage by 2030. In Poland and the EU, skills gaps in priority areas range from 65% to 85%

A. Limited number of specialized training.
   Development of modular training programs

B. Shortage of qualified trainers and teachers.
   Use of funding

C. High costs of educational infrastructure.
   Development of research infrastructure

D. Regulatory and market uncertainty.
   Retraining programs

Cooperation between industry and institutes

Defining educational standards

Learning mobility and accessibility

Increasing sectoral attractiveness

Growing investment and pro-environmental policies are driving the development of the green hydrogen market. However, regulatory and financial uncertainty underscore the importance of investing in skills and talent as key to scaling the technology

PERIOD	INVESTMENTS	SCOPE	STAFF
2026 - 2030	H2 refueling stations (app. 30) Production 200kTH_2/a	Investments in infrastructure: transport, production, storage. Public transport (800 buses)	Electrochemists, Operators, Safety & Health & Safety Specialists, Designers 3 000 - 5 000
2030 - 2050	2GW electrolyzers. Integration with RES and decarbonisation in production	Increase in the number of integration hubs RFBNO. Network automation and management	System Operators and Integrators. Automatics. RnD implementers 10 000 - 15 000
2040 +	International clusters and hubs. Cross-border infrastructure.	National and international value chains. Synthetic fuels. Circular economy	System designers. Recyclers and planners. Cyber IT operators. 30 000

Poland is developing research and training in hydrogen technologies, but the human resources market is still taking shape. Apart from universities, there are few private training courses and internship programs.

MBA Transformacja Energetyczna i Cyfrowa oraz MBA Technologie Wodorowe i Transformacja Energetyczna

CENTRUM EDUKACJI GRUPA ORLEN

AGH
Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie

INŻYNIERIA SYSTEMÓW ZASILANIA WODOREM

EDYCJA STUDIÓW

Data rozpoczęcia: 01.10.2025

Data zakończenia: 31.07.2026

Termin składania dokumentów: 02.06.2025 - 26.09.2025

Technologie wodorowe i elektromobilność

STUDIA PODYPLOMOWE

Wodór i biometan
- pozyskanie, transport i wykorzystanie.
Transformacja energetyczna

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MOŚCICKI Campus ECOSYSTEM – investment 2024-2026 becomes a unique ecosystem for supporting hydrogen projects, education and training, and PoC in the heart of Warsaw

1,000+ Training Participants	600+ Certificates Awarded	30+ PhD Students Engaged
35+ Scientific Publications	12+ Patents Filed	20+ Industrial Partners
1+8 Laboratory Certifications	5-6 Startups Supported	5-6 Professional Standards

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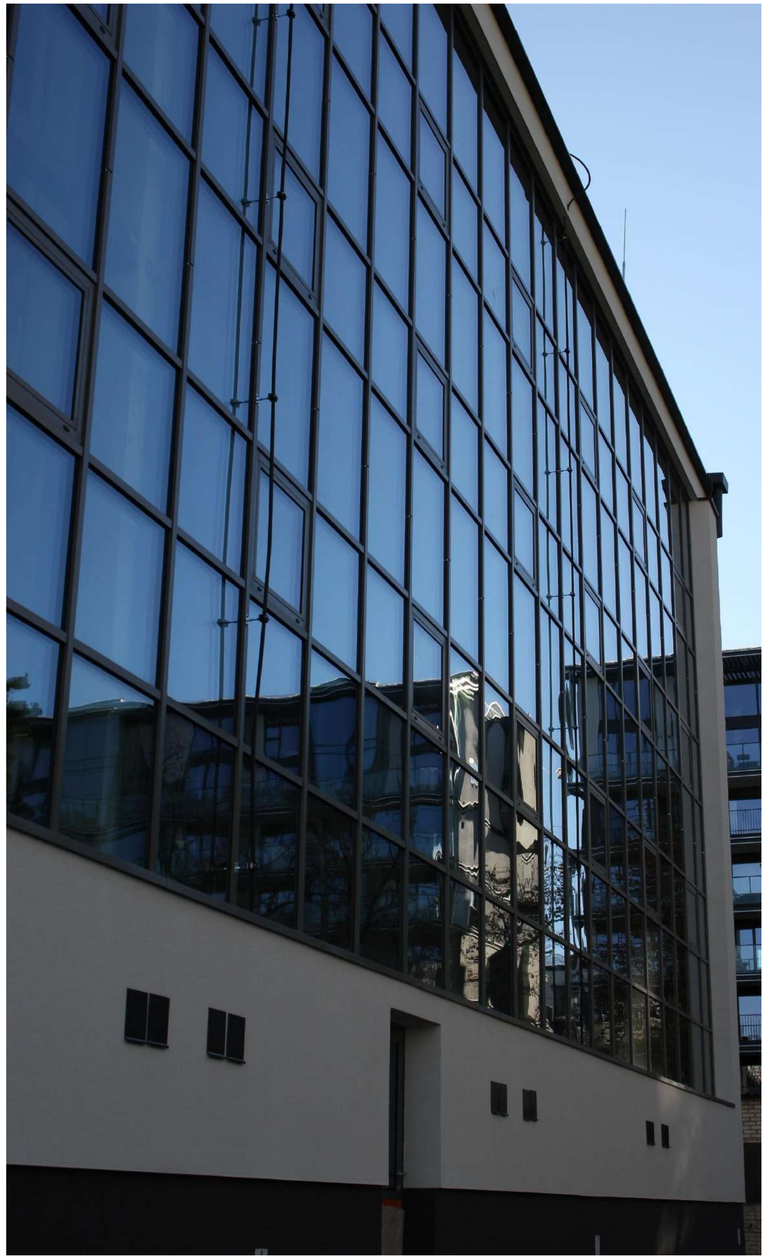

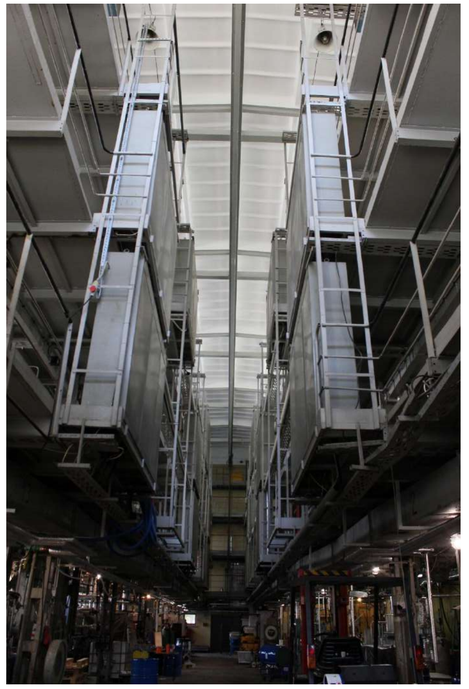

A sustainable future starts with chemistry

Thank you for your attention

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