

Prospects for Green Ammonia and Hydrogen in Sustainable Energy Systems

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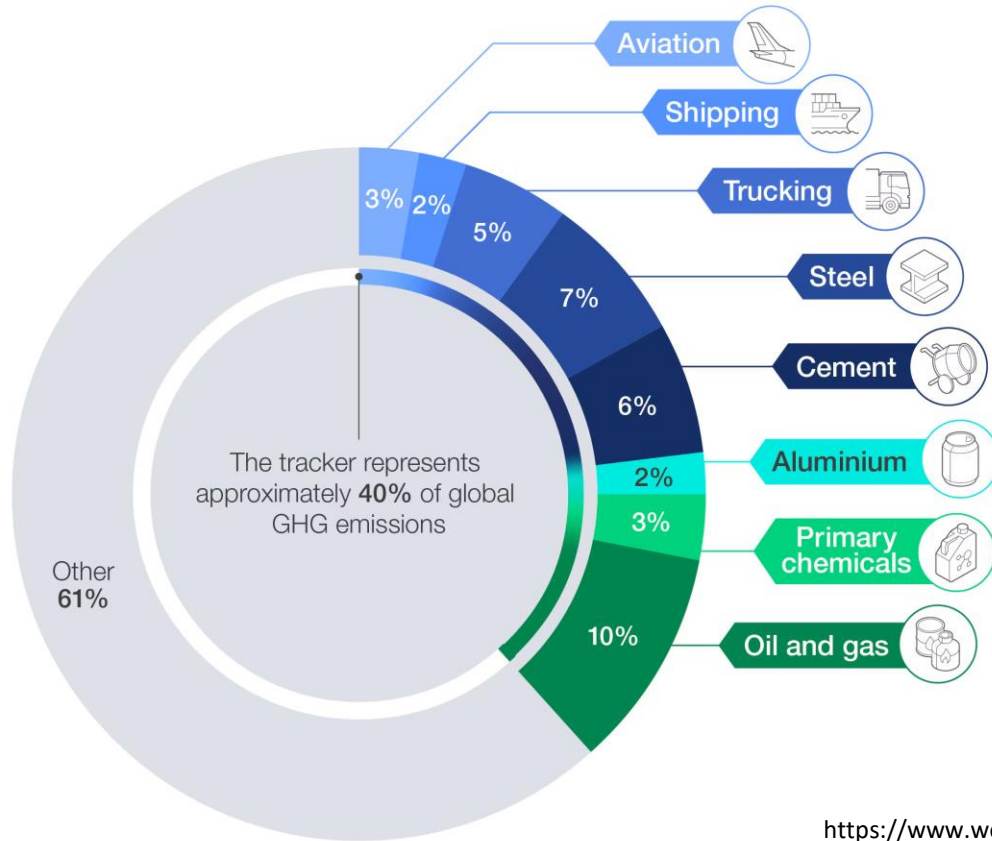
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Content of the presentation

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1. Introduction – Why Are “Green” Hydrogen and “Green” Ammonia Important? Decarbonization.
2. What Are Green Hydrogen and Green Ammonia?
3. Production Technologies and Areas of application.
4. Technological and economic challenges.
5. Outlook: where are we headed?
6. Conclusions and summary.

Hard-to-abate sectors account for nearly 40% of global GHG emissions, making them critical for global efforts to reach net-zero emissions.



<https://www.weforum.org/stories/2024/12/net-zero-hard-to-abate-sectors-decarbonization>

Note: Data is for scope 1 & 2 global GHG emissions.

Source: World Economic Forum and Accenture analysis derived from IEA, IAI.

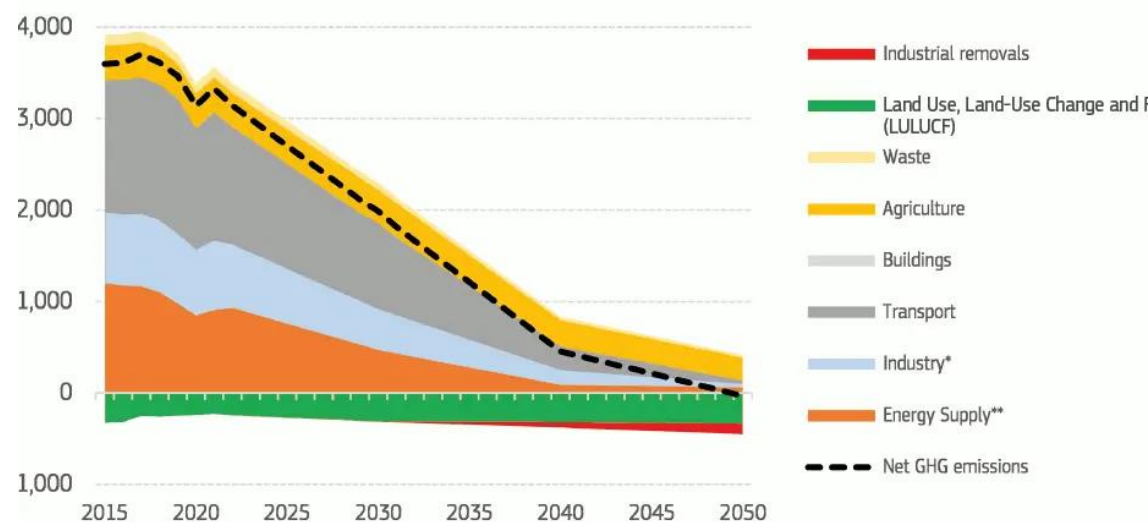
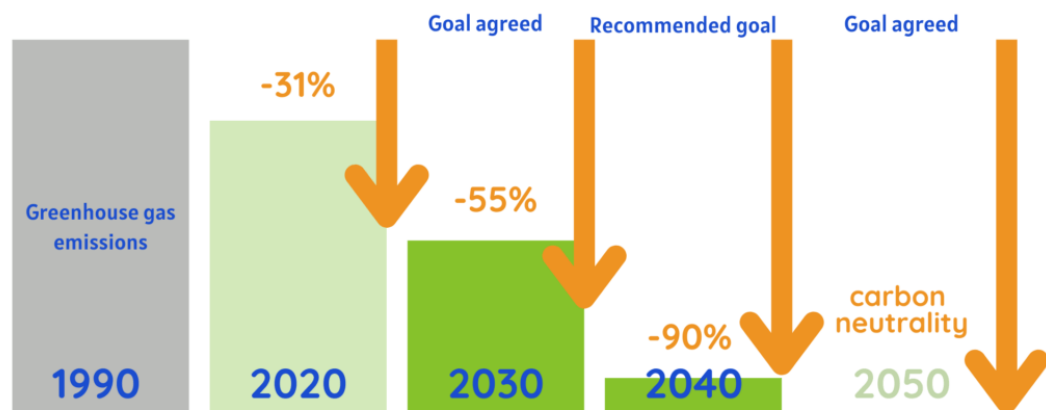
Net Zero race

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Greenhouse gas (GHG) emissions refer to the release of heat-trapping gases- primarily carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) - into the atmosphere, mainly as a result of human activities.

Net Zero race

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te : *Excluding non-BECCS industrial removals, **Excluding Bioenergy with carbon capture and storage (BECCS)

Source: Commission impact assessment

The European Commission recommends reducing emissions by 90% by 2040.

Regulation (EU) 2026/667, in force since 7 April 2026 <https://eur-lex.europa.eu/eli/reg/2026/667/oj/eng>

<https://planbe.eco/en/blog/new-guidelines-the-european-commission-recommends-reducing-emissions-by-90-percent-by-2040/>

Energy Transition Forum - Decarbonizing the Future, 18 September 2026

Global leader

EU leads technology development in renewables

25.2%

share of renewables in EU energy consumption 2024

at least 42.5%

binding target for the share of renewables in the energy mix by 2030

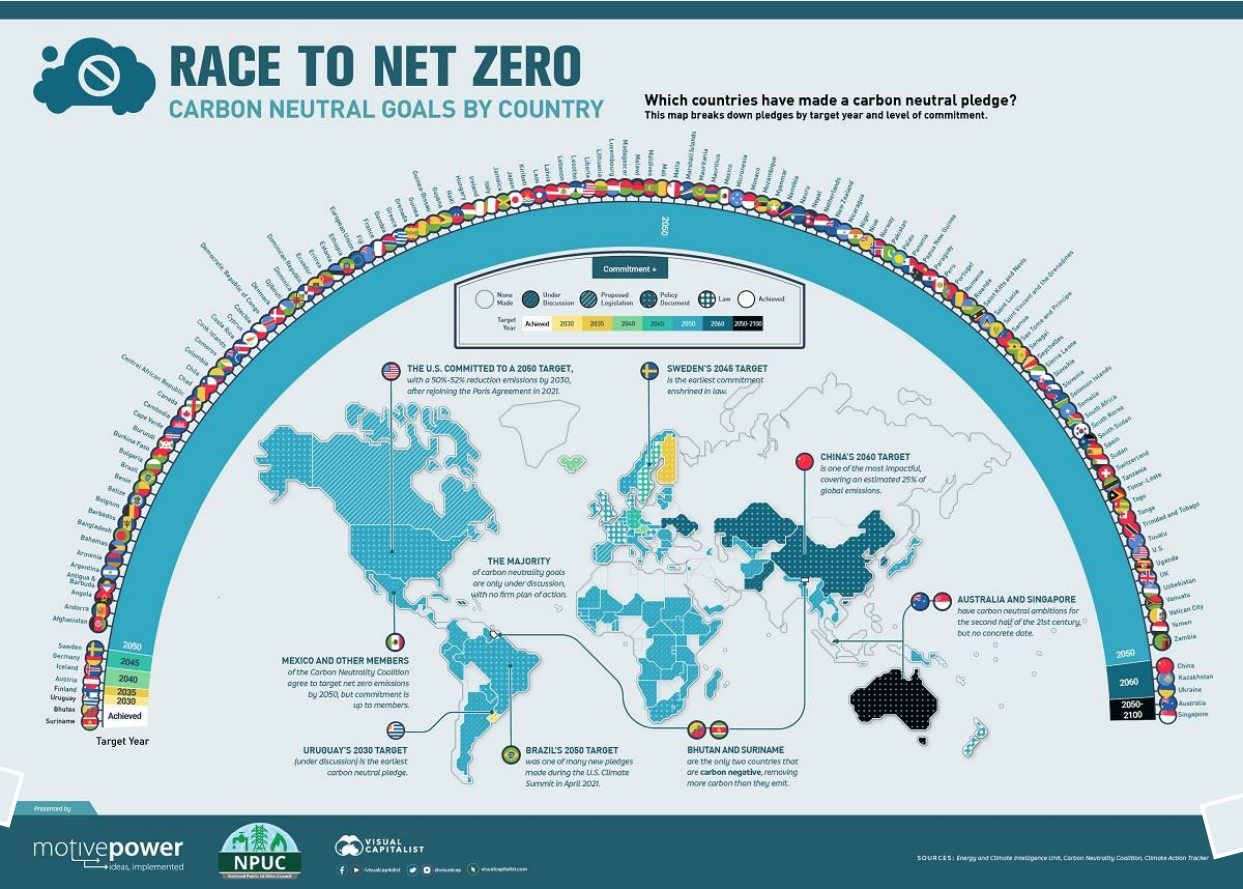
The Renewable Energy Directive sets targets aimed at increasing the use of renewable energy in the EU. It promotes cooperation among EU countries to achieve this goal.

https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en

Net Zero race

Climate neutrality (Net Zero):

A state in which the amount of greenhouse gases emitted into the atmosphere does not exceed the amount that nature (forests, oceans) or technology is capable of absorbing.

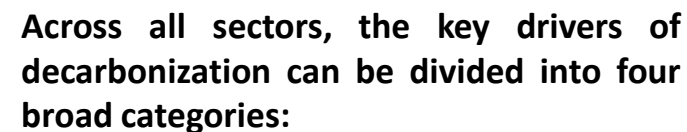


Decarbonization:

The process of restructuring the economy to minimize the use of fossil fuels (coal, oil, and natural gas) and transition to renewable energy sources and green hydrogen.



NEOS
ADVISORY
www.neosadvisory.com



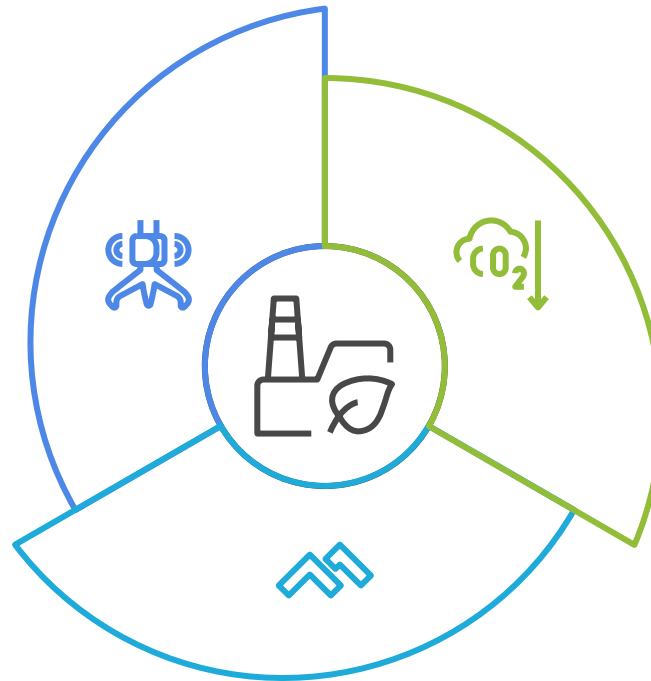
<https://neosadvisory.com/perspectives/decarbonization-pathways-for-power-buildings-transport-and-industry/>

Clean energy sources

Clean energy sources produced from renewable resources.

Decarbonization

It helps drastically reduce greenhouse gas emissions in industry and transportation.



EU climate goals

These are essential for achieving the European Union's goal of carbon neutrality by 2050.

Lithuanian Hydrogen Development Roadmap 2024–2050

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129 000 t

Renewable hydrogen
per year by
2030



1,3 GW

Electrolyzer capacity
is planned to reach by
2030



8,5 GW

Electrolyzer capacity
is planned to reach by
2050



32 %

Final energy demand
met by hydrogen by
2050

Key objectives: By 2030, at least 2 cities will use hydrogen in public transportation • at least 10 hydrogen refueling stations • 41% of ammonia fertilizer production from green hydrogen • Lithuania aims to become a net exporter of electricity and hydrogen by 2050.

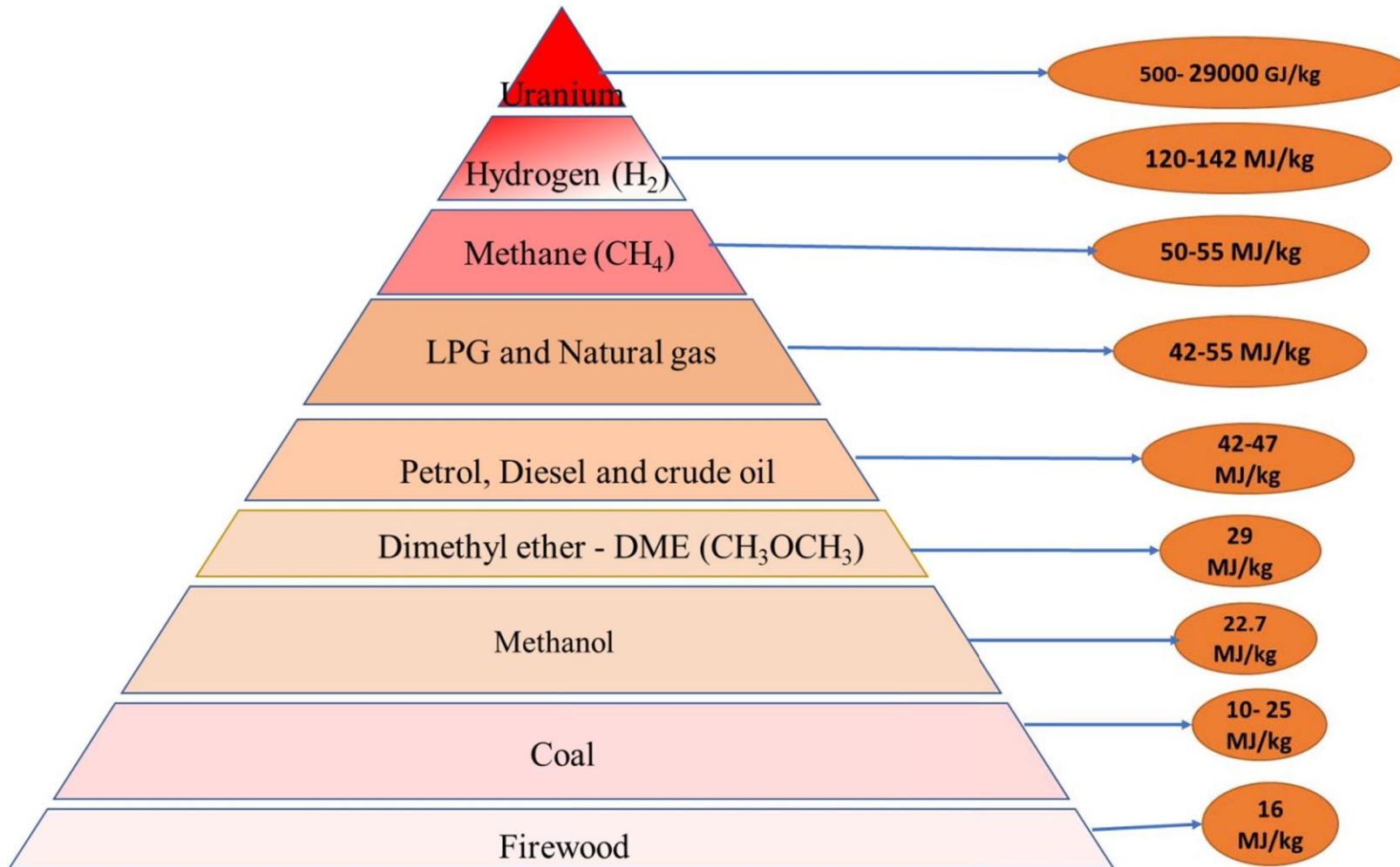
Source: Hydrogen Development Roadmap 2024–2050, Ministry of Energy of Lithuania

Content of the presentation

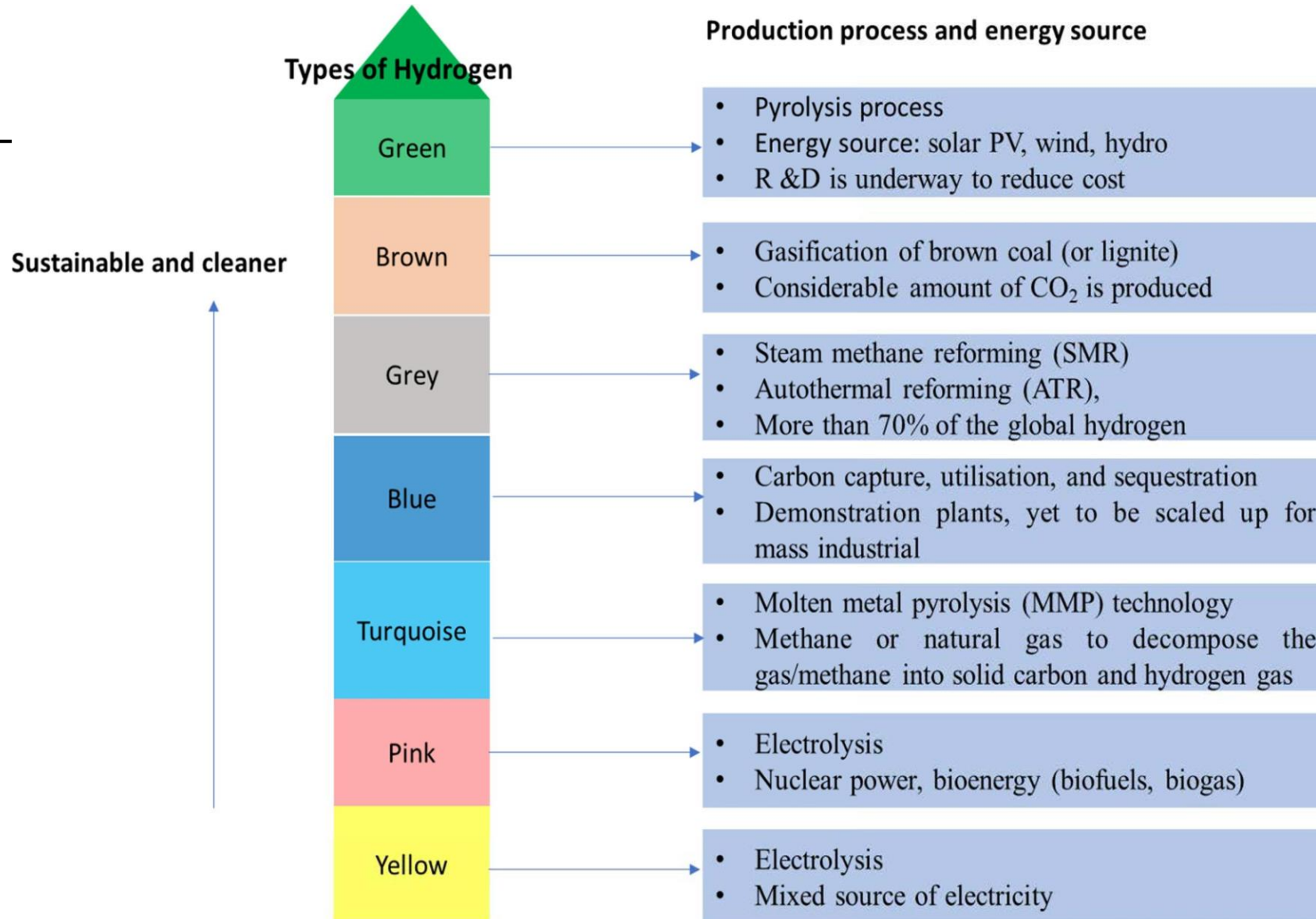
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Calorific value of traditional fuels

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Different types of hydrogen based on the energy source used to produce it.



M.G. Rasul, M.A Hazrat, M.A. Sattar, M.I. Jahirul, M.J. Shearer, The future of hydrogen: Challenges on production, storage and applications, Energy Conversion and Management, Volume 272, 2022, 116326, <https://doi.org/10.1016/j.enconman.2022.116326>.

Hydrogen Produced (With Color Code)	Production Process	Feedstock Source	Environmental Impact (GHG emission)
Green H ₂	Electrolysis	Renewable energy sources (Hydro/ Solar/ Wind/ Tidal)	Minimal. Water is the by product
Yellow H ₂		Grid electricity	Medium
Pink H ₂		Nuclear Energy	Minimal
Black H ₂	Gasification (no CCUS)	Black Coal	High
Brown H ₂		Brown Coal (Lignite)	High
Grey H ₂	SMR	Natural Gas (CH ₄)	Medium
Blue H ₂	SMR+CCUS Gasification + CCUS	NG Coal	Low
Turquoise H ₂	Methane Pyrolysis	Natural Gas (CH ₄)	Solid Carbon (by product)/ No CO ₂ emission
White H ₂	Naturally occurring hydrogen	Geological formations, industrial byproducts	
Gold H ₂	Biological fermentation in depleted wells	Residual hydrocarbons	Low

A Comparison of Various Hydrogen Production Processes

International Journal of Hydrogen Energy 102 (2025) 1026–1044. <https://doi.org/10.1016/j.ijhydene.2025.01.033>

Hydrogen has exceptional gravimetric energy content - but storage is a volumetric challenge.

H₂: ~120 MJ kg⁻¹

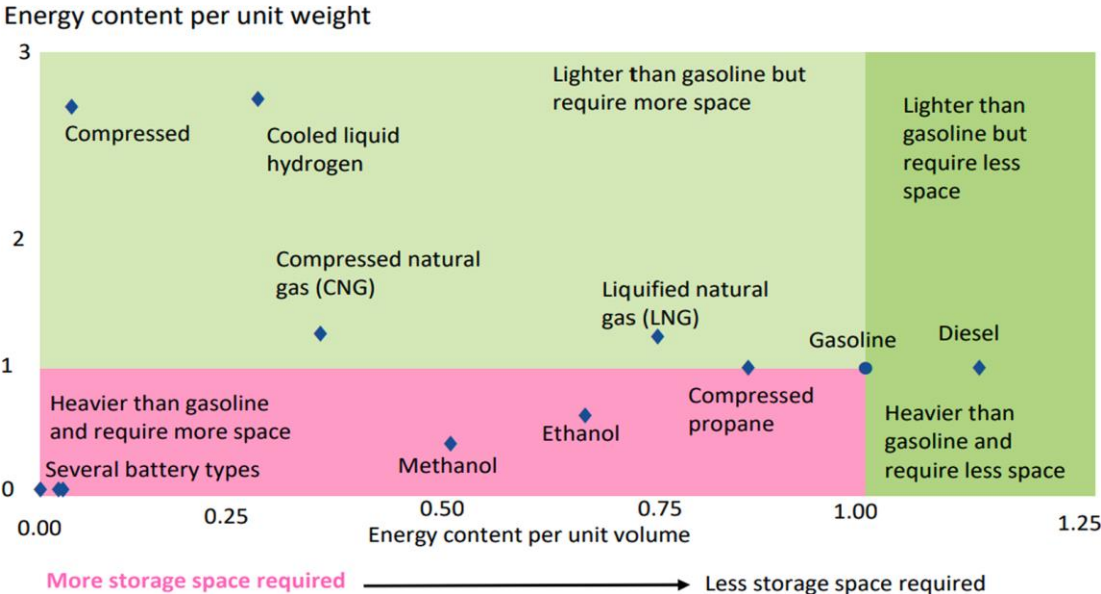
Lower-heating-value basis;
Highest energy per unit mass among
common chemical fuels.

H₂ at 700 bar: ~4.8–5 MJ L⁻¹

Compression increases volumetric density
but requires high-pressure storage
systems.

Liquid H₂: ~8 MJ L⁻¹

Cryogenic storage near 20 K improves
volumetric density but adds liquefaction
and boil-off complexity.



Implication for NH₃

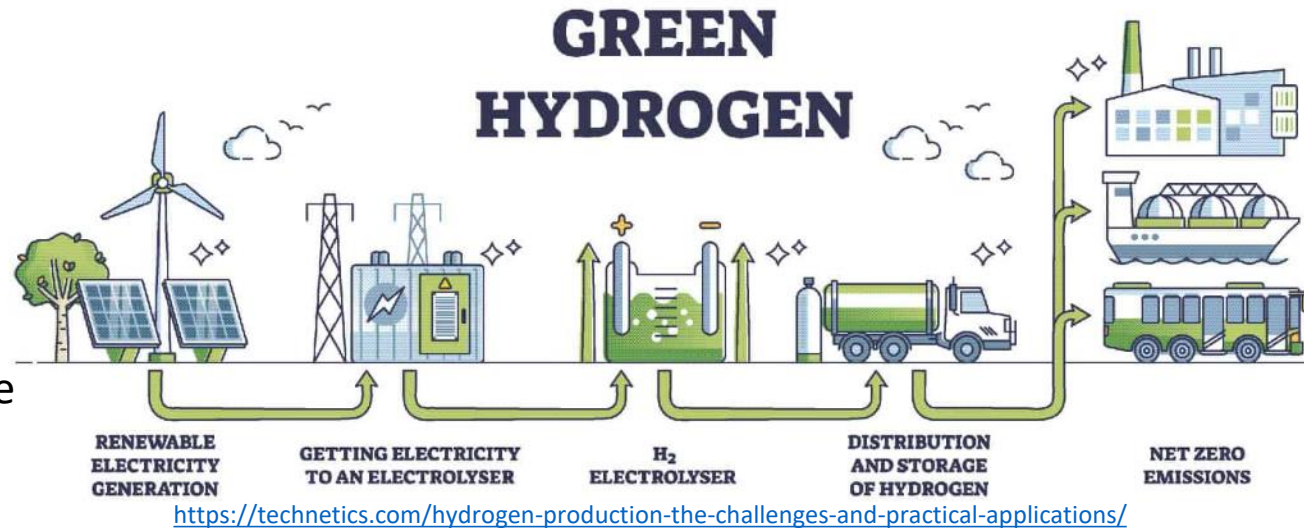
Ammonia sacrifices gravimetric energy density but offers much
higher volumetric density than compressed H₂ and is
established as a globally traded chemical.

The Importance of Green Hydrogen and Ammonia

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What are green hydrogen and green ammonia?

By understanding the principles of production, we can better appreciate the potential of these materials.



Green hydrogen

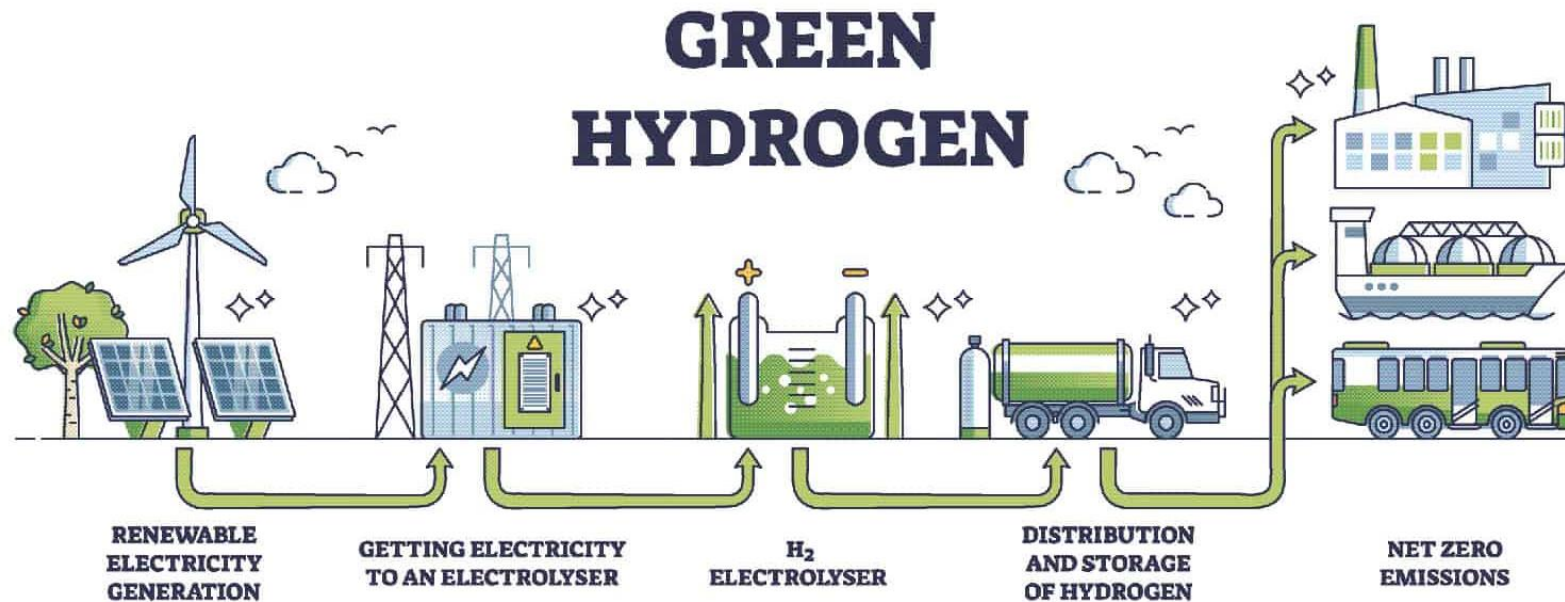
It is produced through electrolysis using water and renewable energy (solar, wind).

Green ammonia

It is synthesized from hydrogen and nitrogen and is used as a fertilizer and an energy carrier.

Ammonia as a hydrogen carrier

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<https://technetics.com/hydrogen-production-the-challenges-and-practical-applications/>

Liquification temperatures at atmospheric pressure:

- -253 °C for H₂;
- -162 °C for natural gas;
- -33 °C for NH₃.

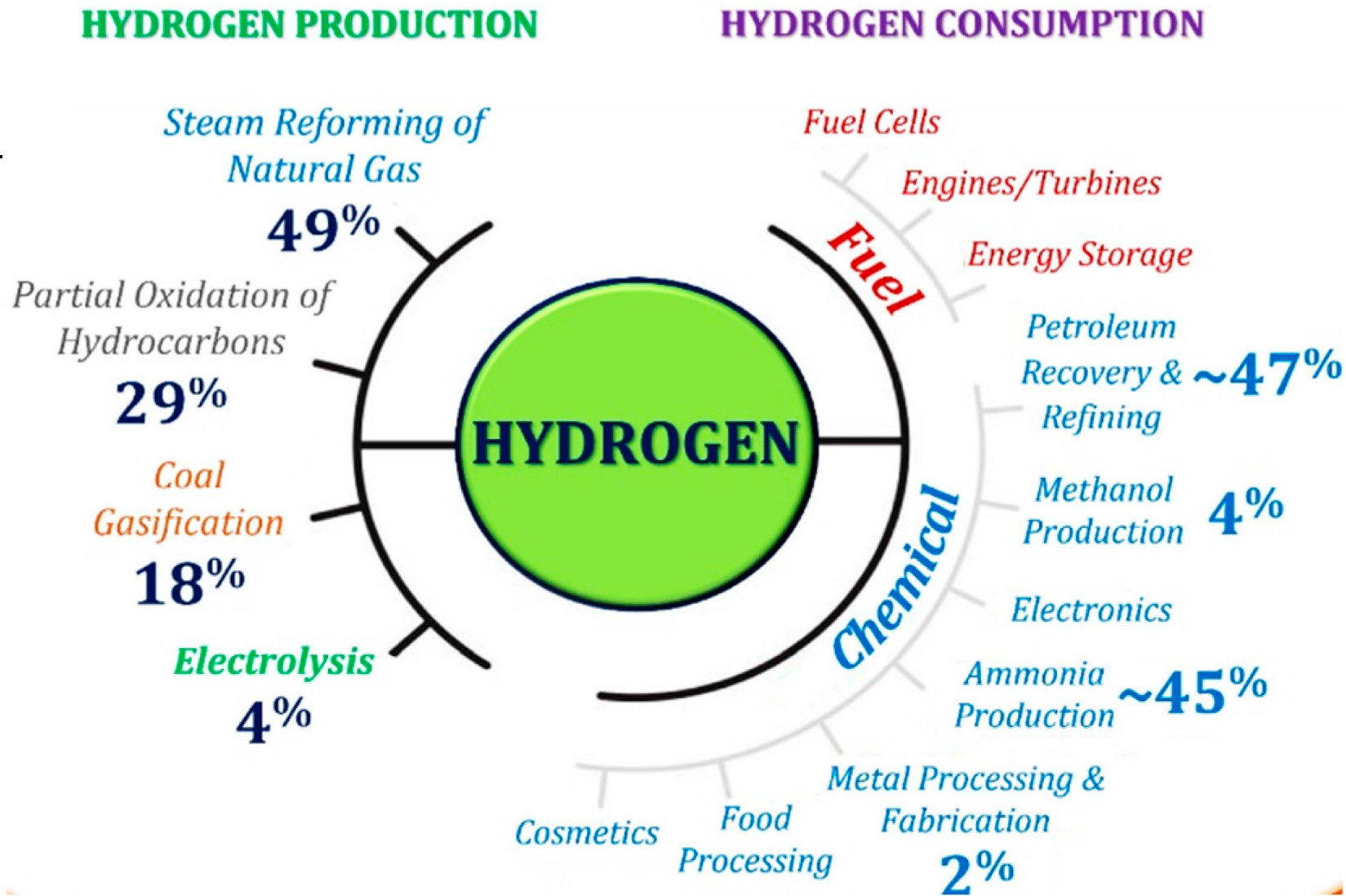
Ammonia as the energy source:

- Indirect: can be decomposed by catalytic cracking to recover hydrogen.
- Direct: in fuel cells where reaction occurs:



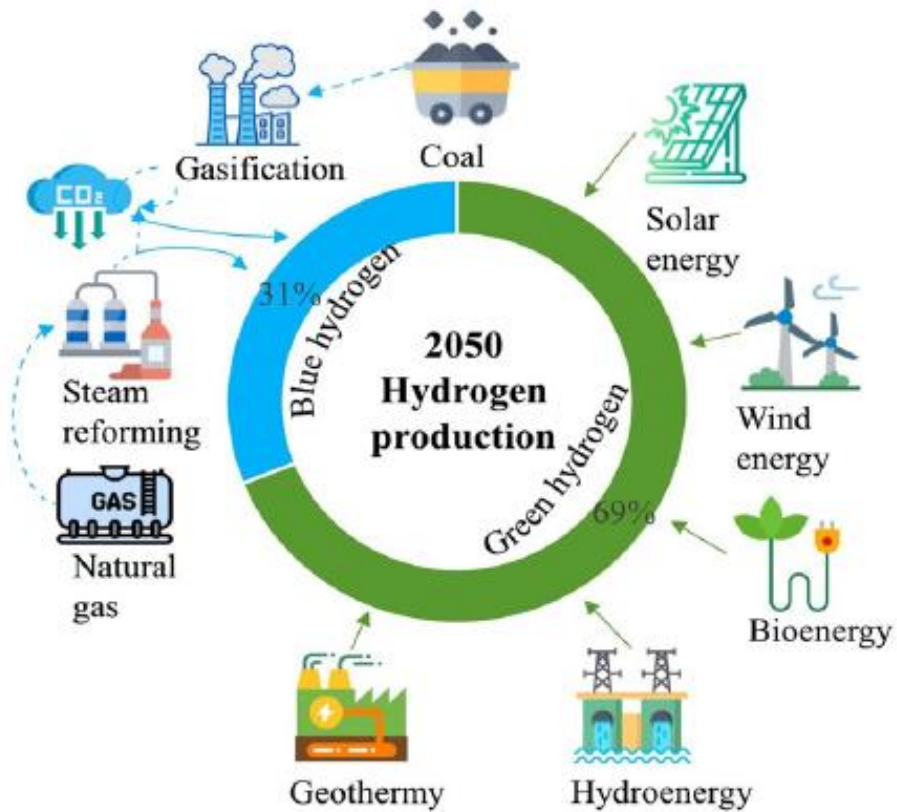
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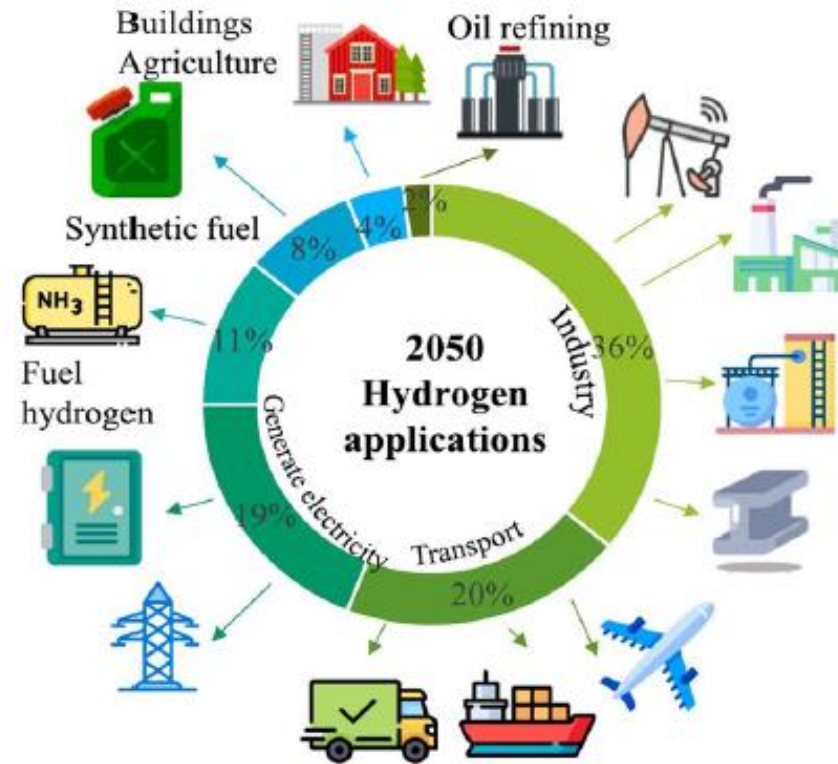


Sustainability 2023, 15(6), 5258; <https://doi.org/10.3390/su15065258>

- > Raw materials and production process
 ———> Sources of hydrogen production
 ←—— Hydrogen applications in diverse sectors



(a) Hydrogen production



(b) Hydrogen applications

Hydrogen Production and Use

Sustainability **2025**, 17, 5900. DOI: [10.3390/su17135900](https://doi.org/10.3390/su17135900)

Where renewable "molecules" add value

Hydrogen and ammonia are not substitutes for electrification - they address specific process, storage and transport constraints.

High-temperature / chemical feedstock

Steel DRI, refining, chemicals and ammonia synthesis require molecules as reactants or high-temperature energy carriers.

Long-duration / international energy

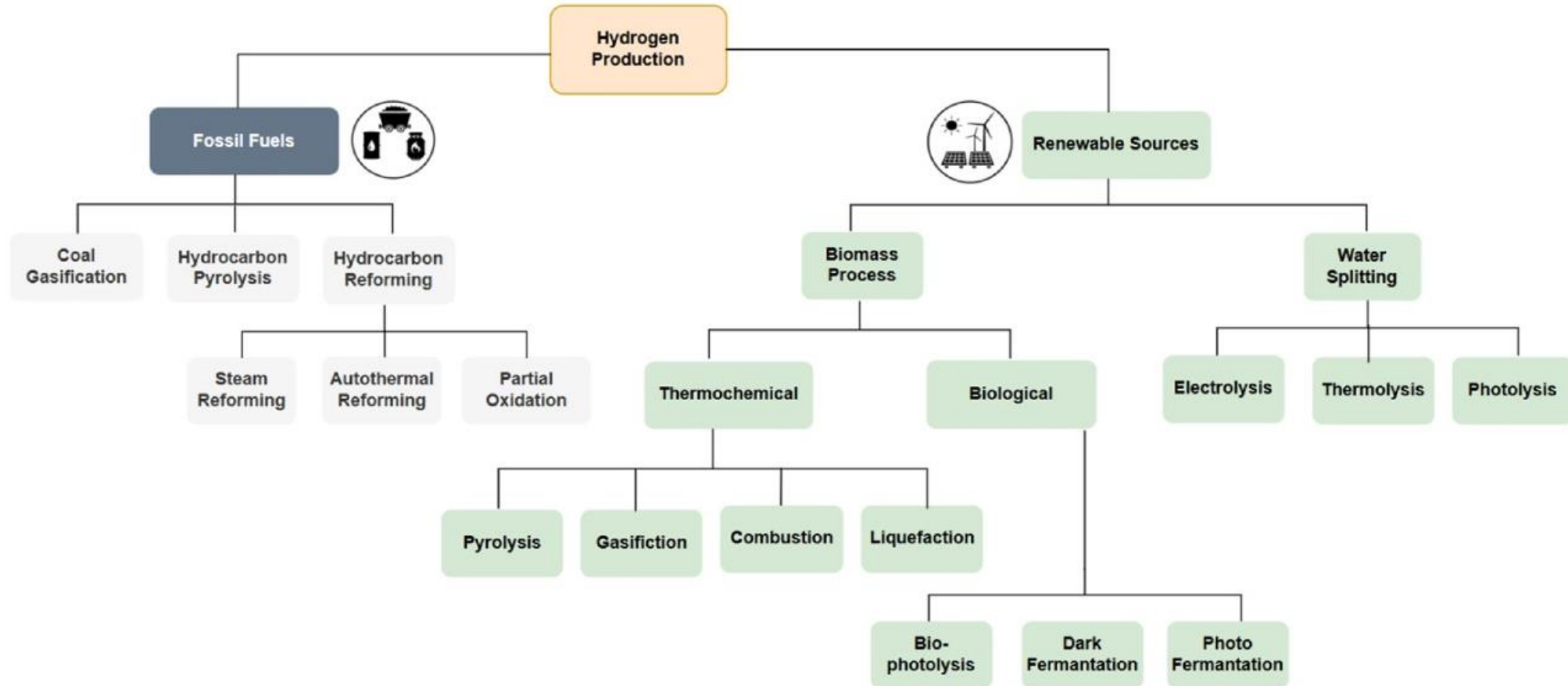
Molecules can store energy over longer periods and can be transported internationally more readily than electrons.

Heavy transport

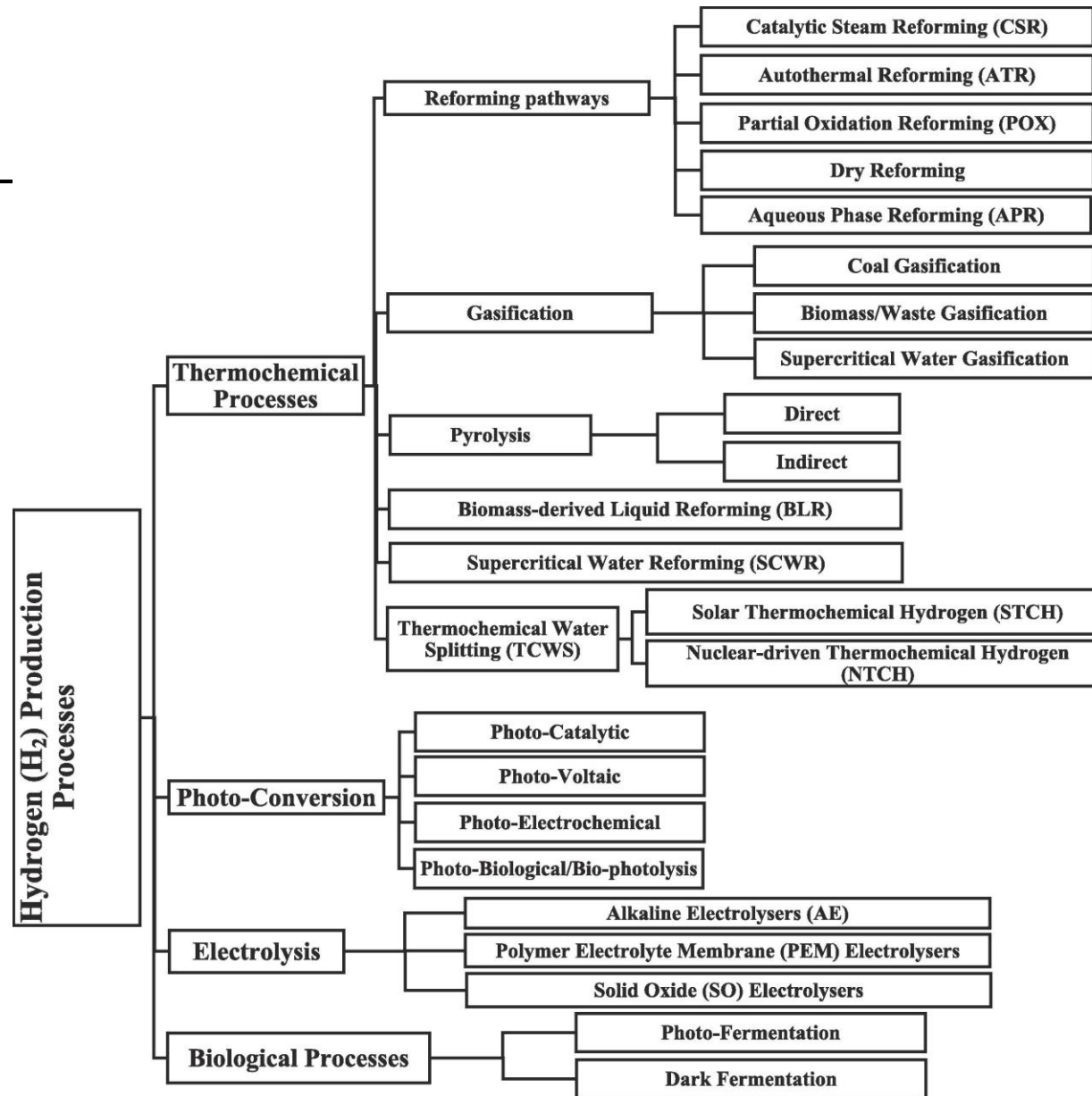
Hydrogen and ammonia may be relevant where battery mass, range, charging time or onboard energy density constrain direct electrification.

Boundary condition

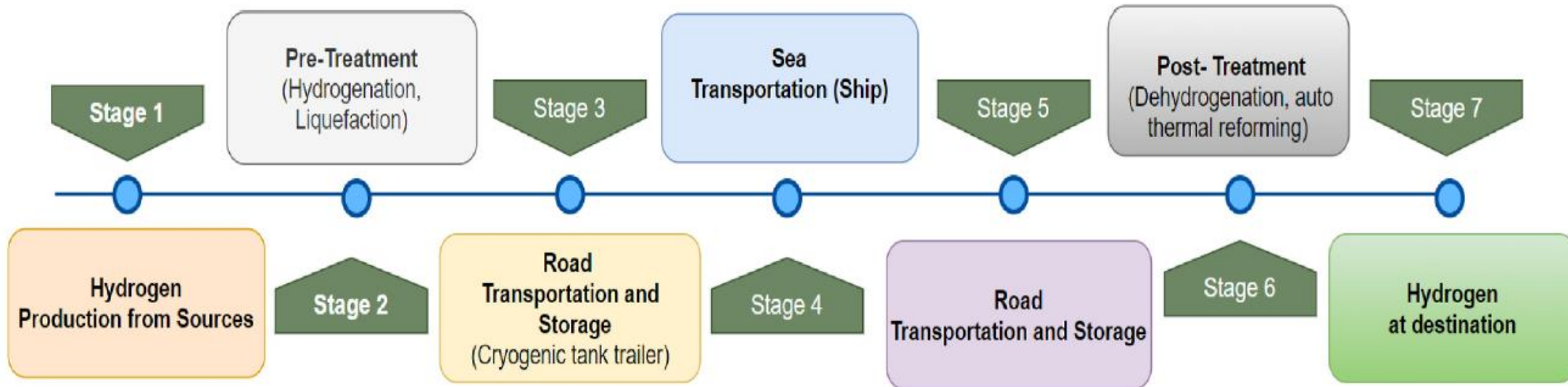
The climate benefit depends on the lifecycle emissions of electricity, feedstocks, conversion, storage and end use—not on the colour label alone.



Hydrogen production technologies

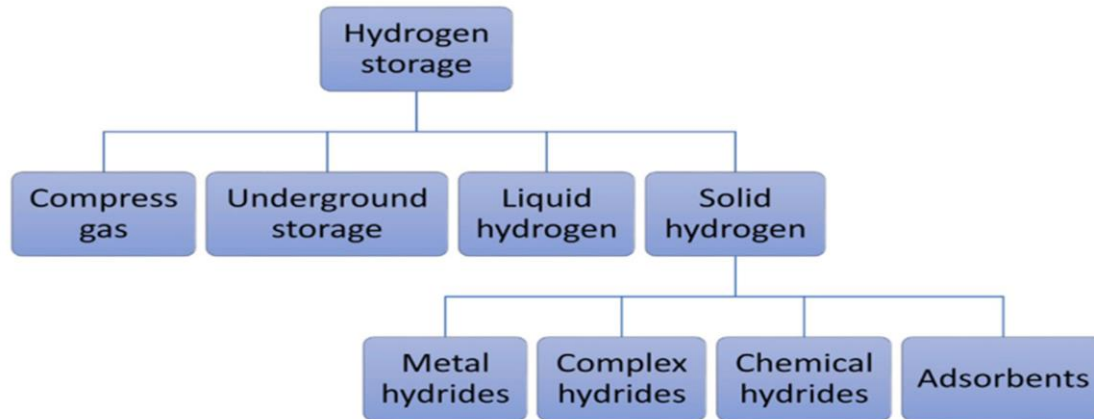


M.G. Rasul, M.A Hazrat, M.A. Sattar, M.I. Jahirul, M.J. Shearer, The future of hydrogen: Challenges on production, storage and applications, Energy Conversion and Management, Volume 272, 2022, 116326, <https://doi.org/10.1016/j.enconman.2022.116326>.



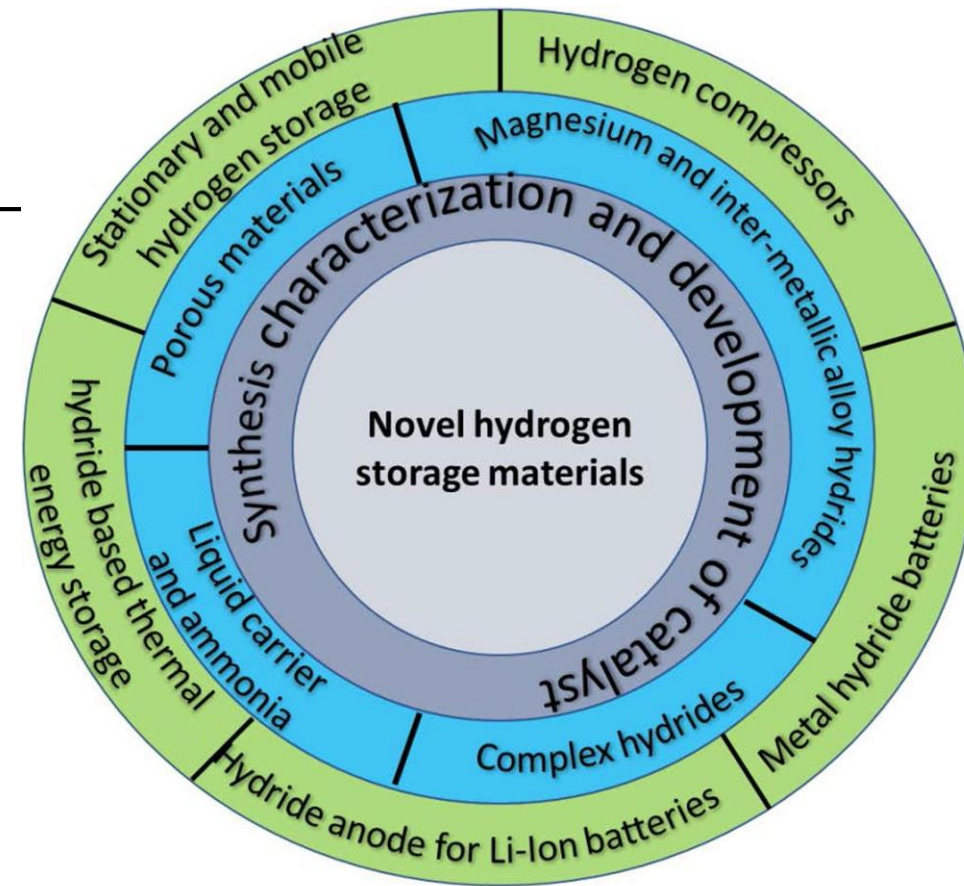
Stages of the hydrogen supply chain

Md Monjur Hossain Bhuiyan, Zahed Siddique, Hydrogen as an alternative fuel: A comprehensive review of challenges and opportunities in production, storage, and transportation, International Journal of Hydrogen Energy, Volume 102, 2025, Pages 1026-1044, <https://doi.org/10.1016/j.ijhydene.2025.01.033>.



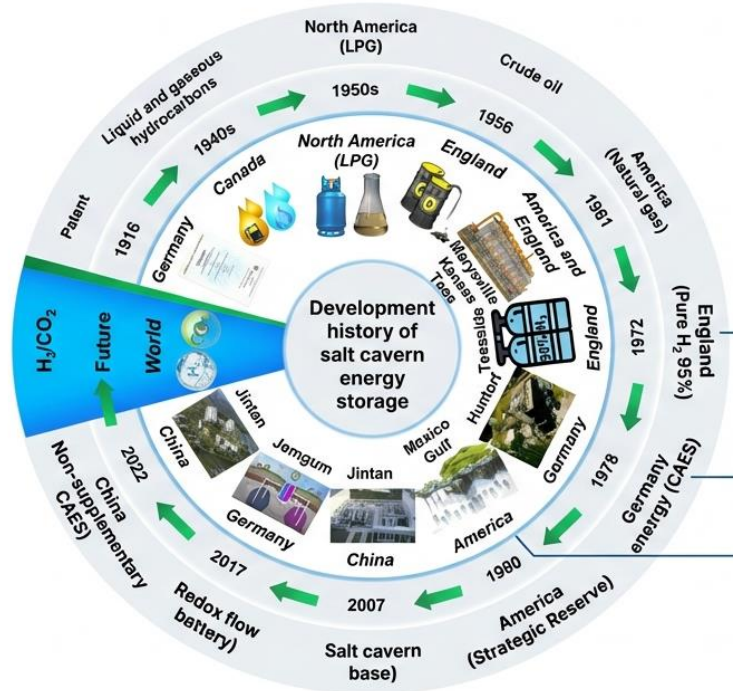
Hydrogen storage technologies

Energies **2024**, *17*(1), 130; <https://doi.org/10.3390/en17010130>



A Development Strategy for Hydrogen Energy Storage and Conversion Using Reversible or Regenerative Hydrogen Storage

M.G. Rasul, M.A. Hazrat, M.A. Sattar, M.I. Jahirul, M.J. Shearer, The future of hydrogen: Challenges on production, storage and applications, *Energy Conversion and Management*, Volume 272, 2022, 116326, <https://doi.org/10.1016/j.enconman.2022.116326>.



1972 (Teeside, UK)

First engineering example of **95% pure hydrogen** storage at 350m depth. Still operational.

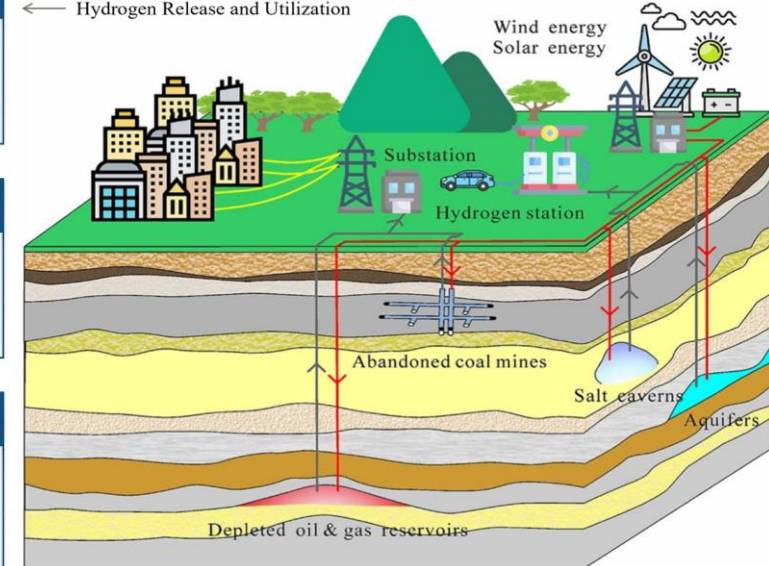
1983 (Clemens, USA)

Validated long-term stability with over **60,000 pressure cycles** without failure and a **99.8%** usability rate.

2023 (ACES, USA)

Reached Technology Readiness Level (TRL) **6** by cycling **8,000 tons** of pure H₂ with a leakage rate of **less than 0.08%** per cycle.

→ Hydrogen Production and Storage
← Hydrogen Release and Utilization



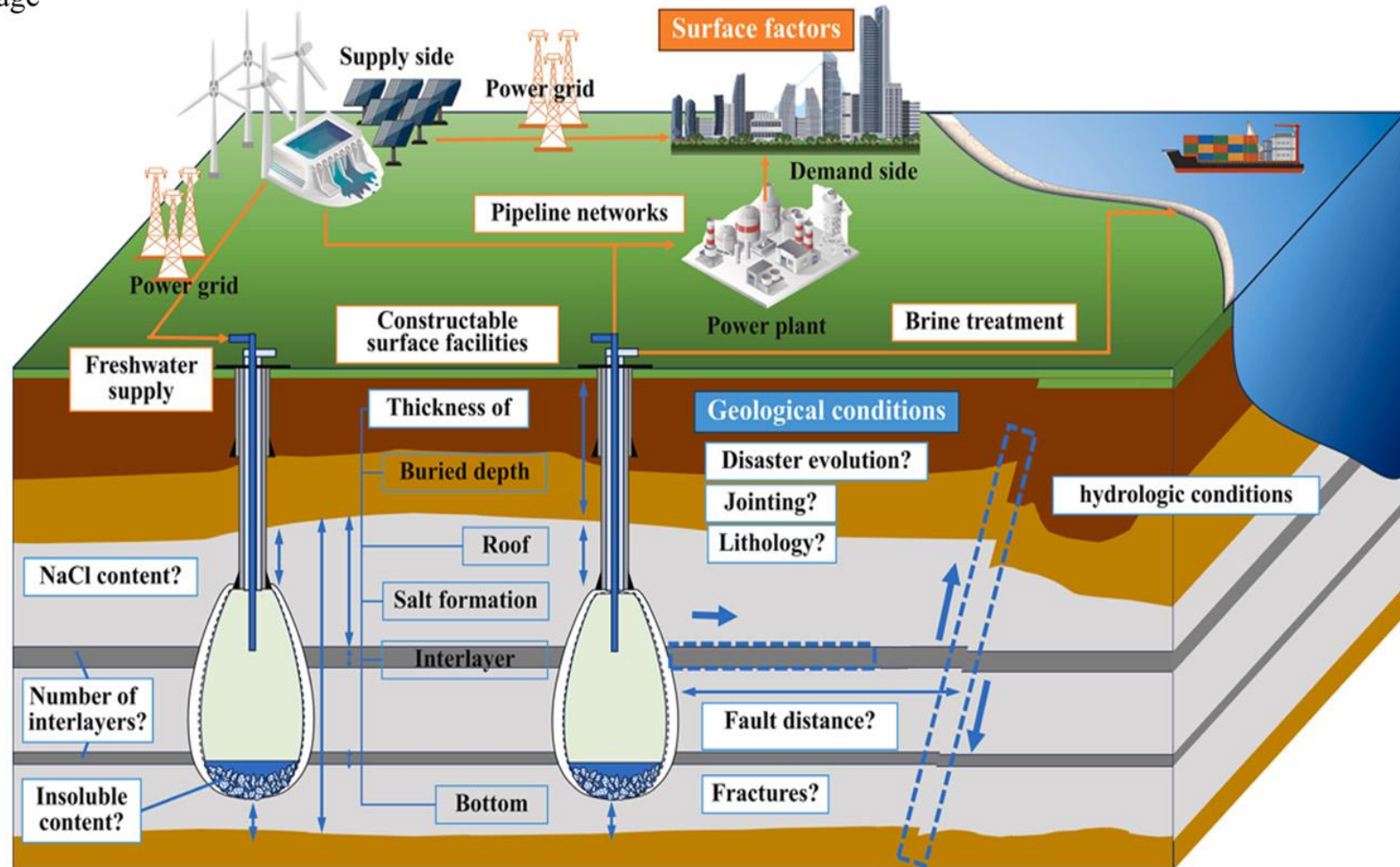
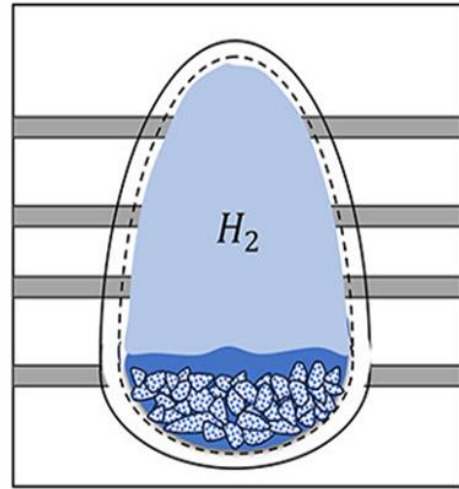
The history of the development of salt cavern energy storage (SCES) around the world.

Schematic representation of the main methods of underground hydrogen storage (UHS)

- Hydrogen supply and demand
- Direction of hydrogen leakage
- ↔ Stratum depth or distance
- Cracks or faults

Challenges

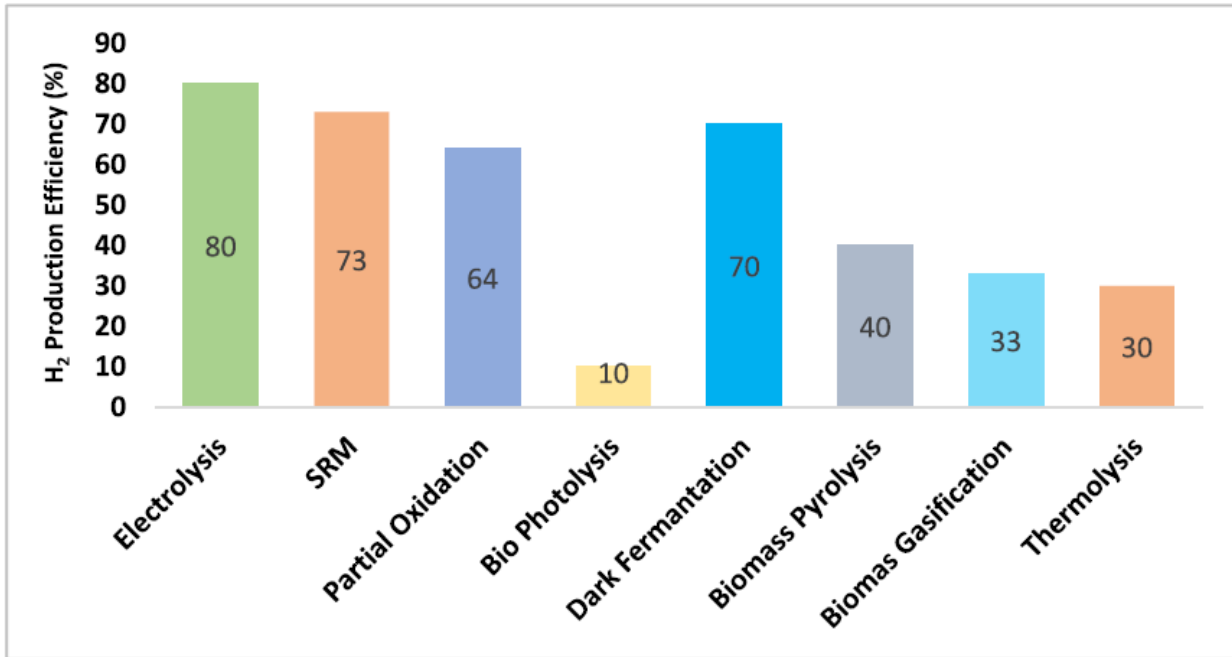
- Layered salt formations
- High impurity
- Small molecules
- Properties of hydrogen



Sustainability **2025**, 17, 5900. DOI: [10.3390/su17135900](https://doi.org/10.3390/su17135900)

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Hydrogen production efficiency using different processes

Type of Hydrogen	Cost [USD/kgH ₂]	Emissions [kgCO ₂ /kgH ₂]	Energy Input (MJ/kg)	Process Used
Green H ₂	2.28–7.39	0	192	Electrolysis
Yellow H ₂	6.06–8.81	–		
Pink H ₂	2.18–5.92	0		
Black H ₂	1.2–2	20	236	Gasification (no CCUS)
Brown H ₂	1.2–2	20		Steam methane reforming (SMR)
Grey H ₂	0.67–1.31	8.5	167	SMR + CCUS, gasification + CCUS
Blue H ₂	0.99–2.05	2	169/223	Pyrolysis
Turquoise H ₂	~2	Solid carbon	–	

Comparison of hydrogen types by price and environmental impact

Md Monjur Hossain Bhuiyan, Zahed Siddique, Hydrogen as an alternative fuel: A comprehensive review of challenges and opportunities in production, storage, and transportation, International Journal of Hydrogen Energy, Volume 102, 2025, Pages 1026-1044, <https://doi.org/10.1016/j.ijhydene.2025.01.033>.

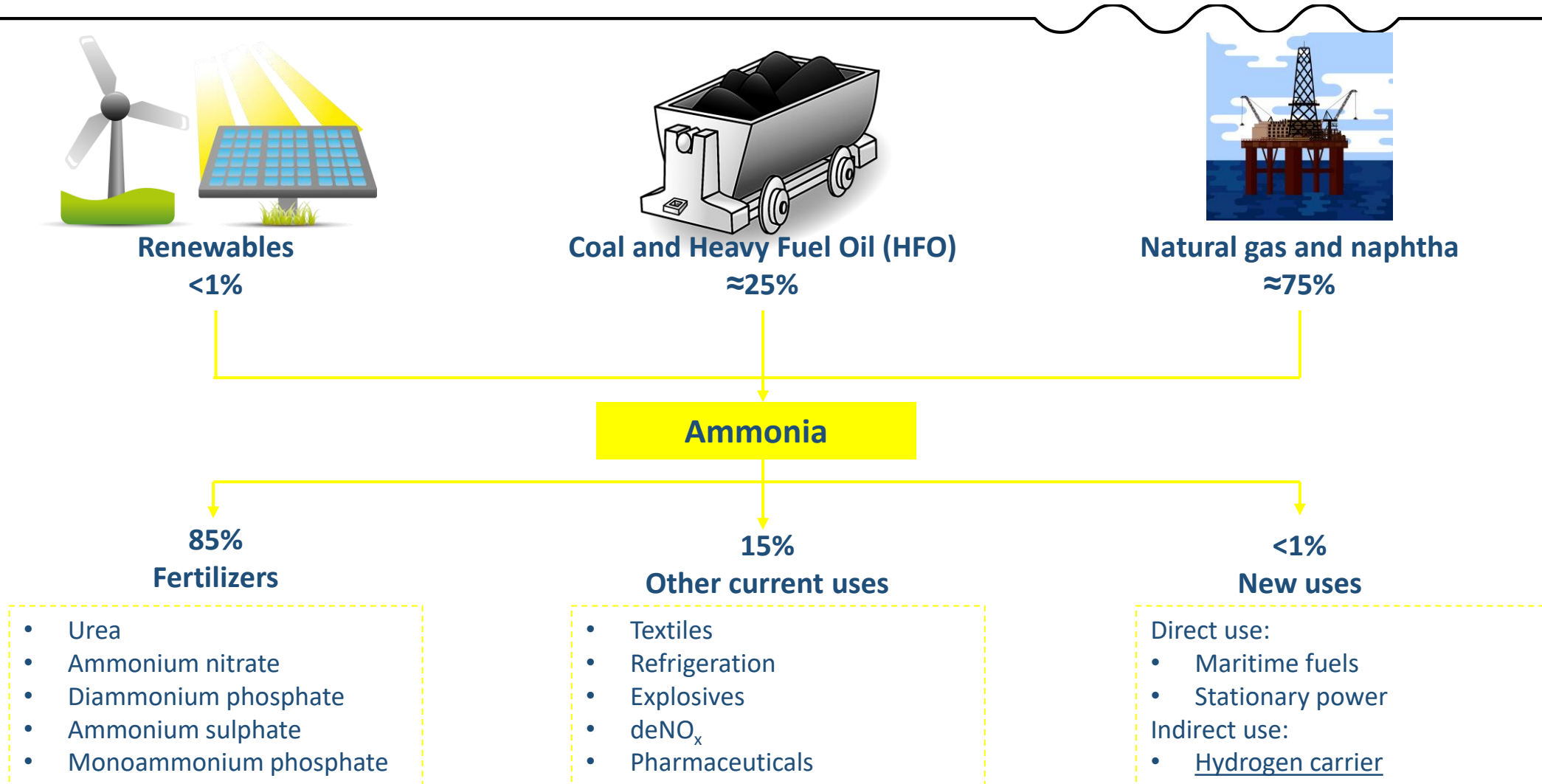
Comparison of cost of production of hydrogen with different methods [399].

Process	Energy source	Feedstock	Capital cost (M\$)	Hydrogen cost (\$/kg)
SMR with CCS	Fossil fuels	NG	226.4	2.27
SMR without CCS	Fossil fuels	NG	180.7	2.08
CC with CCS	Fossil fuels	Coal	545.6	1.63
CG without CCS	Fossil fuels	Coal	435.9	1.34
ATR of methane with CCS	Fossil fuels	NG	183.8	1.48
Methane pyrolysis	Internally generated steam	NG	–	1.59–1.70
Biomass pyrolysis	Internally generated steam	Woody biomass	53.4–3.1	1.25–2.20
Biomass gasification	Internally generated steam	Woody biomass	149.3–6.4	1.77–2.05
Direct bio-photolysis	Solar	Water+ algae	50 \$/m ²	2.13
Indirect bio-photolysis	Solar	Water + algae	135 \$/m ²	1.42
Dark fermentation	–	Organic biomass	–	2.57
Photo-fermentation	Solar	Organic biomass	–	2.83
Solar PV electrolysis	Solar	Water	12–54.5	5.78–23.27
Solar thermal electrolysis	Solar	Water	421–22.1	5.10–10.49
Wind electrolysis	Wind	Water	504.8–499.6	5.89–6.03
Nuclear electrolysis	Nuclear	Water	–	4.15–7.00
Nuclear thermolysis	Nuclear	Water	39.6–2107.6	2.17–2.63
Solar thermolysis	Solar	Water	5.7–16	7.98–8.40
Photo-electrolysis	Solar	Water	–	10.36

Comparison of hydrogen production costs using different methods

M.G. Rasul, M.A Hazrat, M.A. Sattar, M.I. Jahirul, M.J. Shearer, The future of hydrogen: Challenges on production, storage and applications, Energy Conversion and Management, Volume 272, 2022, 116326, <https://doi.org/10.1016/j.enconman.2022.116326>.

Why is ammonia needed?



Why ammonia matters: fertiliser first, energy carrier second

Existing industrial demand

Ammonia is an essential chemical feedstock, with fertilisers dominating current use.

Hydrogen carrier

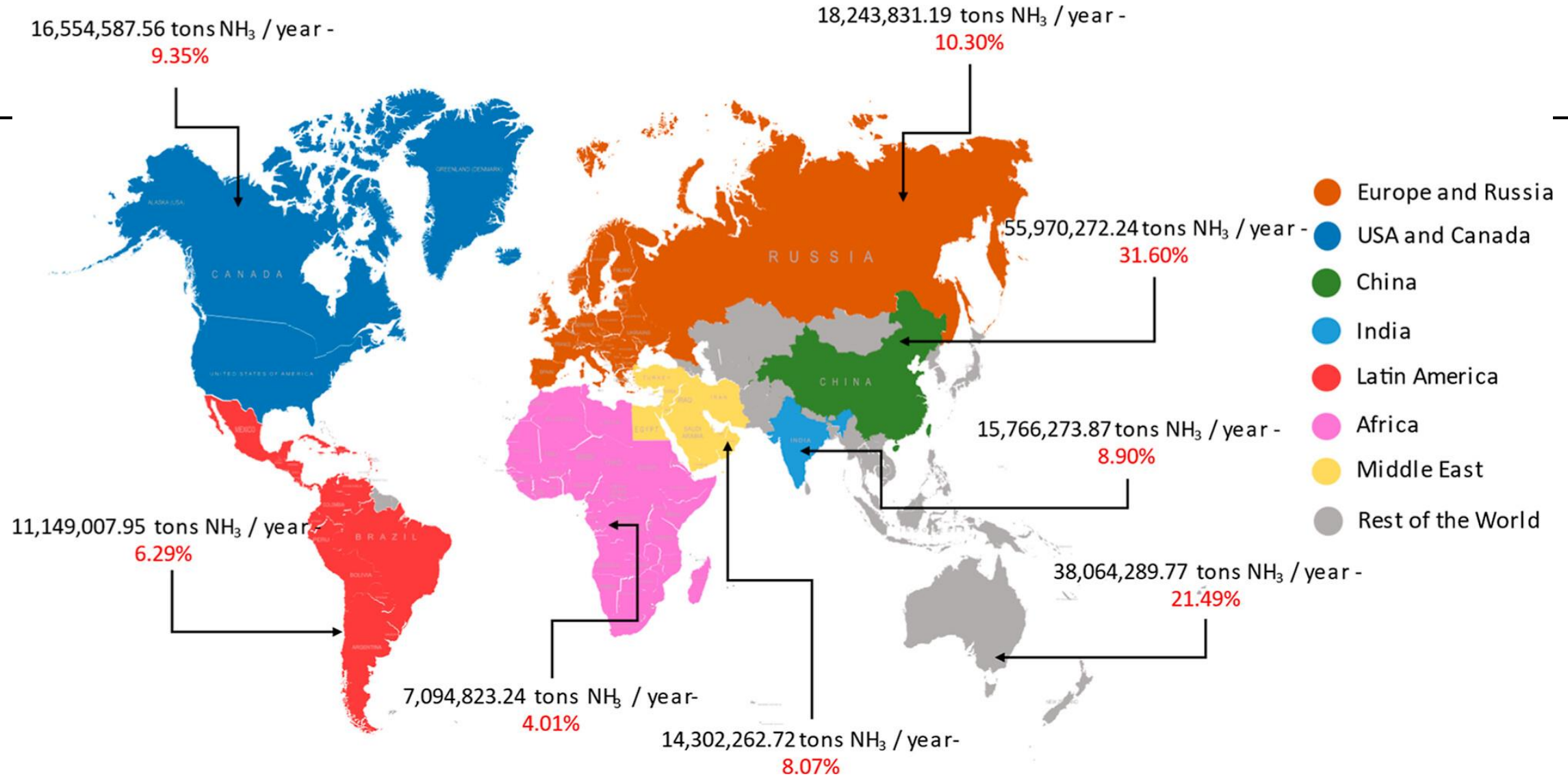
NH_3 can transport hydrogen chemically and can be cracked back to H_2 where appropriate.

Potential fuel

Direct use in shipping, stationary power and other applications is being investigated, but combustion emissions, NO_x control and efficiency must be addressed.

The strategic advantage is not that ammonia is universally superior to H_2 . It is that ammonia is already a globally handled molecule with established synthesis, storage and transport infrastructure.

Its climate value depends on how the hydrogen and nitrogen are produced and on the end-use conversion pathway.



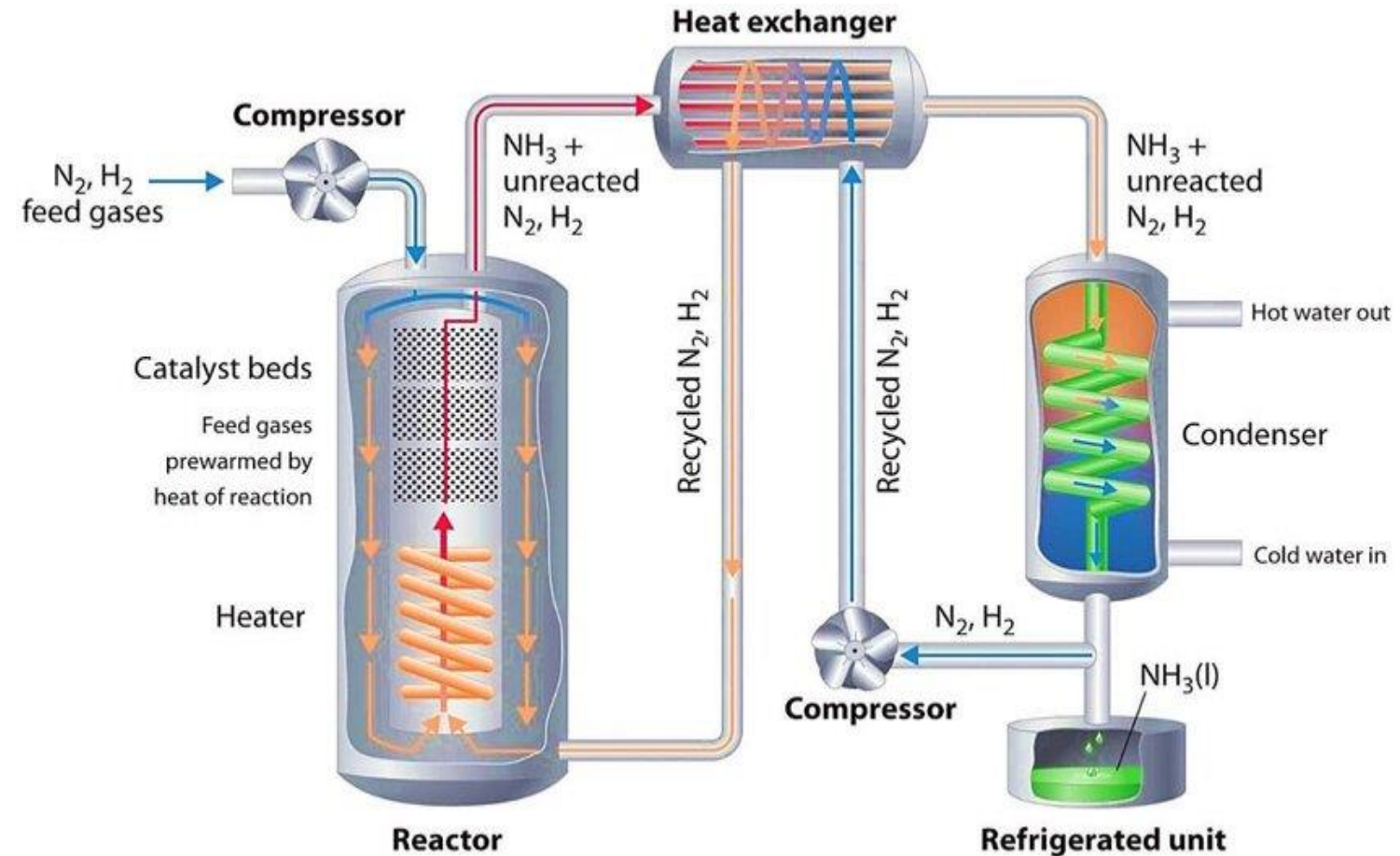
ACS Sustainable Chemistry & Engineering, Vol 12/Issue 33, 2024, 12652-12669

What is wrong with traditional ammonia synthesis?

The Haber-Bosch process:

- $N_2 + H_2 \leftrightarrow 2NH_3$
- Temperature: 450-550 °C
- Pressure: 250-350 bar
- Source of nitrogen – air.
- Source of hydrogen:
 - Natural gas (~70%)
 - Oil (~4%)
 - Coal (~22%)
 - Electrolysis (4%)

Annually: ~450 million tons of CO_2 , 80% of them – from H_2 production.



Why today's ammonia production is hard to decarbonize

Decarbonisation is not a one-step substitution. It means changing the H₂ source, the plant operation, and the scale of economics at the same time.

1 · Feedstock

Carbon is embedded upstream in H₂ production

In conventional ammonia plants, the hydrogen is usually produced from natural gas via reforming. That means a large share of the carbon footprint is created upstream, before NH₃ synthesis even begins.

Need a low-carbon H₂ source

2 · Haber–Bosch need steady operation

Efficiency comes with operating inflexibility

The synthesis loop uses elevated temperature, high pressure, compression, and strong heat integration. This makes it efficient, but also much better suited to continuous operation than to variable power input, as is the case with renewables.

Need flexibility or buffering

3 · Economics reward very large plants

Decarbonization is also a plant-scale problem

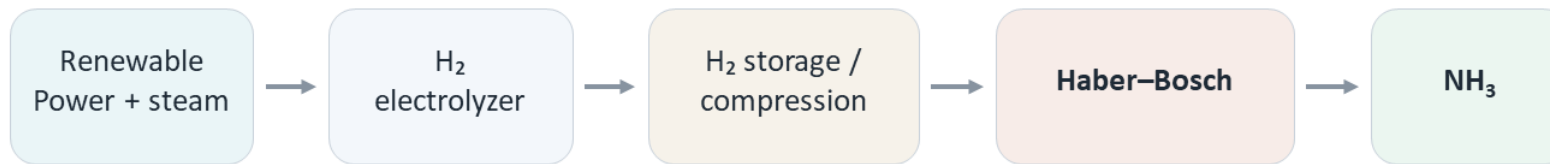
The favorable economics come from large centralized facilities. Green ammonia, however, is often wanted near renewable power or end use, for example ports or local fertilizer demand, where smaller-scale production can be more attractive.

Need favorable economics for lower scale operation

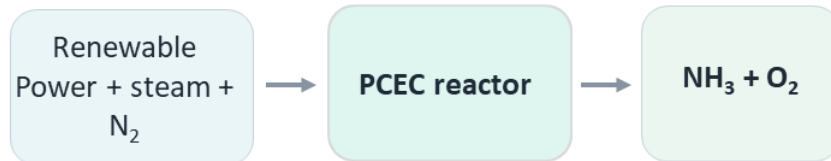
Why direct electrochemical NH_3 from steam is the “holy grail”

Green routes for H_2 exist, but they still need Haber-Bosch to produce the NH_3 . One-step route produces NH_3 directly in a one-step electrochemical reactor instead of making H_2 first (avoid the CO_2 emissions) and synthesizing NH_3 later (energy intensive)

Conventional green route



Direct route in a proton-conducting electrolysis cell

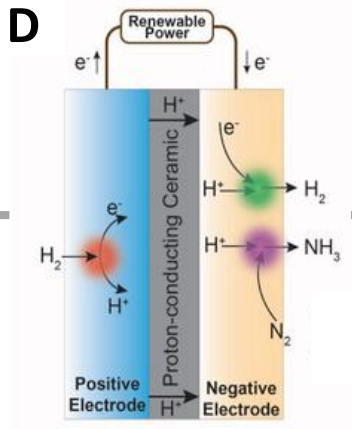
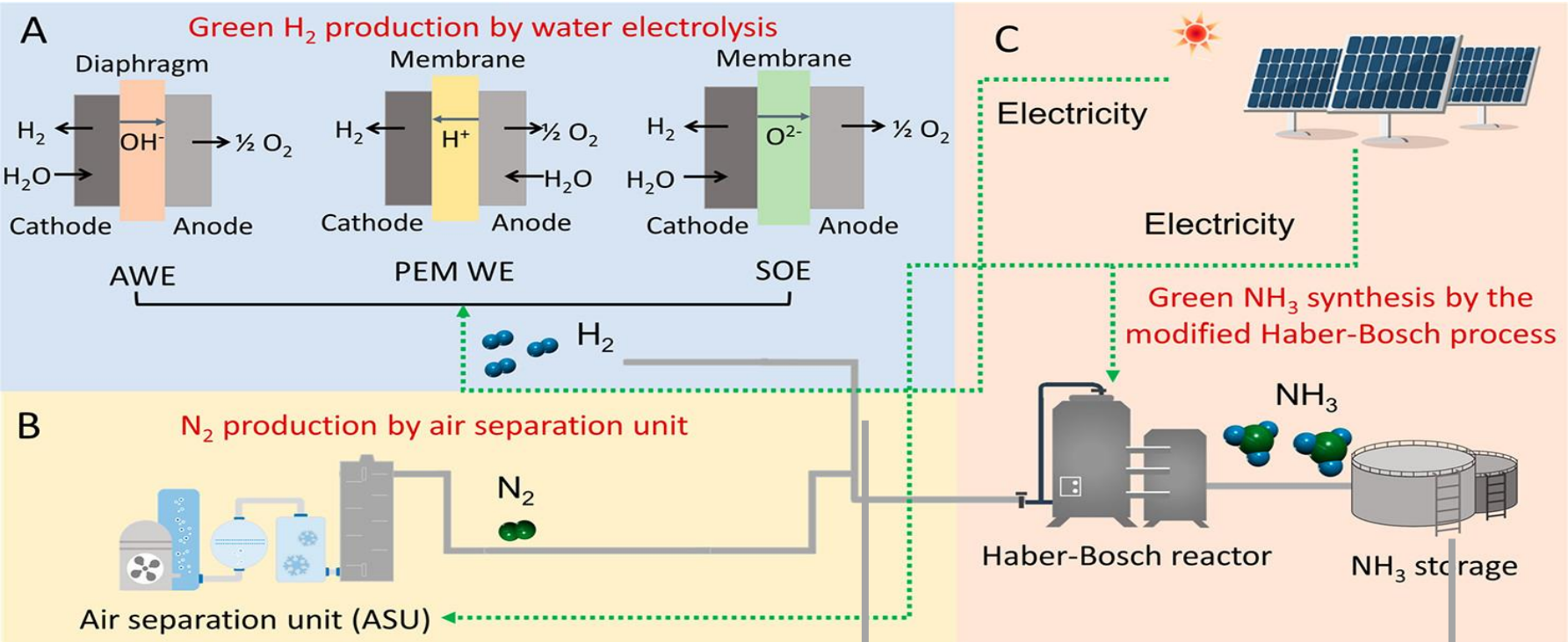


Potential advantages

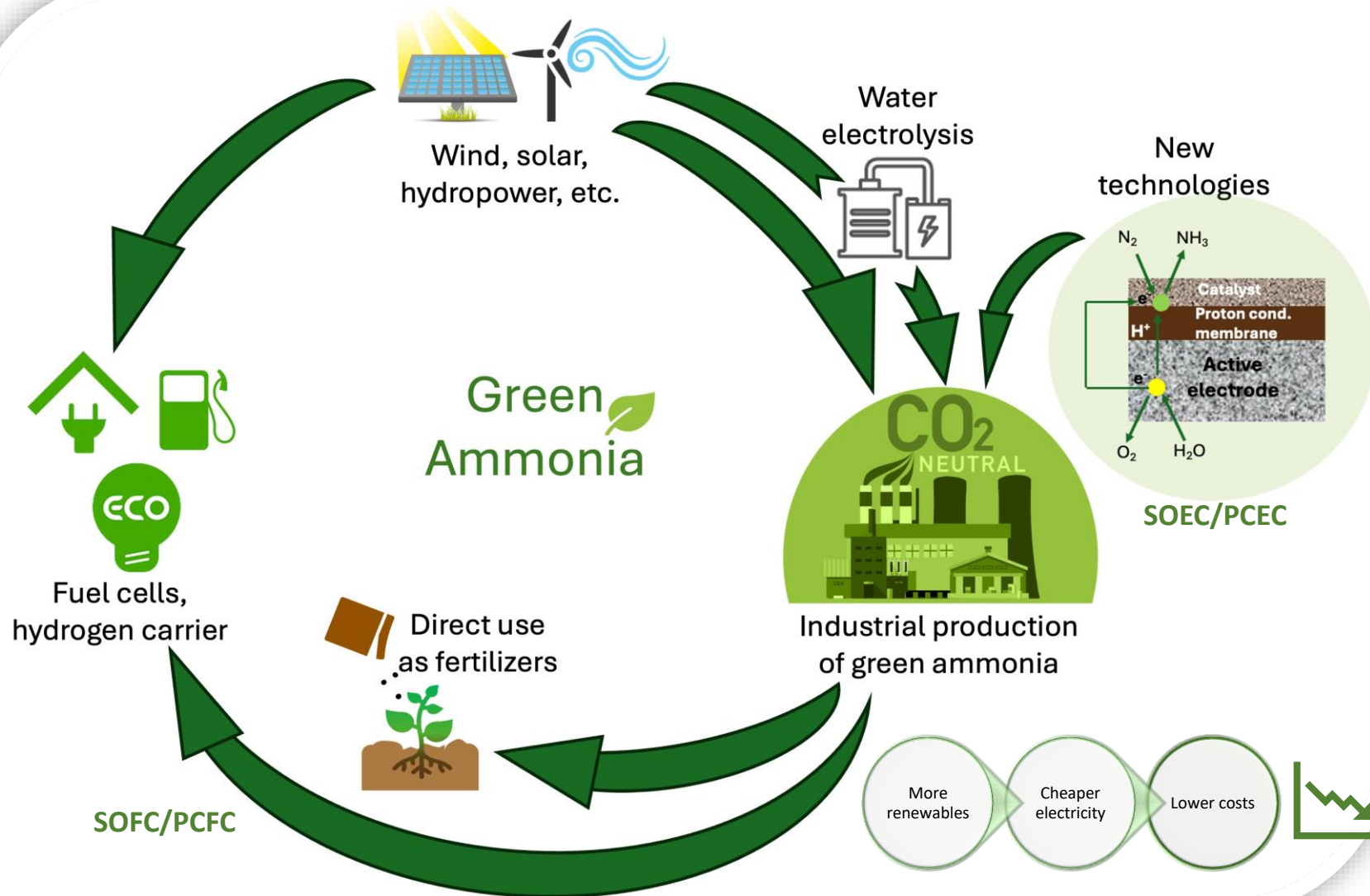
- Skips the separate H_2 loop
- Can be powered directly by renewable electricity
- May be modular and distributed
- Opens the possibility of on-site NH_3 production

However, this is an emerging route, not a mature industrial replacement today. Efficiencies are too low, mostly due to the ammonia producing electrode, and fabrication is challenging.

Methods for producing renewable ammonia



Methods for producing renewable ammonia



New technologies:

- **SOEC** – Solid Oxide Electrolytic Cell
- **PCEC** – Proton Ceramic Electrolytic Cell
- **SOFC** – Solid Oxide Fuel Cell
- **PCFC** – Proton Ceramic Fuel Cell

State of the art: performance is improving, but selectivity and durability remain decisive

Study	System	Operating point	NH ₃ rate	Reference
2023 ACS Omega	PCEC, Ni catalyst	400 °C; electrochemical promotion	up to $1.1 \times 10^{-8} \text{ mol s}^{-1} \text{ cm}^{-2}$	DOI 10.1021/acsomega.3c04478
2024 Solid State Ionics	BCY/BZCYYb + Fe/CeO ₂	600 °C; -1 V	$1.1\text{--}1.2 \times 10^{-8} \text{ mol s}^{-1} \text{ cm}^{-2}$	DOI 10.1016/j.ssi.2024.116649
2025 Energy & Fuels	PCEC + Fe thermocatalyst	700 °C; 1.2 V	$16.6 \mu\text{mol h}^{-1} \text{ cm}^{-2}$	DOI 10.1021/acs.energyfuels.5c00423
2026 Adv. Energy Mater.	Tubular PCEC + Fe–Co–Ni alloy	600 °C; 0.6 V; 250 h	$2.37 \times 10^{-8} \text{ mol s}^{-1}$	DOI 10.1002/aenm.202504493
2026 Appl. Catal. B	K-promoted PCEC cathode	500 °C; 0.4 V; 288 h	$1.29 \times 10^{-9} \text{ mol s}^{-1} \text{ cm}^{-2}$	DOI 10.1016/j.apcatb.2026.127059

Reported rates are not directly comparable across studies because electrode area, feed composition, pressure, current/voltage definition, analytical method and Faradaic efficiency differ. The field still needs harmonised benchmarking.

The core scientific bottleneck is the interface - not simply the electrolyte

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N₂ activation

Breaking/activating the N≡N bond remains kinetically demanding. Catalyst electronic structure and adsorption energetics are central.

Selectivity

Hydrogen evolution and proton reduction compete with NH₃ formation. High H₂ flux can reduce Faradaic efficiency.

Materials stability

Protonic ceramics, electrodes and interfaces must tolerate steam, redox gradients, thermal cycling and long operating times.

Measurement integrity

NH₃ quantification requires contamination controls, isotopic verification where appropriate, mass balance and transparent Faradaic-efficiency calculations.

Scale-up physics

Thin electrolytes reduce ohmic losses, but mechanical strength, gas tightness, interfaces, sealing and manufacturing yield become more difficult.

Implementation framework: policy, industry and research must move together

Policy

Predictable certification; infrastructure planning; targeted support for first-of-a-kind projects; standards for H₂/NH₃ quality and safety.

Industry

Secure renewable power and offtake; integrate heat and material flows; develop storage/logistics; publish performance and durability data.

Research

Prioritise interface science, long-duration testing, scalable manufacturing, system modelling, TEA/LCA and open benchmarking.

Shared KPI set

€/kg H₂ or NH₃ • kg CO₂e/kg product • kWh/kg product • Faradaic efficiency • degradation rate • operating hours • critical-material intensity

Economics: electricity, utilisation and infrastructure dominate the cost of renewable molecules

Electricity price × utilisation

Electrolysers are capital-intensive. Low-cost electricity is not enough if the electrolyser operates too few hours.

CAPEX + financing

Electrolyser and synthesis-plant capital costs, financing conditions and project risk strongly affect levelised cost.

Infrastructure

Grid connection, renewable generation, water, nitrogen separation, storage, pipelines, ports and ammonia handling add system costs.

Current market reality

IEA reports that low-emissions H₂ remains more costly than unabated fossil-based H₂ in the near term, although the gap is expected to narrow with deployment and policy support.

Content of the presentation

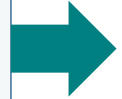
1. Introduction – Why Are “Green” Hydrogen and “Green” Ammonia Important? Decarbonization.
2. What Are Green Hydrogen and Green Ammonia?
3. Production Technologies and Areas of application.
4. Technological and economic challenges.
5. **Outlook: where are we headed?**
6. Conclusions and summary.

A useful systems view: „electrons" first, "molecules" where they solve a constraint.

Renewable
electricity



Direct
electrification



Electrolysis
H₂



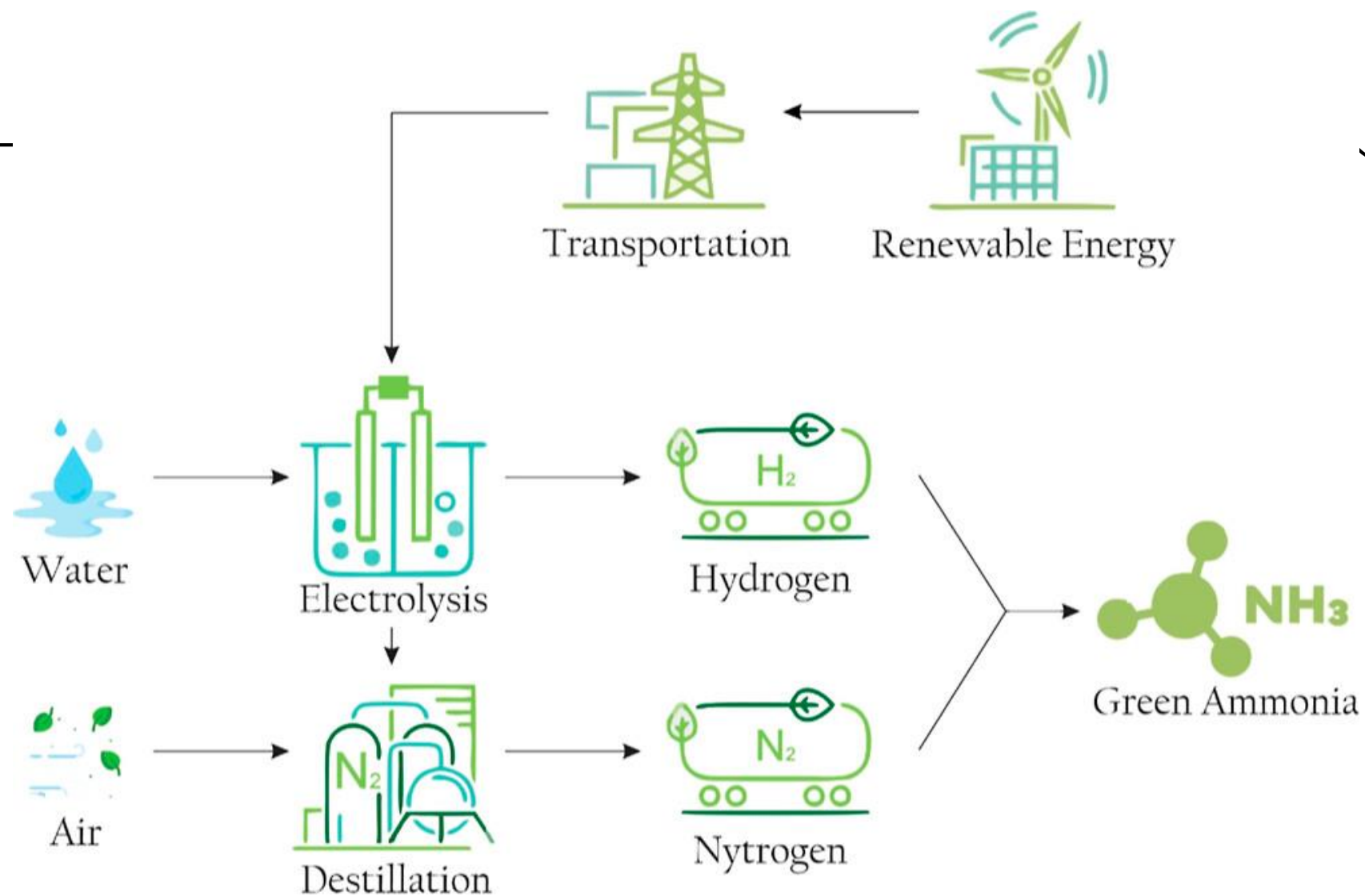
H₂ derivatives
NH₃ / e-fuels



Difficult end uses

Decision rule

Use the simplest low-carbon energy pathway that meets the technical requirement:
electricity → H₂ → NH₃ only when the additional conversion step creates a system-level benefit.



Green Hydrogen and Green Ammonia: The Outlook – Where Are We Headed?

1. Strategic Direction: From Demonstration Projects to System-Wide Integration

2. Technological Focus: Economies of Scale and Increased Efficiency

Materials Innovation

Integration with Renewable Energy

3. Green ammonia: from fertilizer to fuel

4. Economic and Geopolitical Trends

5. Systemic challenges that will determine the direction:

Will hydrogen be used where it is needed, rather than everywhere?

Infrastructure synchronization.

Economic competitiveness.

Green Hydrogen and Green Ammonia: The Outlook – Where Are We Headed?

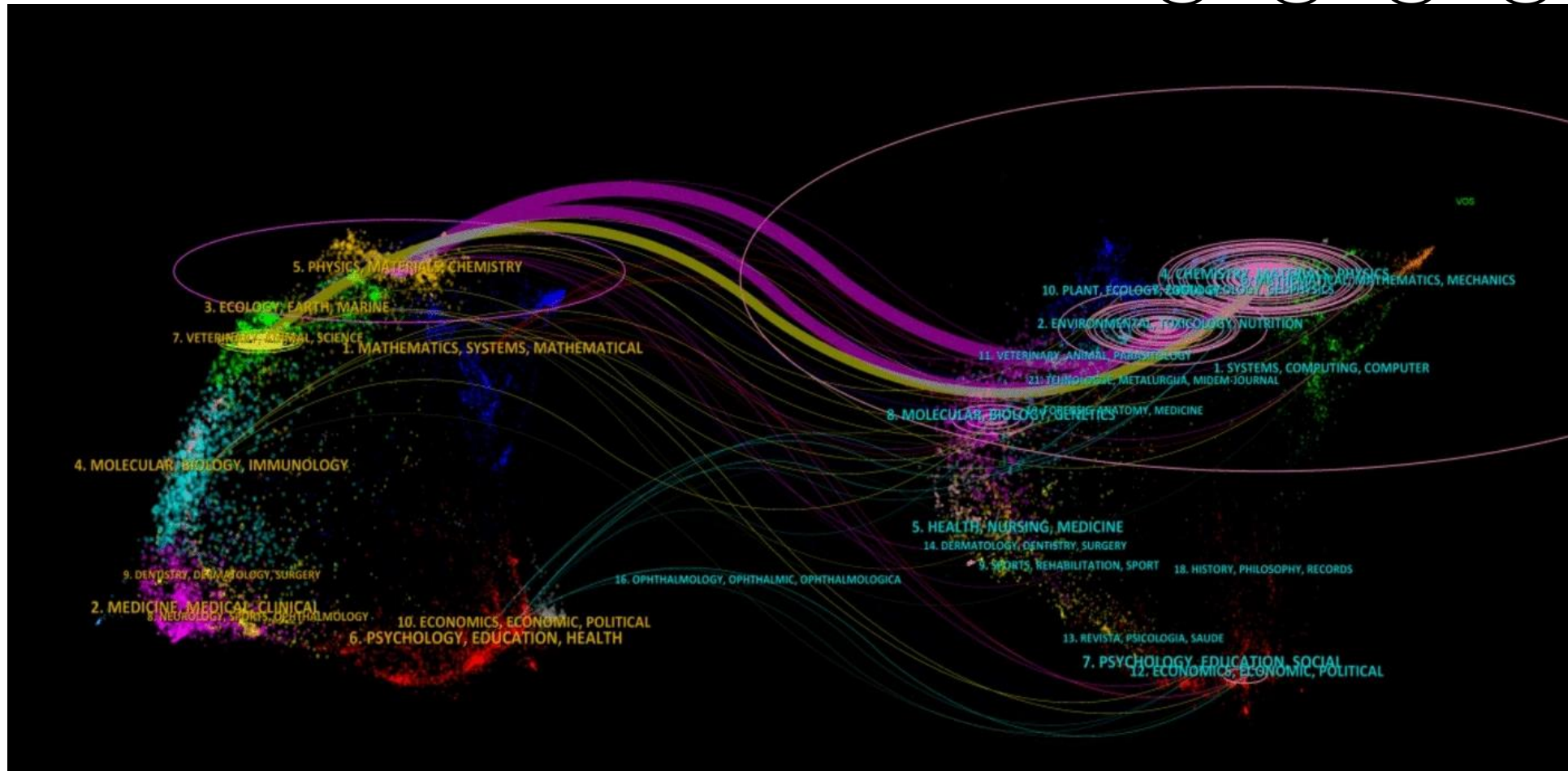
6. Long-term vision: 2040–2050.

If current technological and political trends continue:

- Green hydrogen will become an integral part of industry (steel, chemicals).
- Green ammonia will become the standard raw material for low-carbon fertilizers.
- Maritime transport will partially switch to ammonia or ammonia blends.
- The energy system will become hybrid: electricity + molecules (H₂, NH₃).

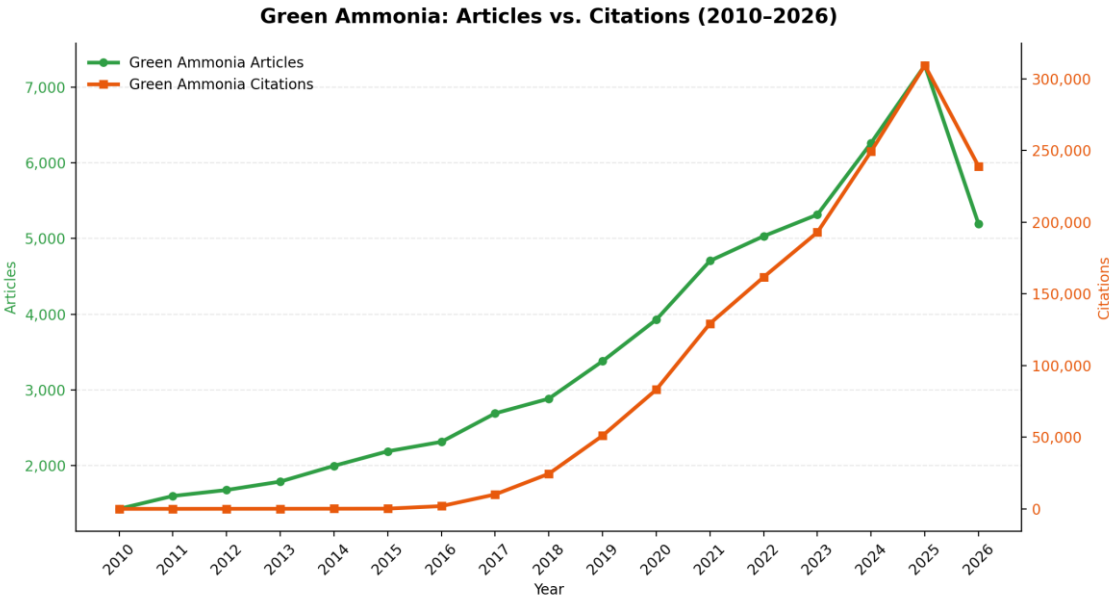
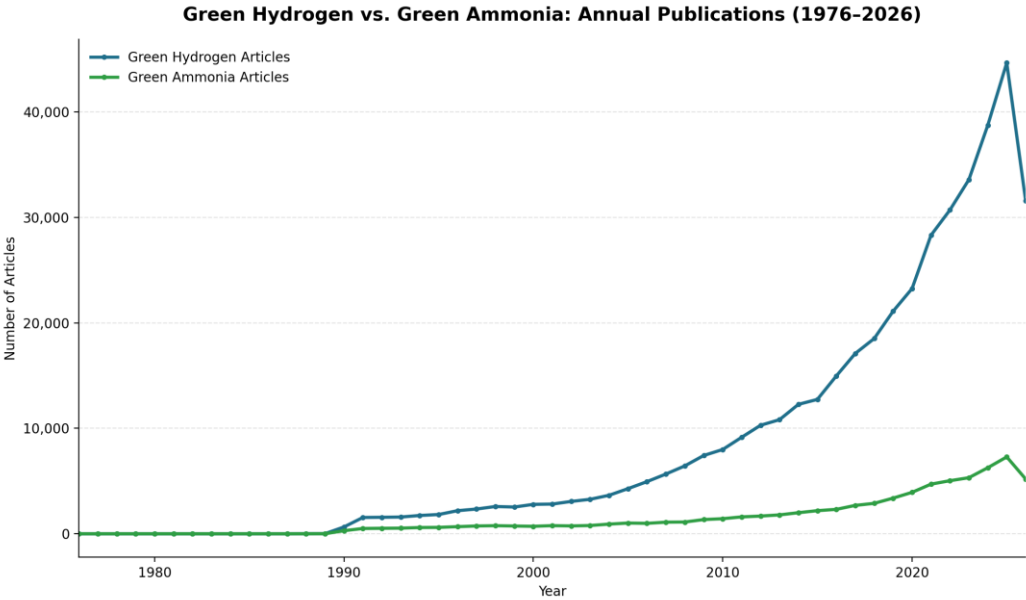
However, it is unlikely that hydrogen will serve as a universal fuel. Instead, it will become a specialized but critically important tool for decarbonization.

Chen C. et al., "Global knowledge structures and evolutionary dynamics of green hydrogen technology research revealed by integrated scientometric analysis," Discover Applied Sciences, Vol. 8, Art. 828 (2026). <https://doi.org/10.1007/s42452-026-08902-9>



Overlay visualization of disciplinary interactions

The full data table for the number of research articles published annually on green hydrogen and green ammonia from 1976 to 2026, as returned by Web of Science. <https://www.webofscience.com/wos/research-assistant> (*Web of Science Research Assistant*).



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Conclusions

- Green hydrogen and green ammonia are not alternatives to electrification - they complement it. The energy transition is taking shape along two parallel tracks: direct electrification and the use of renewable molecules. Hydrogen is becoming a critical link between these two systems.
- Its role is particularly important in sectors where electrification is impossible or economically challenging: steel, chemicals, and fertilizer production, as well as maritime transport and long-term energy storage.
- Electrolysis technologies have already reached commercial levels, but their scale remains limited. The transition to gigawatt-scale production will be a major turning point.
- The situation is more favorable for green ammonia - the ammonia production technology itself (Haber-Bosch) is well-established. The transformation is taking place by changing the source of hydrogen. Therefore, this sector may be one of the first to actually achieve decarbonization.
- The biggest barrier remains cost. The competitiveness of green hydrogen directly depends on the price of renewable electricity and the scale of electrolyzer production.
- Equally important is the infrastructure - transportation, storage, and distribution systems. In this area, ammonia has a clear advantage due to the existing global trade infrastructure.

Innovative transition metal oxide (TMO) based electrocatalyst structures for sustainable hydrogen production (SUSTAIN-H2O)



Project duration 2024-2027

The main objective of the project:

To develop TMO-based electrocatalysts for efficient and stable oxygen evolution reactions (OER), thereby facilitating the implementation of anion exchange membrane (AEM) electrolysis for the production of renewable hydrogen.

Prospects for Green Ammonia in Sustainable Energy Development (AMPROSE)

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Nordic Energy
Research

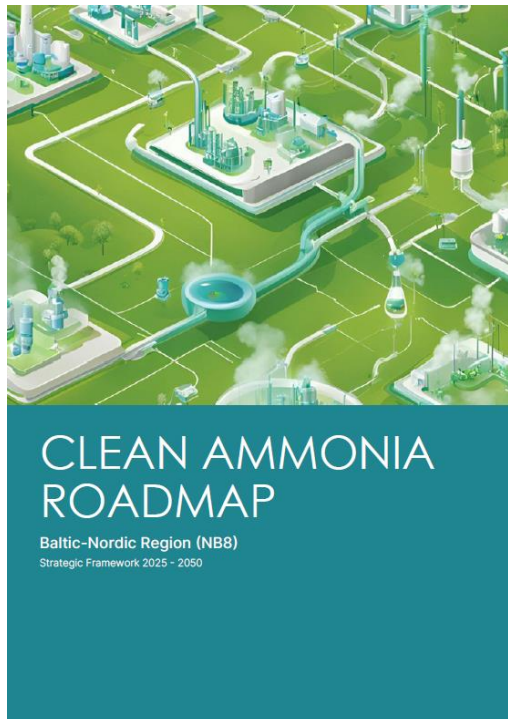
Project duration 2024-2026

Project objectives:

1. To conduct technical and economic analyses to assess the feasibility and cost-effectiveness of various technologies for ammonia production and use, in order to identify research gaps, key milestones, and approaches for the implementation of new ammonia technologies.
2. Demonstrate an electrochemical ammonia production process using readily available and largely non-critical raw materials.
3. Inform policymakers and industry stakeholders about the prospects for ammonia, the state of the technology, and its expanded role in ensuring a sustainable energy future in the Baltic and Nordic regions.

Prospects for Green Ammonia in Sustainable Energy Development (AMPROSE) Project duration 2024-2026

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The Clean Ammonia Roadmap for the Baltic-Nordic (NB8) region, 2025–2050, is based on scientific literature, AMPROSE's project techno-economic analysis and experimental research on direct ammonia production technologies.

<https://ebooks.ktu.edu/product/721323>





THANK YOU FOR YOUR ATTENTION !!!