



Navigating the Energy Transition:
From a fossil-based economy to a meaningful
hydrogen economy

Leon Stille

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Energy Transition is the biggest challenge of our lifetime

- Independent energy expert with own label New Energy Institute
 - CCO Hovyu BV
 - Manager Education of Impact Hydrogen
 - Lecturer at universities and business schools
- Hydrogen Europe, Illuminum, International Gas Union, European biogas association scientific advisor
- BSc and MSc in Geology and Earth Sciences
- Ongoing PhD in energy policy
- 15+ years experience in the international energy sector
- Focus:
 - Consultancy; expert advice, business development, representation
 - Education; courses, in house training and speaking/moderating events
 - Technology: R&D projects; Hycooker, Hyperion, ZEUS, Hydrogen Lift



Leon Stille 🗣️ (He/Him)

New Energy Expert and Educator | Energy Transition | ESG |
Innovation | Education | Hydrogen | CCUS | Green Gas | Speaker |
Moderator

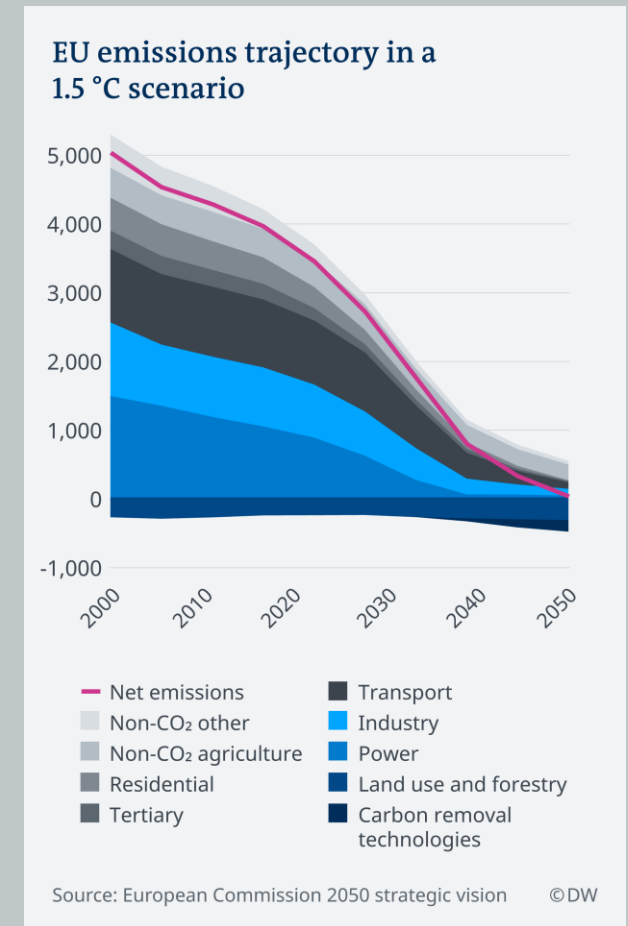
The challenge

- Limit global warming to 1.5 degrees C preferably
- Decrease emission to 0% compared to today
 - Possible negative emissions required
- Completely climate neutral by 2050 (EU)

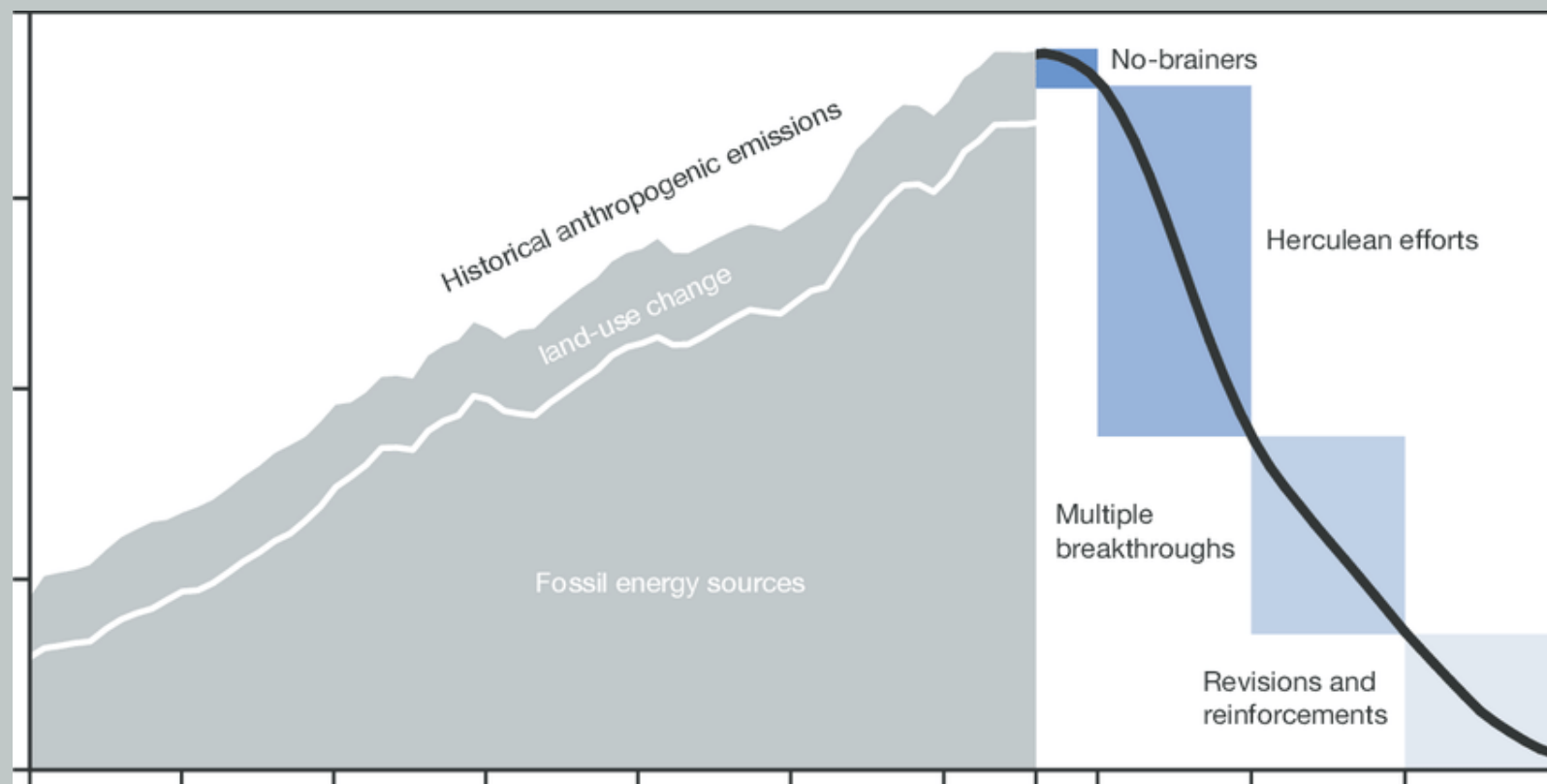


Requires complete rethinking and redesign of the current systems:

- Energy
- Food
- Water
- Industry
- Transport



Steps to be taken to reach the goals



- It would limit average global temperature rise to 2 °C above pre-industrial levels (when coupled with energy efficiency);
- It would avoid up to 12 gigatonnes of energy-related CO₂ emissions in 2030
- It would result in 24.4 million jobs in the renewable energy sector by 2030, compared to 9.2 million in 2014;
- It would reduce air pollution enough to save up to 4 million lives per year in 2030;
- It would boost the global GDP by up to USD 1.3 trillion.

https://www.researchgate.net/figure/2-3-Carbon-roadmap-for-stepwise-decadal-decarbonization-The-emissions-shown-are-based_fig4_312159541

Where are we in the transition?

+	Additions	RENEWABLE CAPACITY ADDITIONS		
		2024	2030 targets (1.5°C Scenario)	On track
	Renewable power capacity additions	582GW	1 044GW	
	Annual solar PV additions	452GW/yr	578GW/yr	
	Annual wind energy additions	114GW/yr	360GW/yr	
	Annual hydropower additions	9GW/yr	28GW/yr	
	Annual bioenergy power additions	5GW/yr	28GW/yr	
	Annual geothermal power additions	0.3GW/yr	13GW/yr	
	Annual ocean energy power additions	0.0016GW/yr	10GW/yr	

Additional energy transition indicators

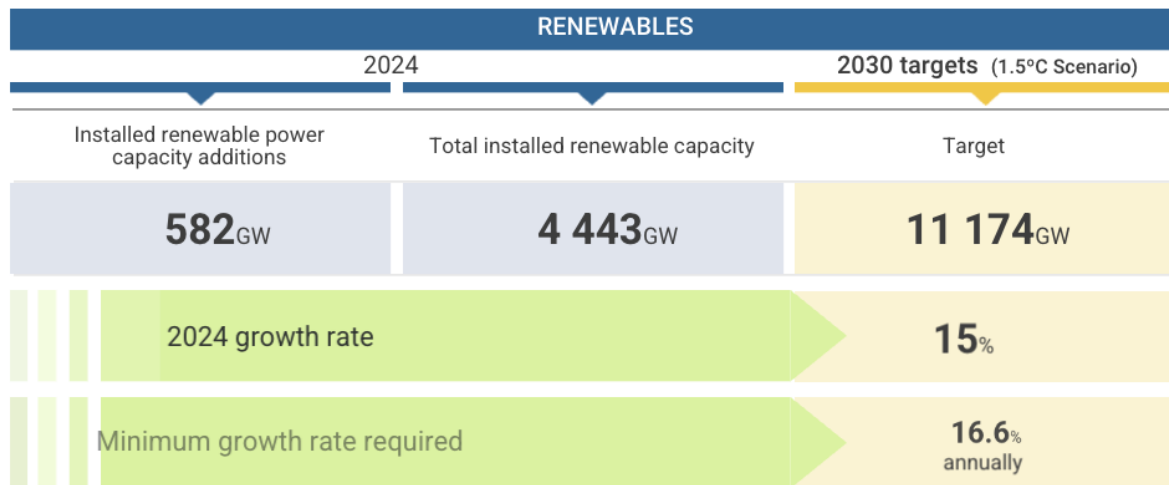
Additional indicators	INDICATORS		
	2023	2030 targets (1.5°C Scenario)	On track
Electric and plug-in hybrid light passenger vehicles stock	40 million	360 million	
Electrolyser capacity stock	2.9GW	428GW	

Tracking finance and investment

Additional indicators	FINANCE AND INVESTMENT		
	2023	2024-2030 (1.5°C Scenario)	On track
Investment in renewable power generation	570 USD billion/yr	1 550 USD billion/yr	
Investment needs for power grids and flexibility	368 USD billion/yr	720 USD billion/yr	

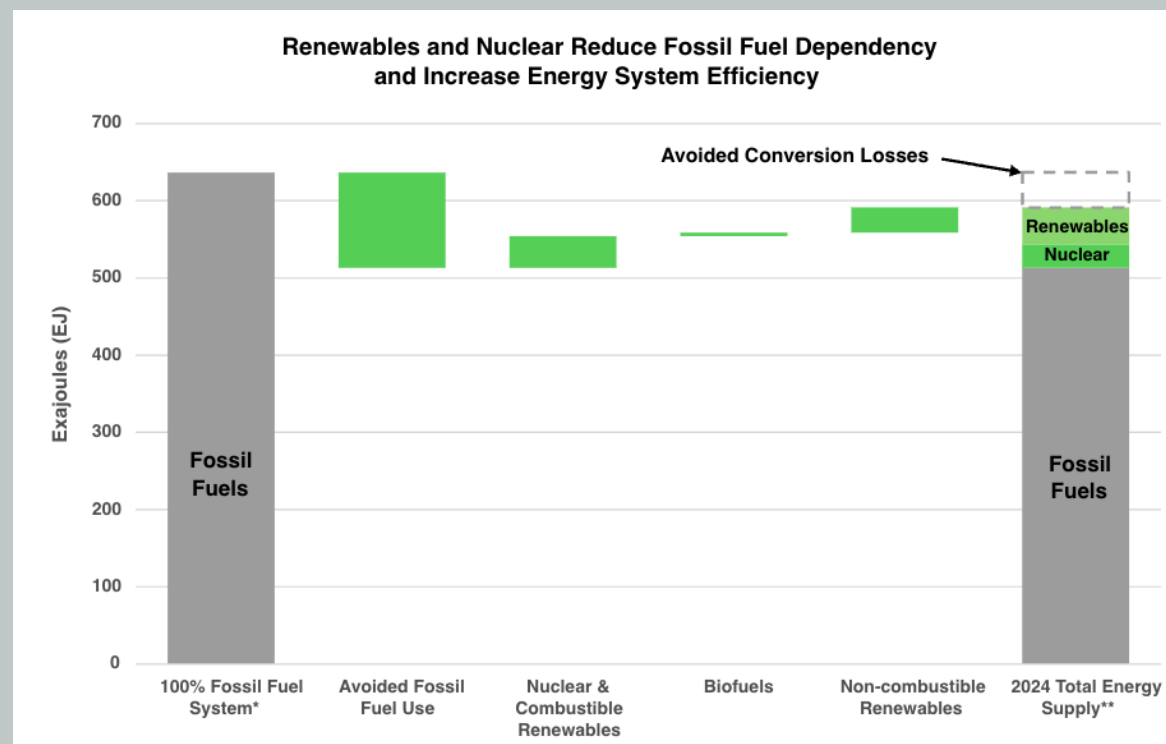
Key metrics; growth and efficiency

Progress in renewable power capacity deployment



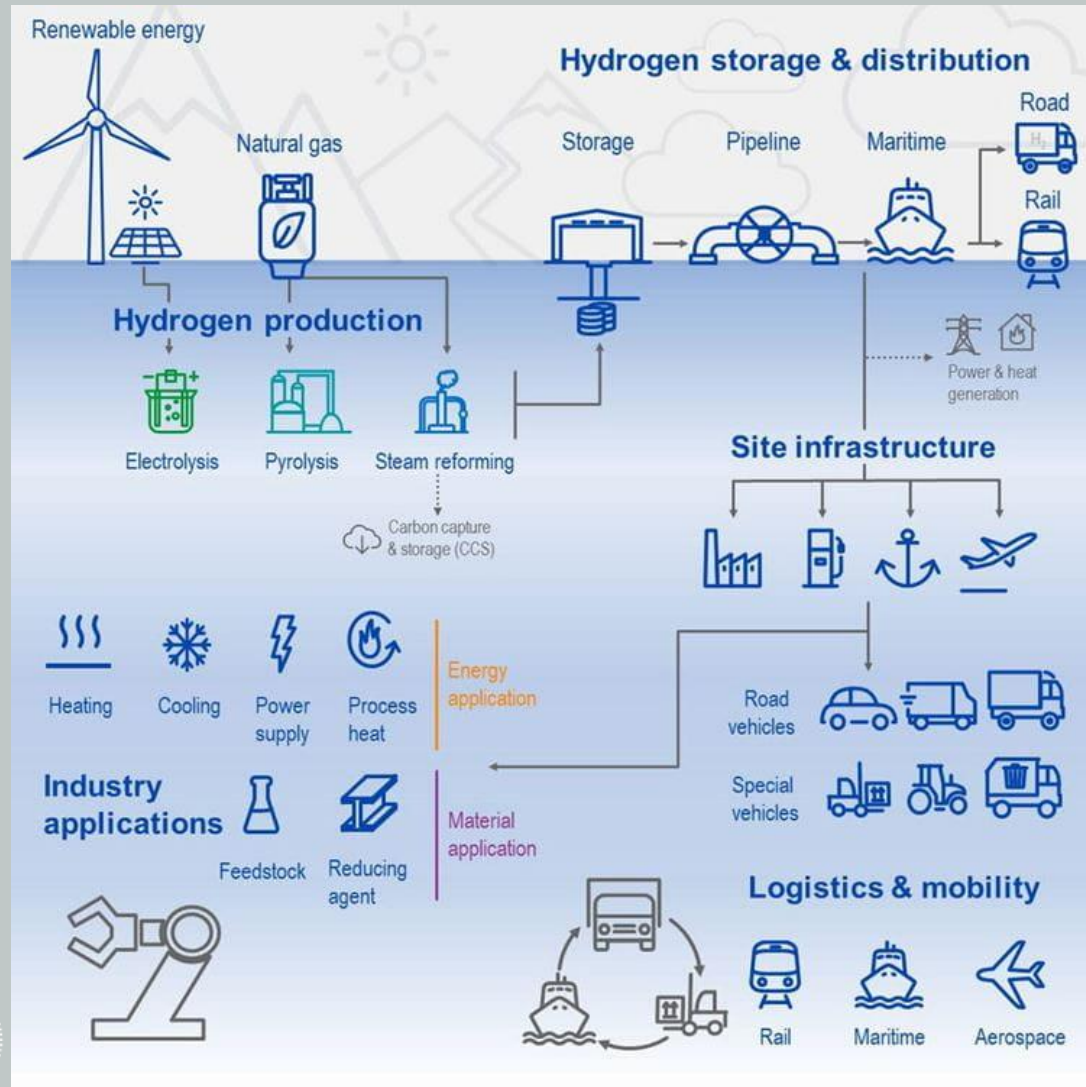
<https://www.irena.org/Energy-Transition/Outlook/Tracking-progress#key-data>

IEA: Oil 1%, NG 1.5% and coal 1.3% growth



<https://www.energyinst.org/statistical-review>

So what about hydrogen?



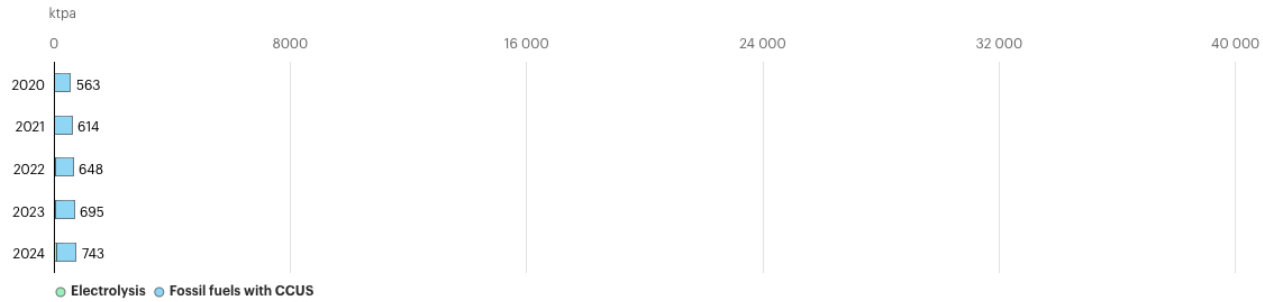
1. Hydrogen is very versatile
2. It can be stored for long periods of time
3. The molecule itself is reactive and a chemical building block
4. Fuel cell and direct use options are being developed
5. Potential for gas infrastructure re use
6. No direct emissions
7. Scalable solutions
8. Fit's in current supply chains

BUT

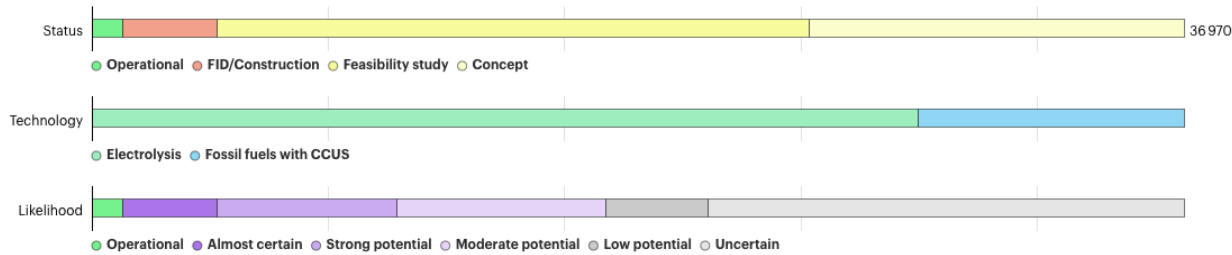
Not all sectors are technically or economically viable

But we do not see this happening

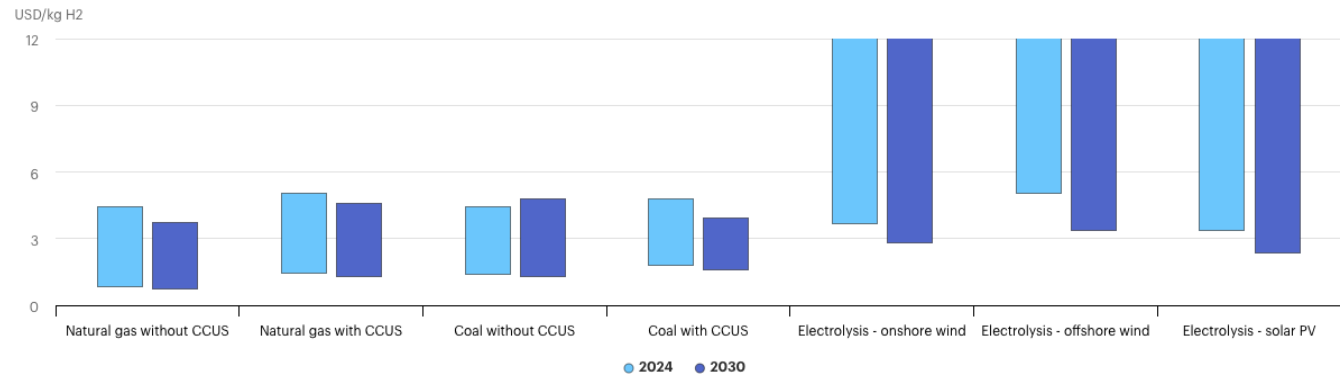
Hydrogen production



Announced 2030 production



Levelised cost of hydrogen production by pathway in 2024 and in the Stated Policies Scenario, 2030



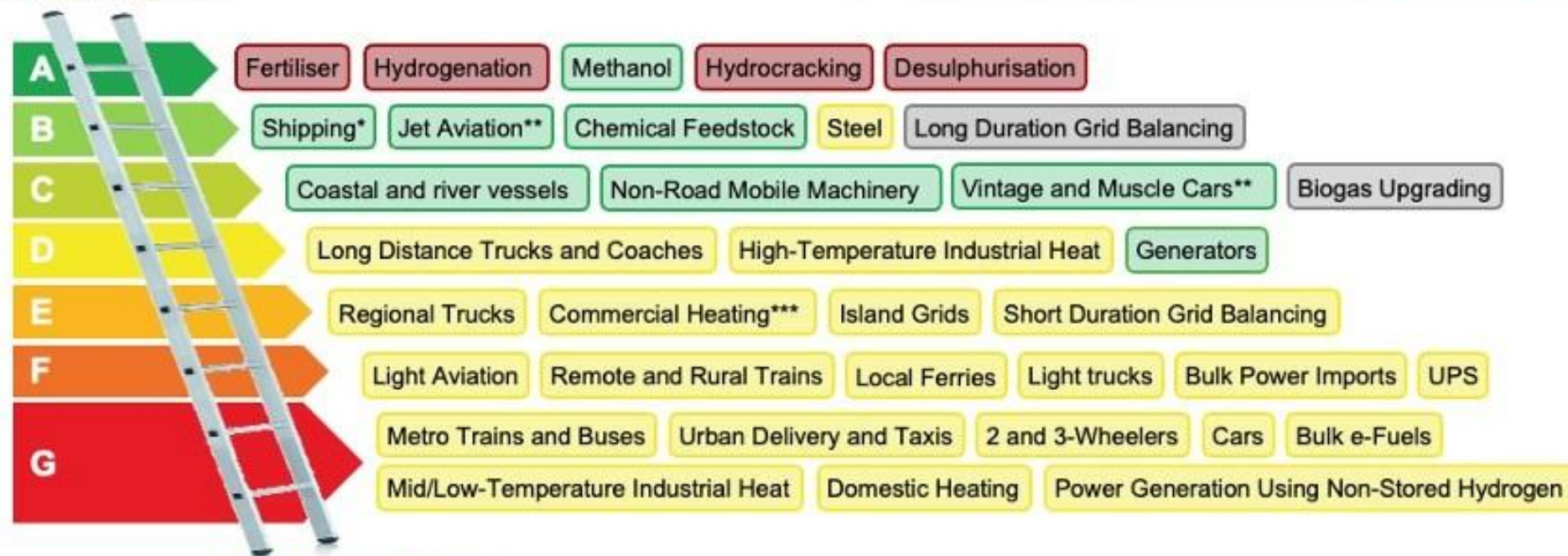
Instead focus is applied to key sectors

Hydrogen Ladder 5.0

Liebreich Associates

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



Uncompetitive

*As ammonia or methanol **As e-fuel or PBTl ***As hybrid system

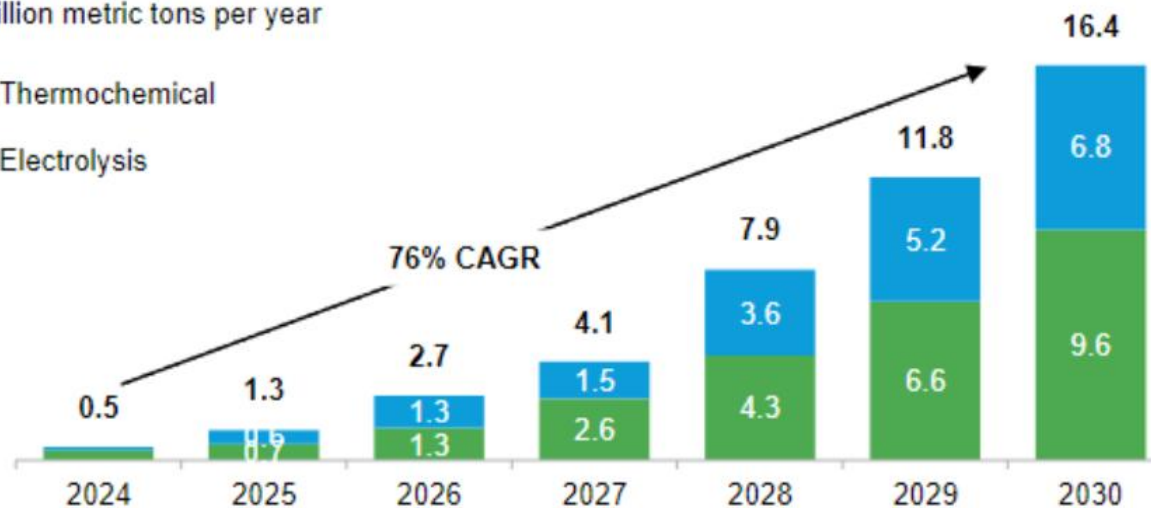
Source: Michael Liebreich/Liebreich Associates, Clean Hydrogen Ladder, Version 5.0, 2023. Concept credit: Adrian Hiel, Energy Cities. [CC-BY 4.0](#)

In line with what is actually happening

Figure 1: Forecast annual low-carbon H₂ supply by production method and commissioning year

Million metric tons per year

- Thermochemical
- Electrolysis

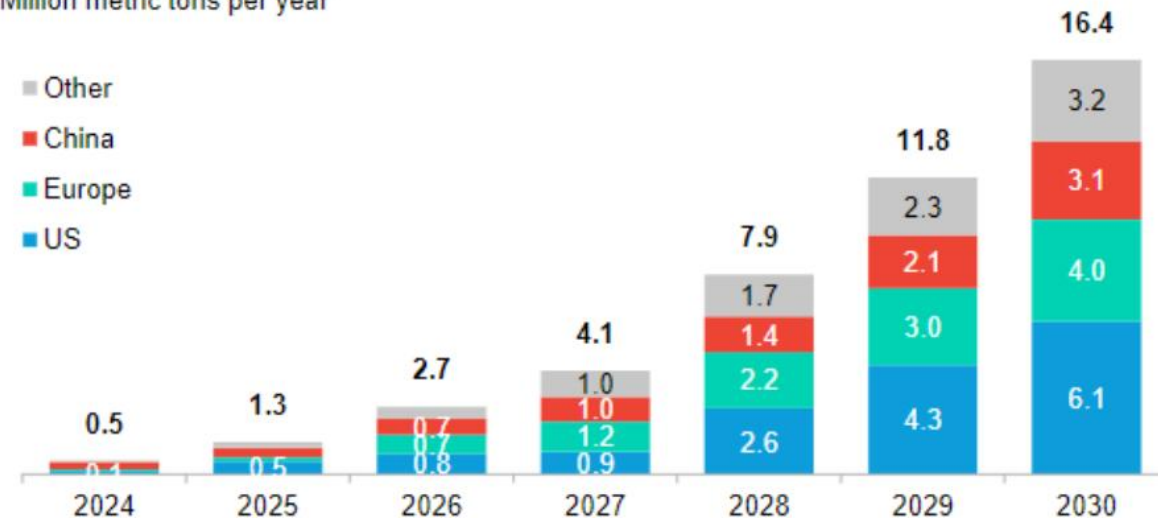


Source: BloombergNEF. Note: 'Thermochemical' includes all low-carbon pathways using fossil fuels as feedstock. 'CAGR' stands for compound annual growth rate.

Figure 2: Forecast annual low-carbon H₂ supply by market and commissioning year

Million metric tons per year

- Other
- China
- Europe
- US

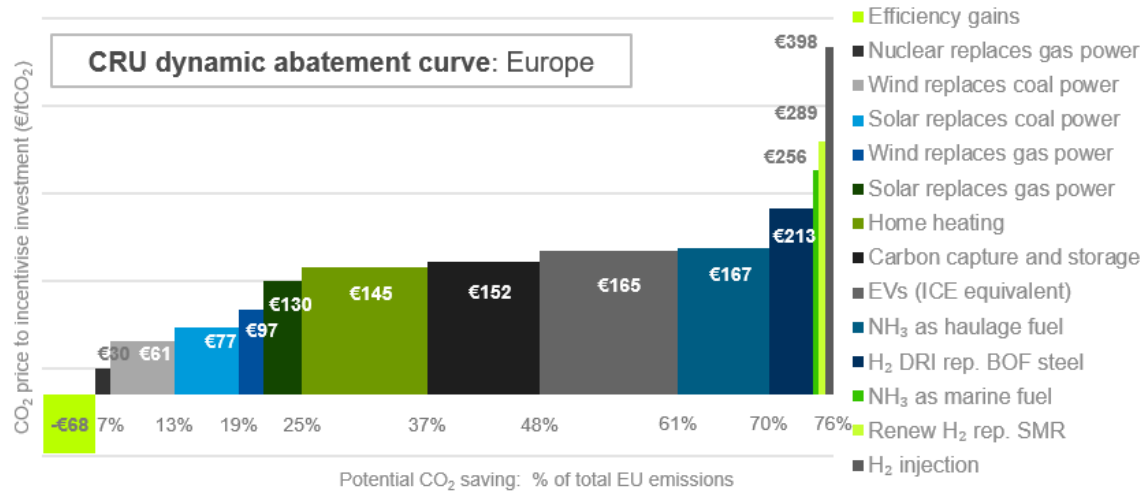


Source: BloombergNEF

<https://about.bnef.com/insights/clean-energy/hydrogen-supply-outlook-2024-a-reality-check/>

Why? Because of the huge success of renewables

Figure 5: A carbon price of >€250 /t is needed to fully decarbonise EU economy

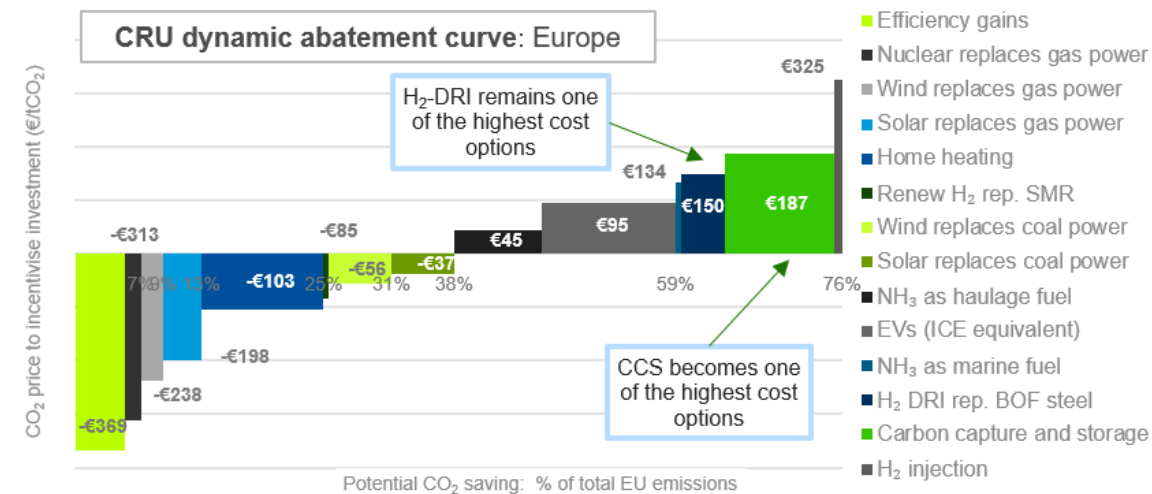


DATA: CRU Sustainability analysis; Note: abatement curve based on 2030 investment costs, steady-state fossil energy prices and reported on a real 2020 basis

Low electricity prices



Figure 6: Current high energy prices pull the abatement curve down drastically



DATA: CRU Sustainability – dynamic carbon abatement curve; Note: abatement curve based on 2030 investment costs, current [very high] fossil energy prices and reported on a real 2020 basis

<https://www.crugroup.com/en/communities/thought-leadership/sustainability/high-energy-prices-help-not-hinder-decarbonisation/>

Is this a problem?...Not really

By 2030, even if we fully prioritise hydrogen for the “no-real-alternative” sectors on the Hydrogen Ladder, global hydrogen demand is likely only ~65–80 Mt (or ~90–110 Mt including declining refining), corresponding to roughly 1–2% of global energy demand.

That translates roughly to 100-200 billion USD per year in value!

Thank you

Leon Stille

Managing Director

Stille@newenergyinstitute.net

+31652779011

