BalticSeaH2

Regulation Node: Clean hydrogen in the chemical industry

From energy carrier to industrial feedstock

Co-funded by the European Union

Clean Hydrogen Partnership

The project is supported by the Clean Hydrogen Partnership and its members.

Co-funded by the European Union

Agenda

10.30 Introduction to CETPartnership TRI6 and BalticSeaH2
Åsa Bergérus Rensvik, Swedish Energy Agency & Pia Salokoski, CLIC Innovation

10.40 Keynote speaker
Daniel Fraile, Hydrogen Europe

11.00 Commentary speakers
Nicolai Romanowski, European Chemical Industry Council (CEFIC)
Mikko Rönkä, Borealis
Anna Sager, Research Institutes of Sweden (RISE)

11.45 Discussion
Moderated by Oleg Todorov, CLIC Innovation

12.00 Closing

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Co-funded by the European Union

Hydrogen Market and EU Regulatory Framework

2 June 2026

Daniel Fraile

Hydrogen Europe

Hydrogen Europe Family

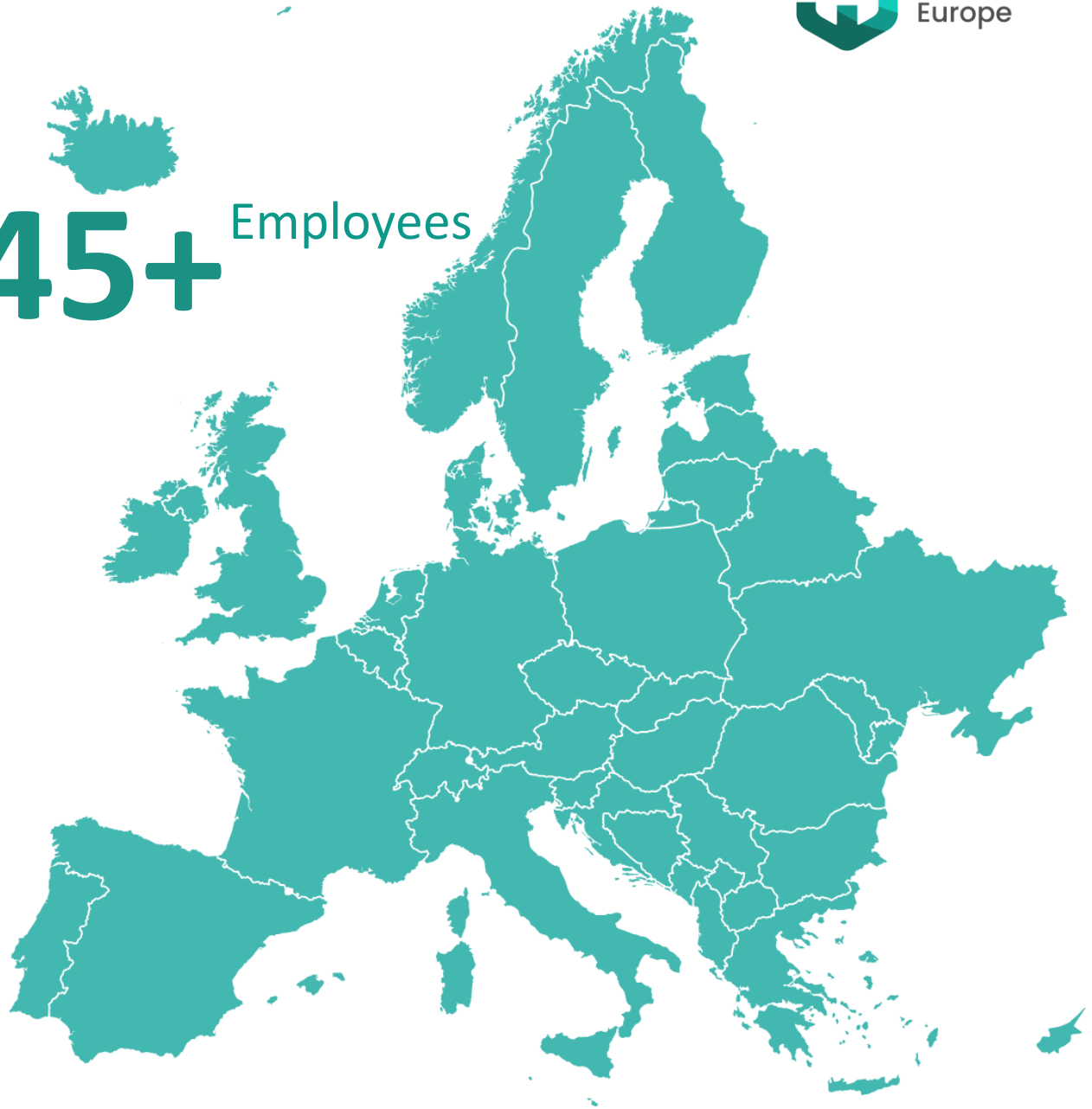
Hydrogen Europe

600+ Members

We encompass the entire value chain of the hydrogen ecosystem: from production, distribution to end uses, including Industry, Non-Profits, EU regions, H2 National Associations and Global Partners.

40 Countries from Europe and beyond

45+ Employees



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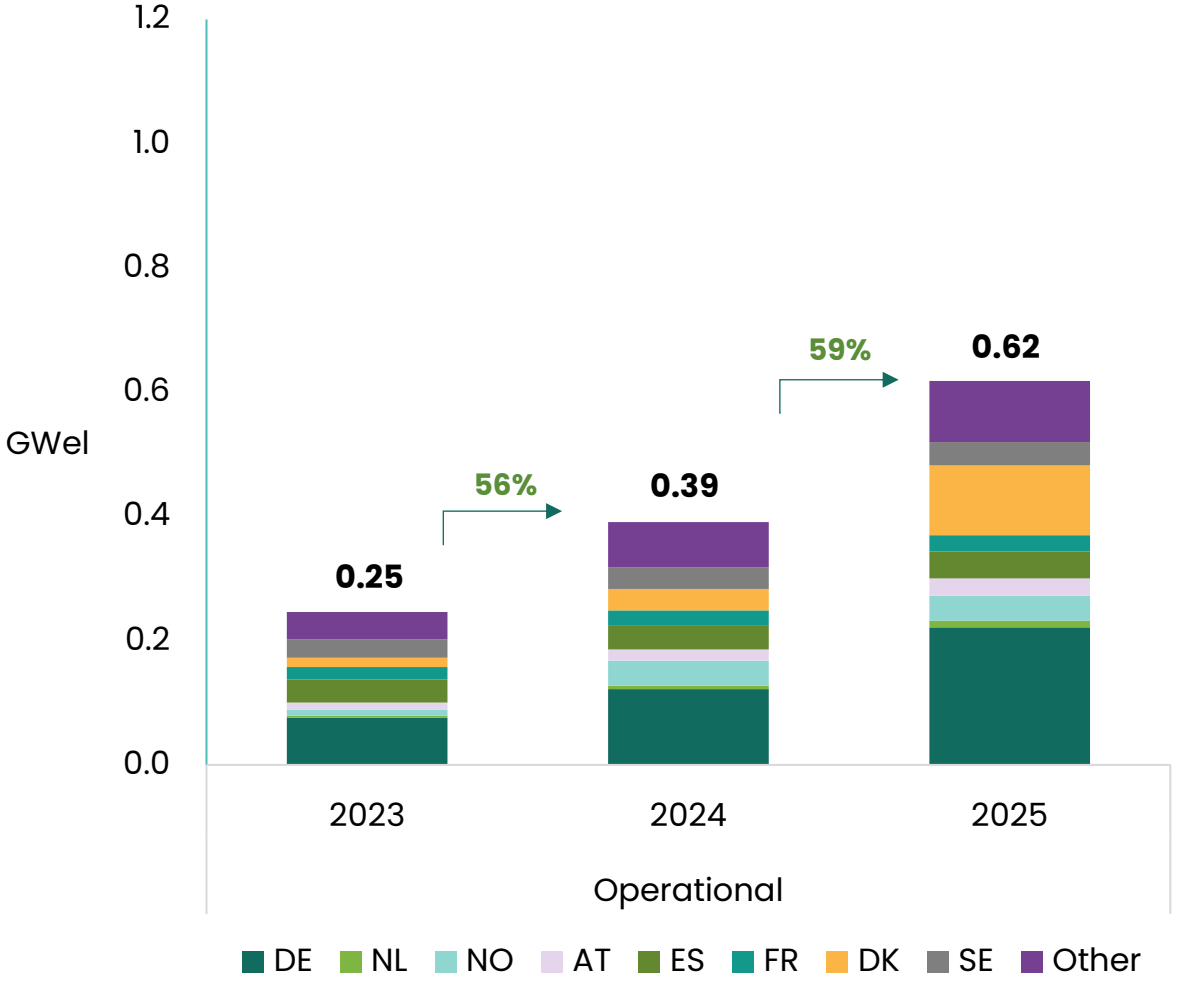
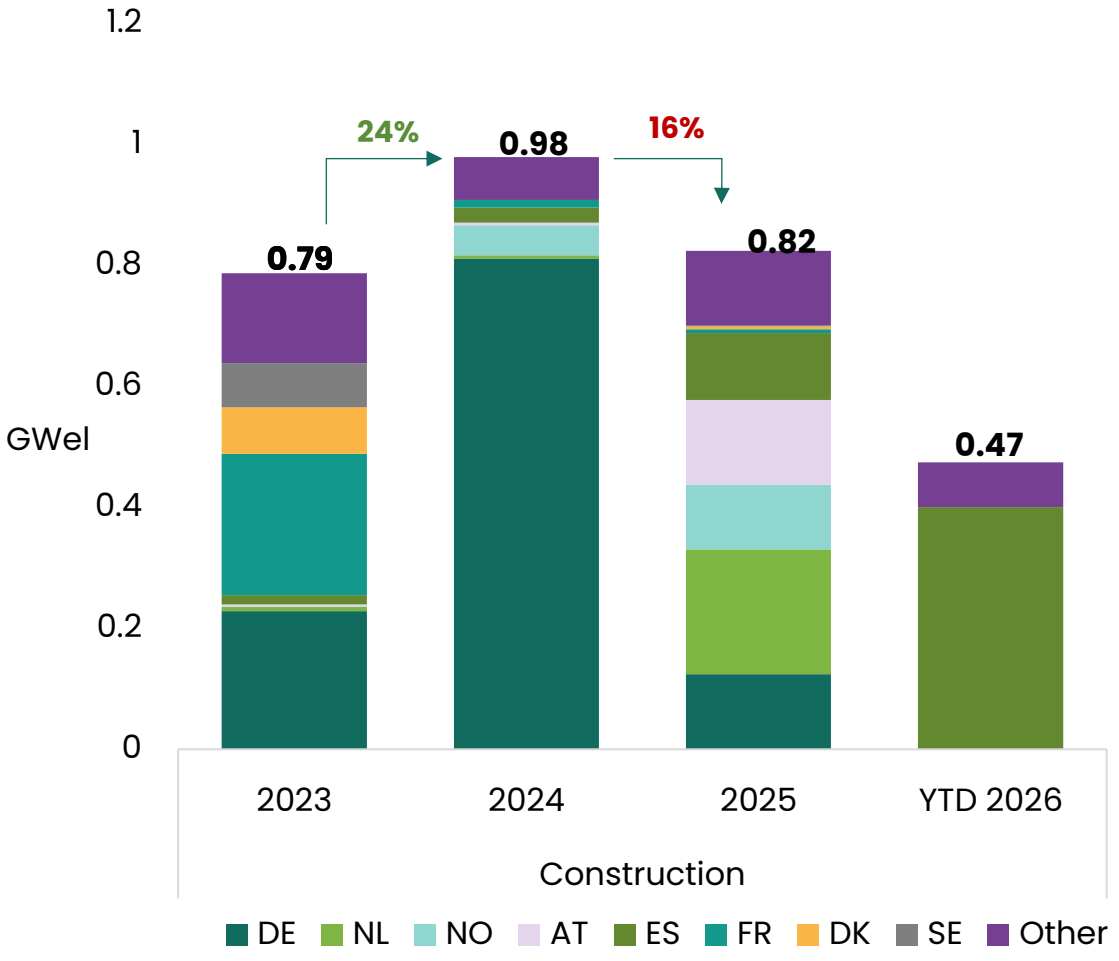
Rapid growth in the number of installations. FIDs happening in a growing number of countries

Thanks to REDIII, 2026 FID in Spain alone represent half of the total Europe's 2025 FIDs

Cumulative operational water electrolysis capacity in Europe by February 2026



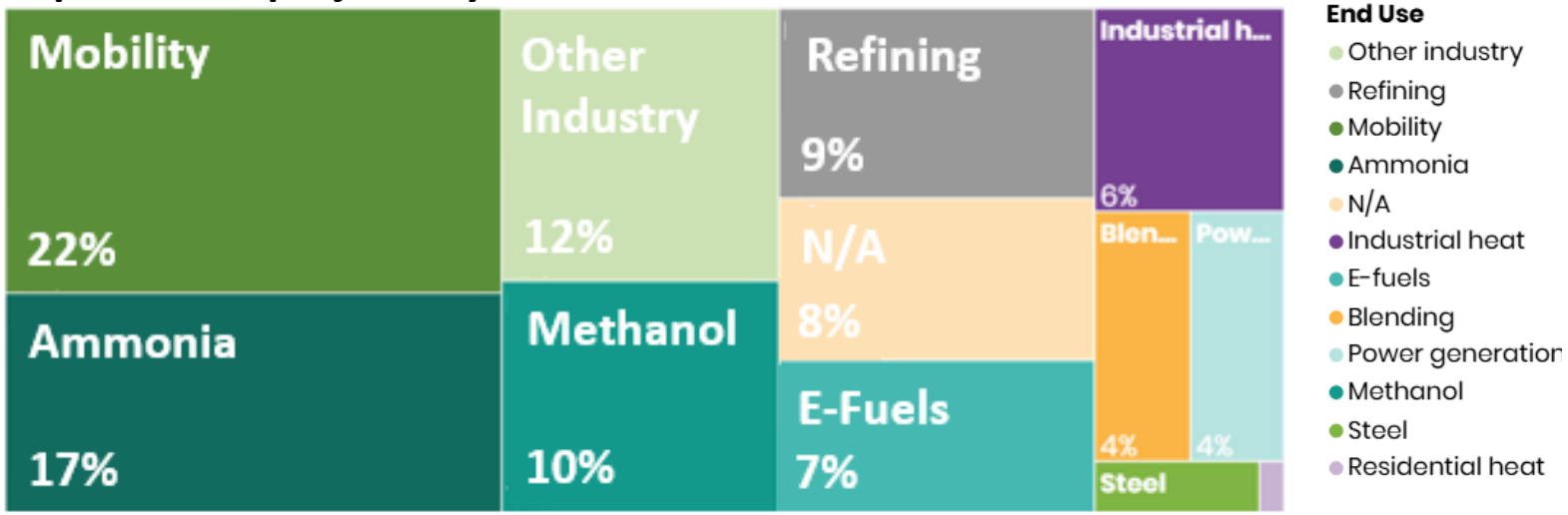
Water electrolysis capacity starting construction /has reached FID in Europe



Operational projects are supporting most applications, with road mobility still dominating the incipient demand

Mobility end-use (22%)
Due to deployment of **HRS** and **small-scale** operational **mobility projects**

Operational projects by end-use

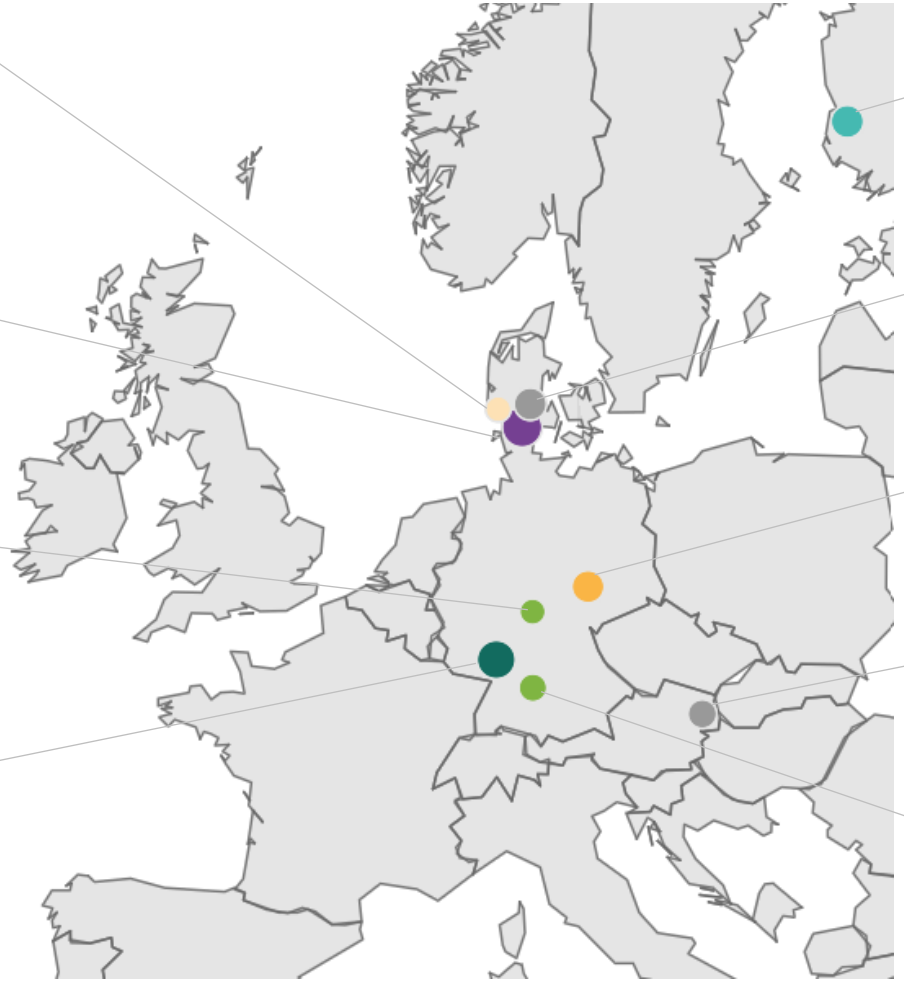


There are over 600 MW_{el} of operational water electrolysis in Europe

23 new projects came into operation in 2025, totalling new 225 MW_{el}

Project bigger than 5 MW_{el} that started operation in 2025.

Methanol · Ammonia · Refining · E-fuels · Other industry · Mobility · N/A



E-methanol Kasso | European Energy
52.5 MW_{el}
Methanol
Support: National DGIF

Made phase 2 | European Energy
3+5 MW_{el}
N/A
Support: National PtX tender

Hunfeld-Michelsrombach | ABO Energy
5 MW_{el}
Mobility
Support: National

Hy4Chem | BASF
54 MW_{el}
Ammonia & other industry
Support: National

P2X Harjavalta | P2X Solutions
20 MW_{el}
E-fuels
Support: National

HySynergy | Everfuel
20 MW_{el}
Refining
Support: National PtX tender

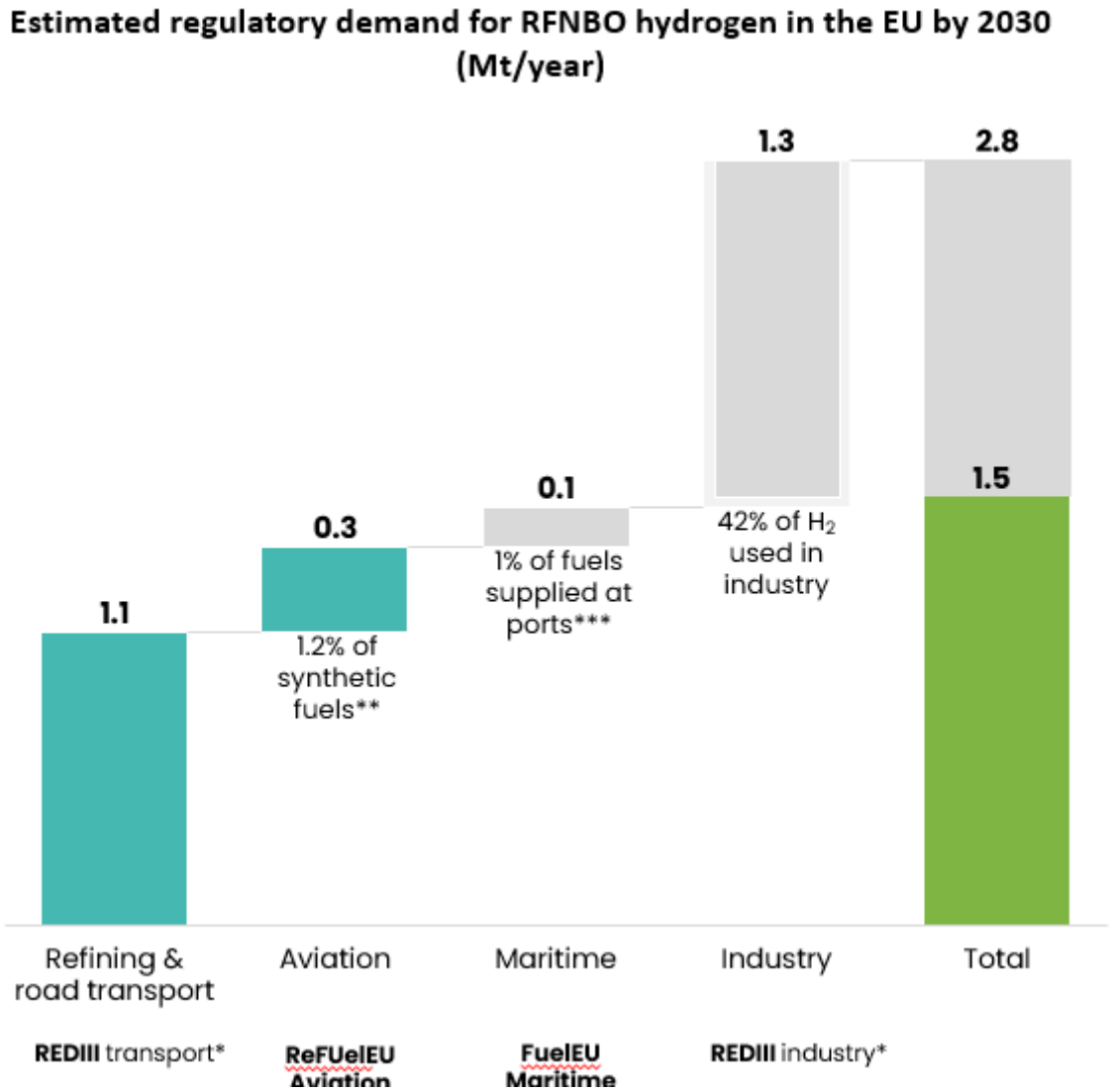
Leuna Chemical Complex | Linde
24 MW_{el}
Other industry
Support: National

Up Hy I and II | OMV
10 MW_{el}
Refining
Support: National

Schwäbisch Gmünd (HyFive) | Lhyfe
10 MW_{el}
Mobility
Support: N/A

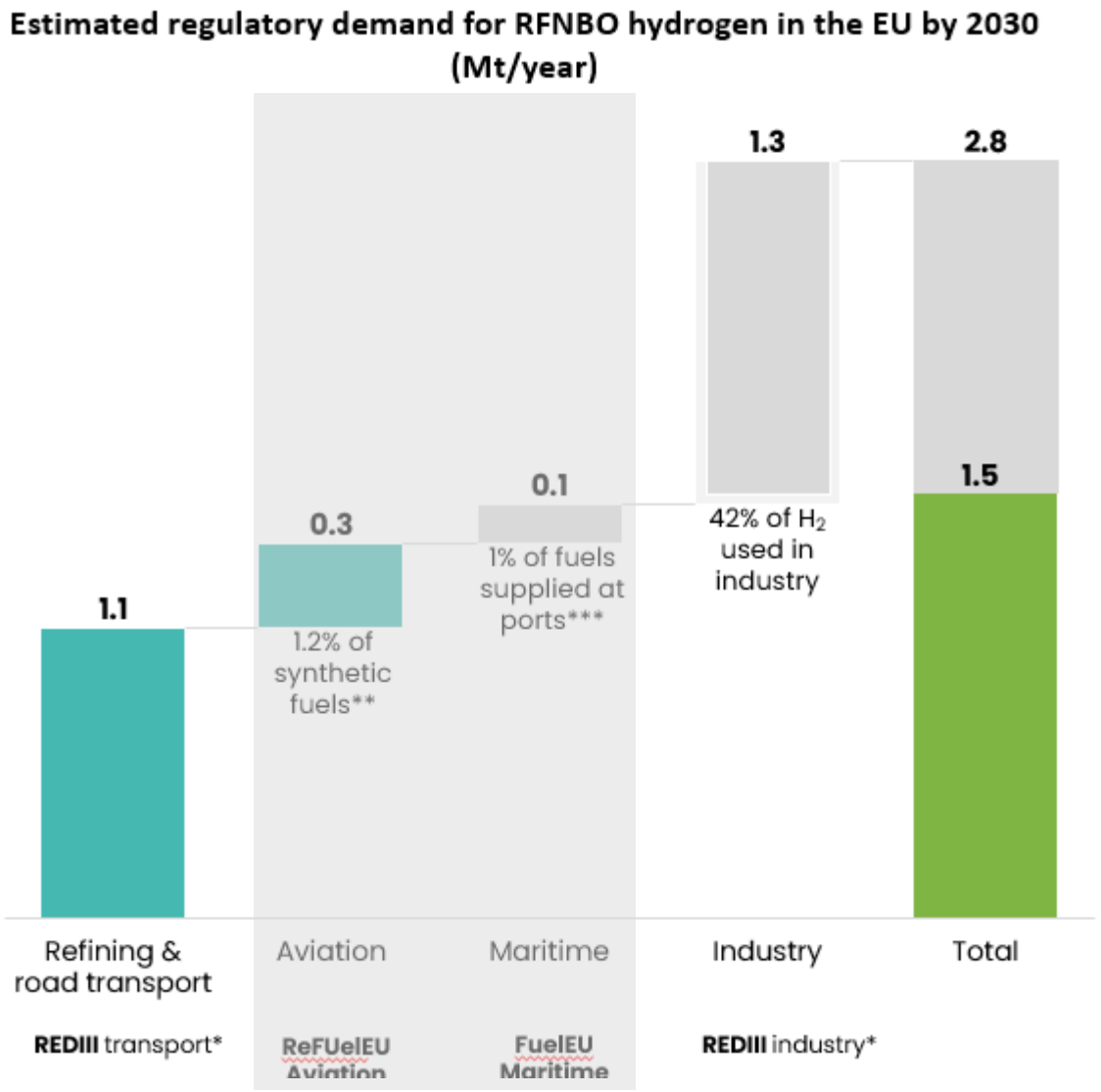
Average project size increased from 3.5 MWel in 2024 to 9.8 MWel in 2025.

Regulation could drive a potential demand of 2.8 Mt of RFNBO by 2030, but depends on national transposition, penalties, and enforcement



Notes: * Use of RFNBOs in refining and other transport estimated based on adopted or proposed REDIII transposition for countries that have done so and assuming 1% RFNBO share in road transport in countries that haven't.** ReFuelEU Aviation requires aviation fuel suppliers to supply at least 1.2% as synthetic aviation fuels, based on renewable and low carbon electrolytic hydrogen.*** The FuelEU Maritime 1% RFNBO share target is non-binding, however as REDIII required MS to take action to reach at least 1.2% share, it is assumed that the FuelEU Maritime objective will be reached.**** The 42% RFNBO share in industry covers both existing hydrogen use in industries such as ammonia or methanol, but also new emerging industrial application for hydrogen i.e., primary steel-making.

Regulation could drive a potential demand of 2.8 Mt of RFNBO by 2030, but depends on national transposition, penalties, and enforcement



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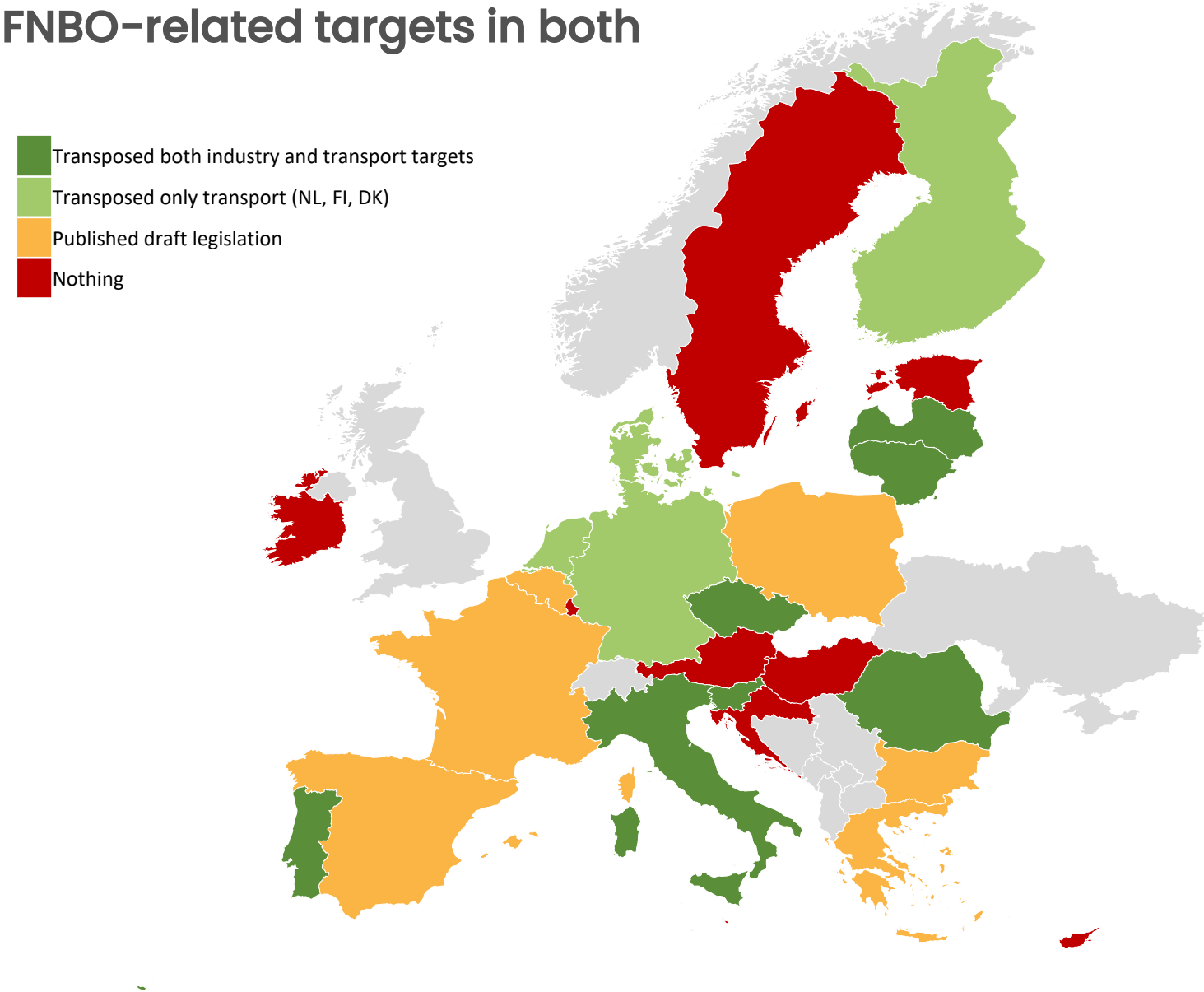
May 2026 REDIII status overview

8 countries have transposed RED3 RFNBO-related targets in both transport and industry

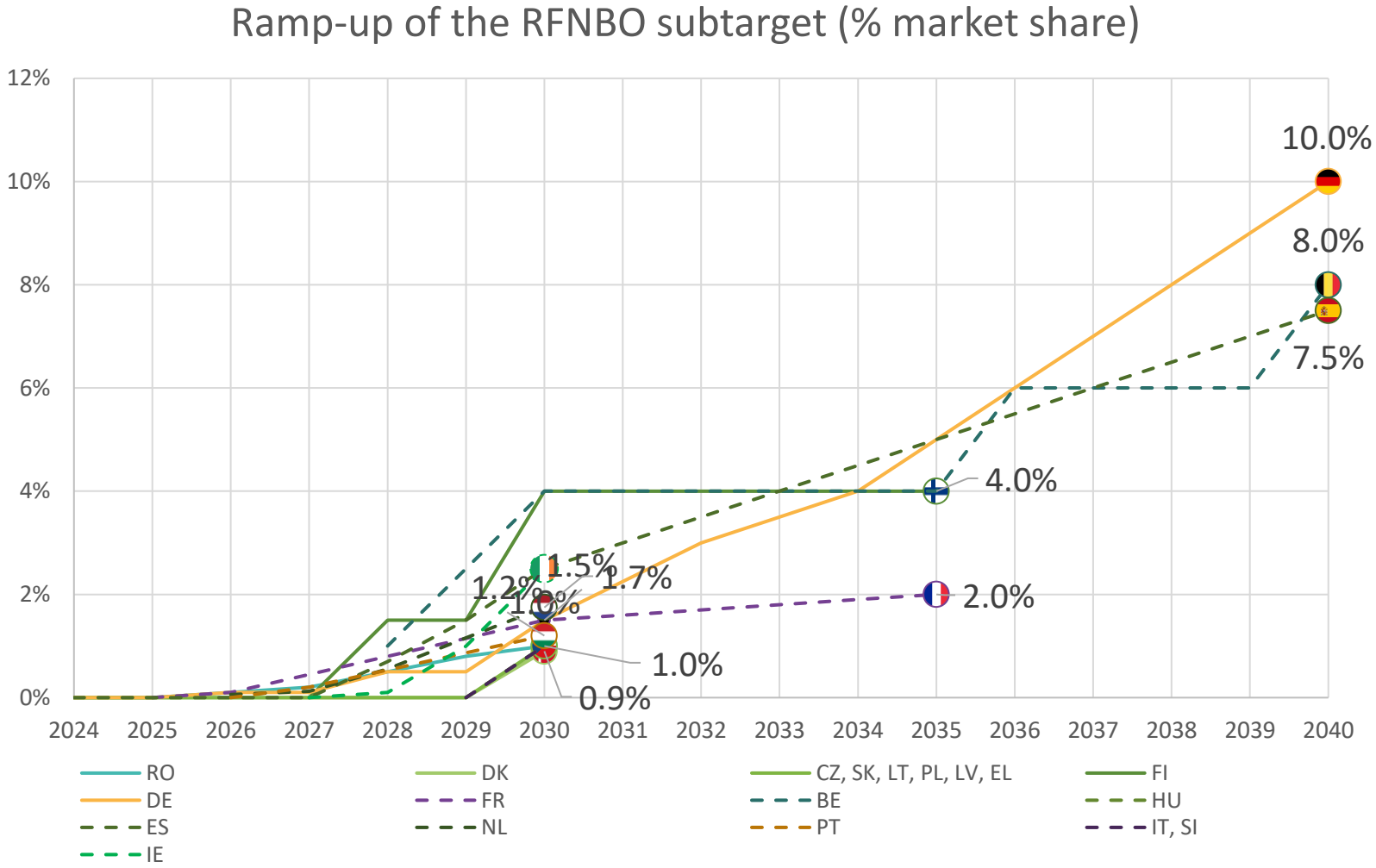
- 8 out of 27 EU MS managed to transpose the RFNBO mandates into law for both transport and industrial use of RFNBOs (RO, CZ, SK, LT, IT, LV, PT, SI)

- Further three countries transposed only the elements linked to the use of RFNBOs in the transport sector (NL + FI + DK)



The RED directive requires MS to propose interim targets in the transport sector before 2030. Some MS are going beyond

- Even though RED3 requires MS to ensure gradual ramp-up of the targets not all MS are doing that:
- **Denmark** doesn't have any obligations before 2030 other than GHG reduction and **CZ, SK, LT** only have interim targets for the combined RFNBO and adv. Biofuels
- **Finland** and **Romania** on the other hand have followed RED3 requirements. In RO those start already in 2026
- This is important as it: (1) creates market certainty for early movers, (2) ensures projects entry into operation before 31.12.2029 and is (3) especially needed for projects aiming to benefit from grandfathering of relaxed additionality rules



* Czechia – has a ramp up only for the combined RFNBO and adv. biofuels subtarget, none for RFNBOs
** Dashed lines – based on a drafts in public consultation or leaks
***Finland – the target is set for „2030 and after"
**** Belgium: showed obligation is for road mobility
***** France: RFNBO subtarget is open for low-carbon fuels (no more than 0.8% starting from 2030)

Conventional hydrogen production in Europe

Majority of hydrogen production is centered in industrial clusters

Location of conventional hydrogen production sites today

2024 figures:

- 11.5 MTons production capacity
- 80% captive reforming
- 10% merchant reforming

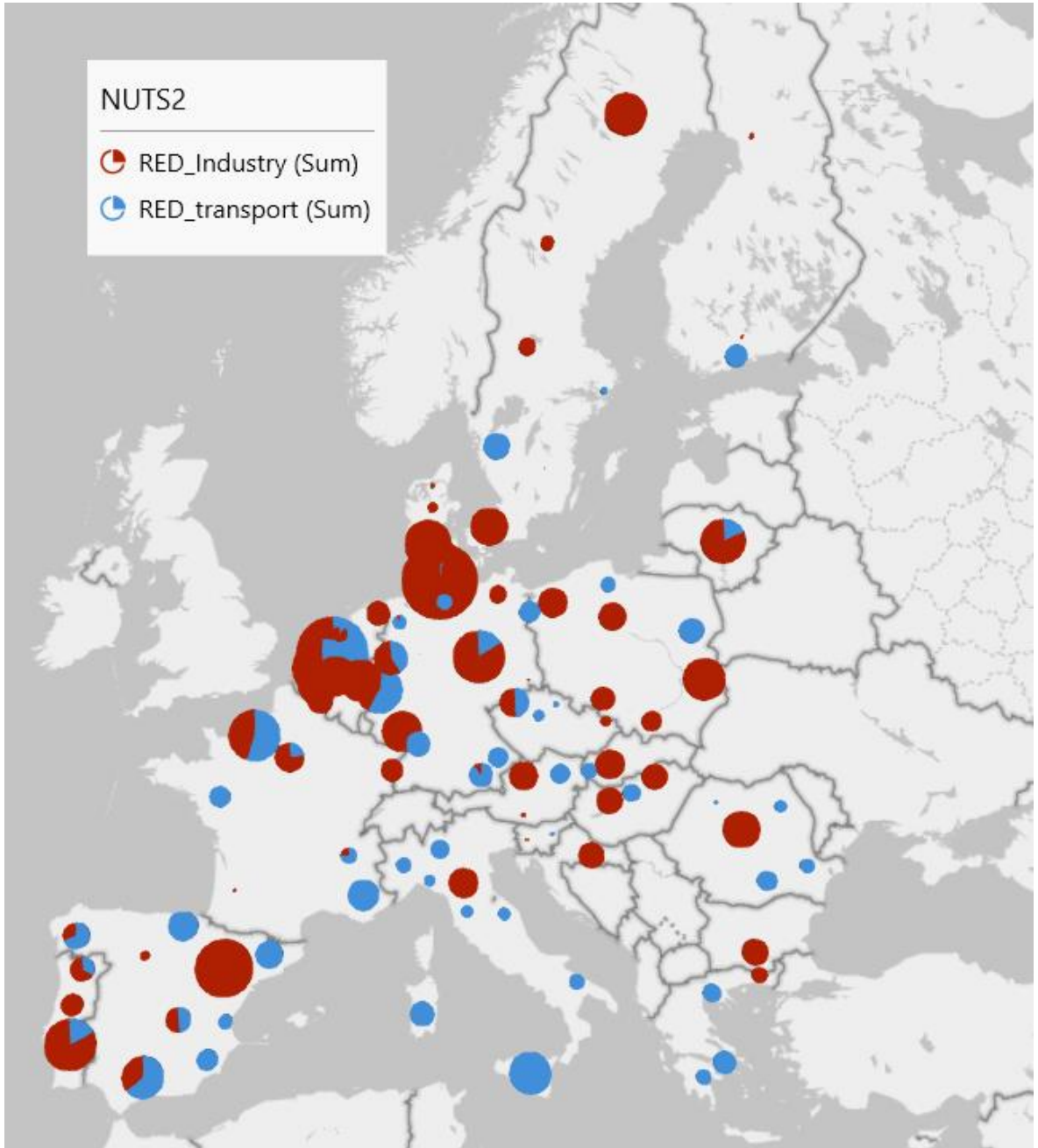
Captive reforming | Merchant reforming | By-product (ethylene, styrene) | By-product (electrolysis)

Source: Hydrogen Europe, 2024

Reforming category includes SMR, ATR, partial oxidation, refining off gases.

RED III Targets: hydrogen demand outlook to 2030

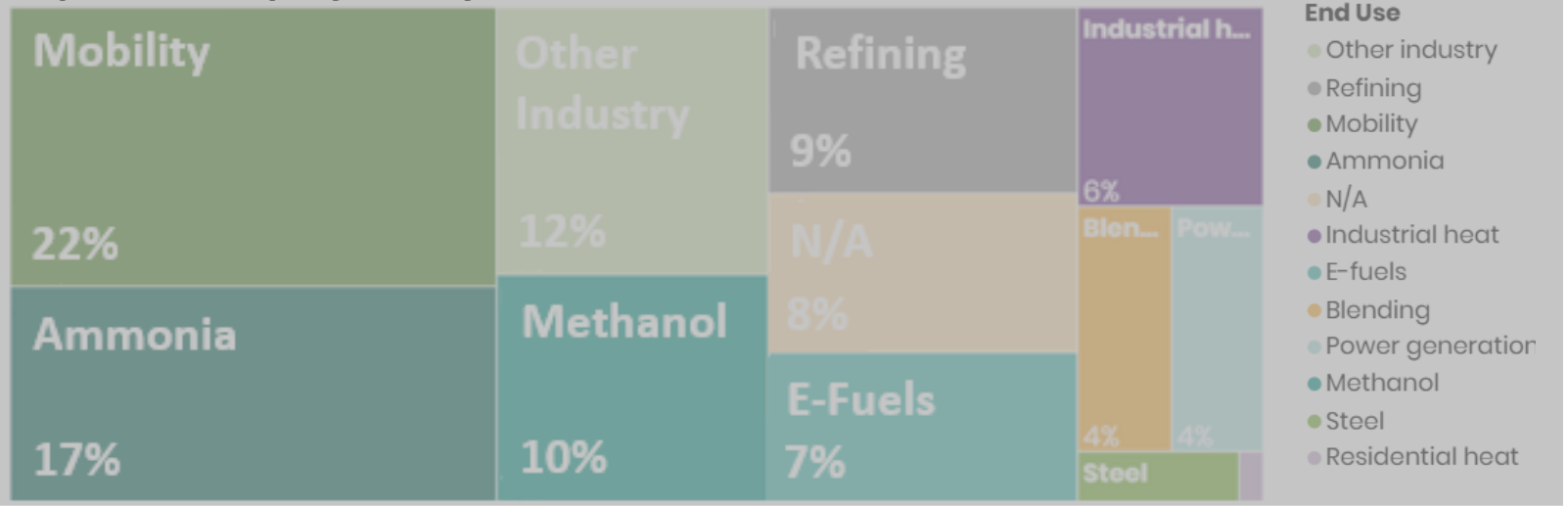
Estimated geographical distribution of RED III demand for H2 by NUTS2 regions



Refining accounts for half of the electrolytic projects that have reached FID

Mobility end-use (22%)
Due to deployment of **HRS** and **small-scale** operational **mobility projects**

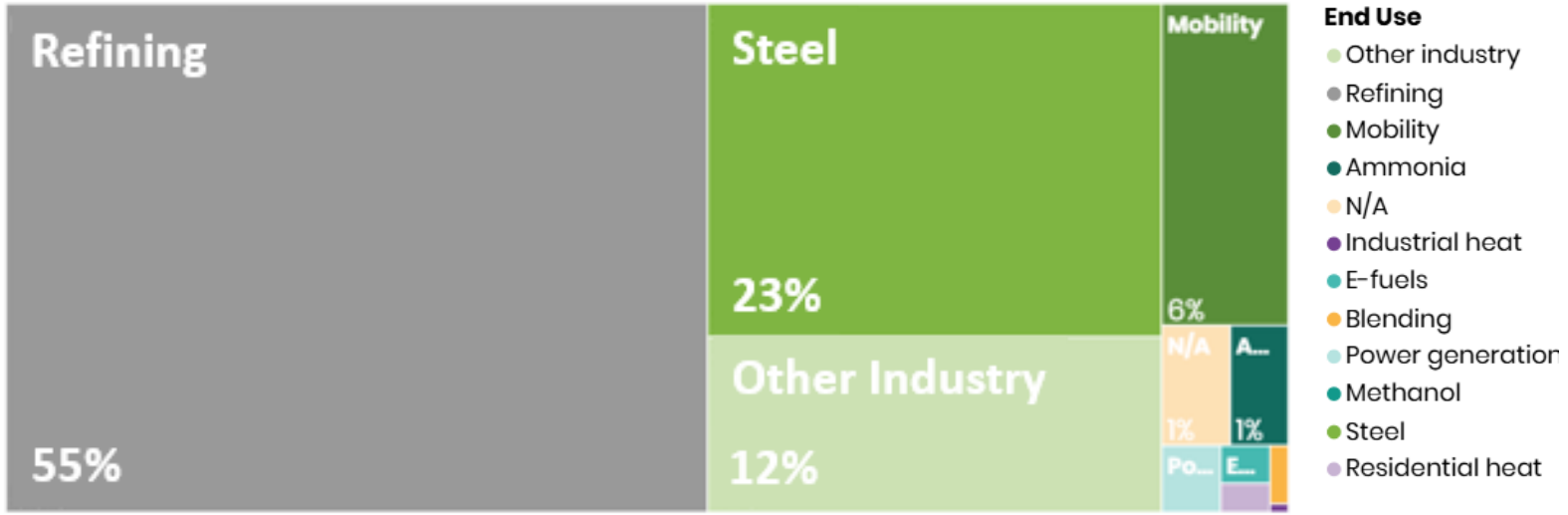
Operational projects by end-use



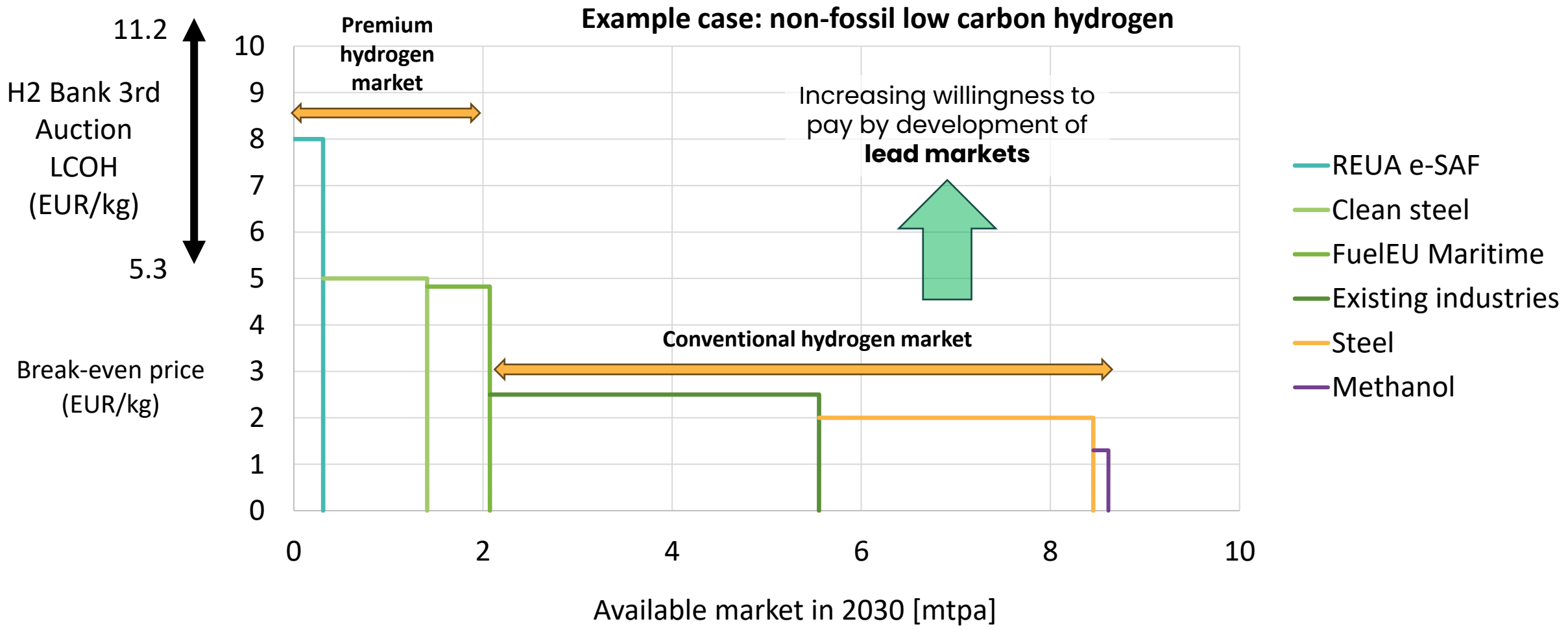
Refining end-use (55%)
driven by REDIII

Steel end-use (23%)
due to large-scale projects such as H2 Green Steel and Salcos

Construction projects by end-use



Price premium created by the existing policies can be significant – but varies depending on the hydrogen certificate



Demand activation through lead markets closes the gap between conventional hydrogen break-even prices and RFNBO LCOH

Fertilisers

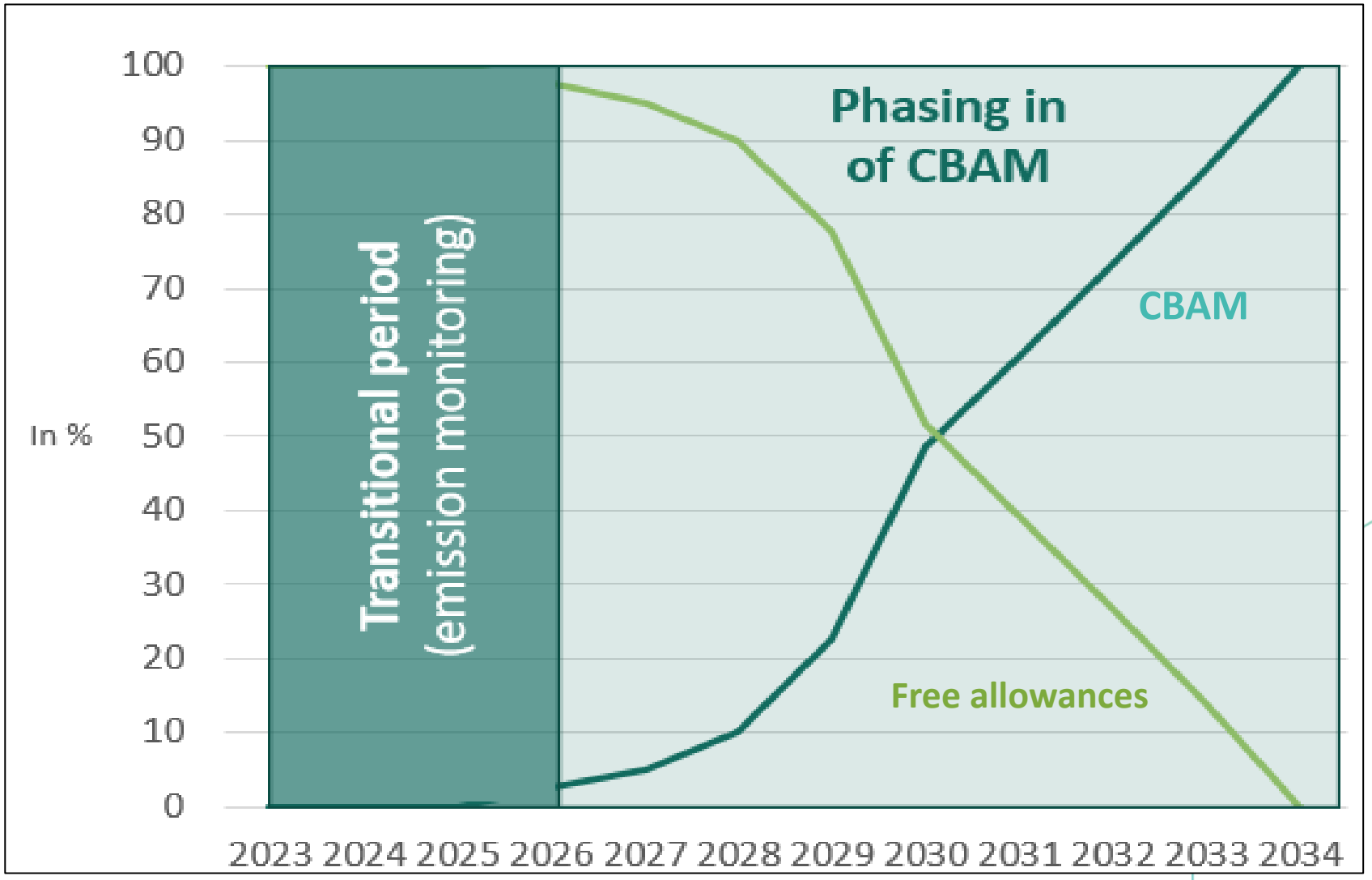
Chemicals

Steel

Tools for lead markets

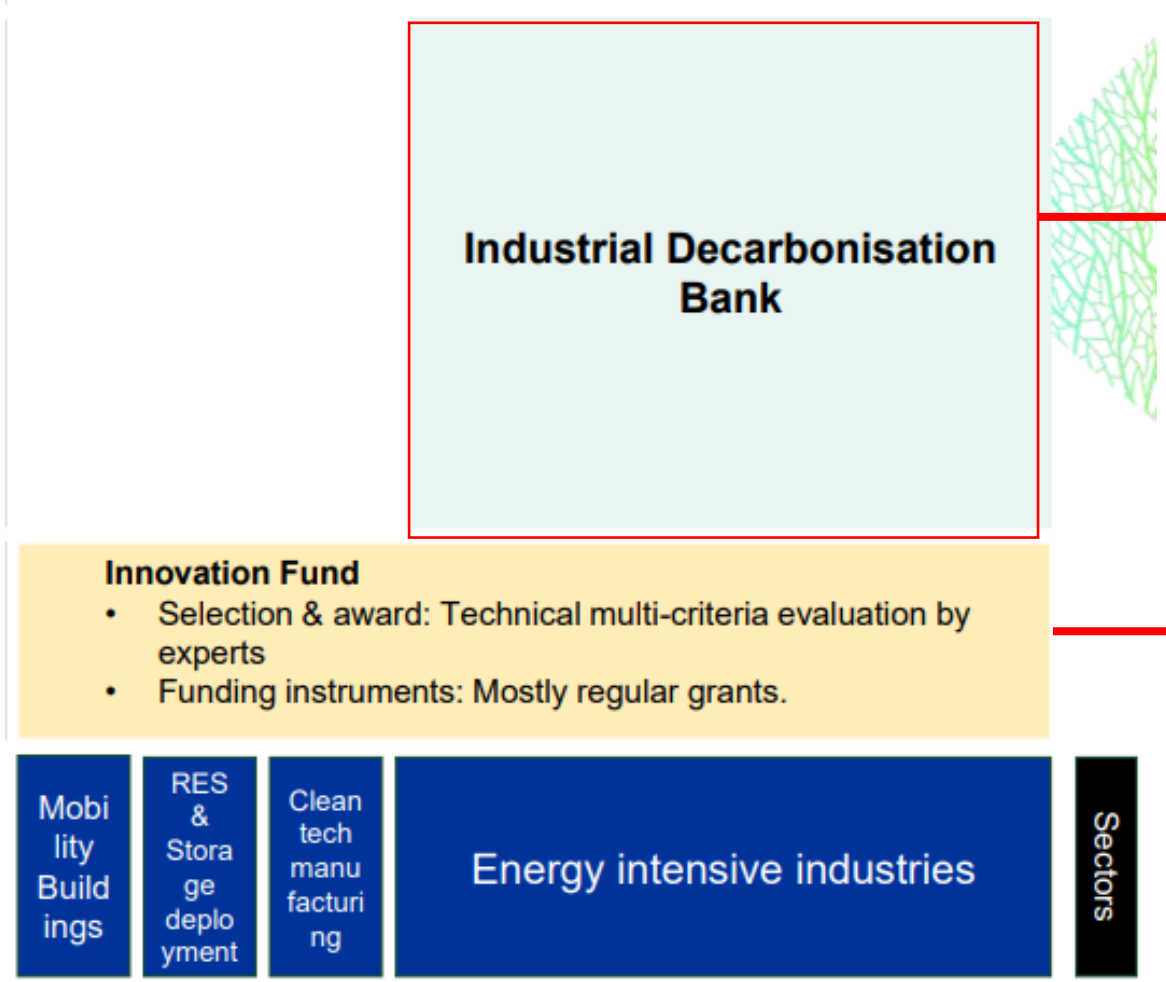
1 - Carbon footprint **labels** for consumer products
2 - **Supply Incentives** (CO2 tax, subsidies, production quotas like in RED3
3 - **Demand Incentives** (Obligations down the supply chain for clean products

Although CO_2 pricing is likely to send gradual signals, regulatory uncertainty and sudden changes to CBAM (Article 27a) could have negative impacts



Industrial Decarbonisation Bank (IDB) opportunity to close the price gap and process

Set-up of EU funding from the EU ETS



Role of the IDB: deploy mature technologies and address commercial risks → reduce premium of electrolytic hydrogen

- IDB will be set-up in two-phases:
  Phase 1: Investment Booster
  Phase 2: CCfDs

Role of Innovation Fund: stay in place to support First-of-a-kind projects & innovative technologies to address technical and deployment risks

Takeaways

- There is positive momentum driven by ongoing project development and the implementation of legislation, with a strong focus on resilience and the protection of European industry
- While several flagship projects are underway, demand remains limited, due to high production costs and international competitive environment
- CO2 pricing could gradually provide a positive signal, but regulatory changes and uncertainty are negatively affecting demand creation and price reduction
- Lead markets increase willingness to pay, with the IAA and the fertilizer action plan providing a strong example of the way forward
- The IDB is a strong funding platform that can help bridge the gap between the LCOH and the break-even price

Thank You

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The Industrial Decarbonisation Bank - process

Phase 1: Investment Booster

	Budget: 400 million allowances (EUR 30 bn with 75 EUR/t carbon price)
	Works with 'First-come, first-served' administrative schemes (to a certain price to reach financial close)
	• Create a compelling business case • Light eligibility check, no award criteria (simplified evaluation) • Competition on speed rather than price • Submissions on a rolling basis • Completion bond and payment upon verified emission reductions • Solidarity
	Focus on speed; important to have project ready to be able to bid to reach financial close

Stakeholder consultation in Q3 2026

Phase 2: IDB

	Budget: 70 bn EUR ?? (it is supposed to be 100 bn EUR, including the Investment Booster)
	Roll out CCfDs as an instrument to lock-in a certain carbon price level providing certainty for investments

	• Work with competitive bidding
	  • Maintain a solid business case by income stabilisation with 'for difference' payments
	  • Price-based auctions for greater efficiency
	  • Perfect sizing of subsidies, as auctions reveal the true subsidy need
	  • Completion bond and payment upon verified emission reduction

	Focus on competitive bidding

European Energy Kasso e-methanol

Kasso, Denmark

Project scope: European Energy Kasso plant is the EU's first large-scale e-methanol production site, utilises a 52.5 MW_{el} Siemens Energy PEM electrolyser to produce hydrogen, which is then combined with biogenic CO2 to synthesise e-methanol. It was officially open in May 2025.

Partners

Developer: European Energy

EPC Contractor: N/A

Offtaker: LEGO, Novo Nordisk, Moller-Maersk

OEM: Siemens Energy

Technology and capacity

ELY technology: PEM

ELY capacity (MW_{el}): 52.5

H2 production (tonnes/year): 6,204

Funding

Source (public): Public (DGIF)

Amount (public): €53m

Investment amount: €150m

Hydrogen Europe

Production type

Water electrolysis

Status

Operational

End-use

Methanol

2021 — Project announced

Under construction/FID — **2023**

2025 — **Project Started Q2 2025**

BASF Hy4Chem

Ludwigshafen, Germany

Project scope: BASF Hy4CHEM utilises a 54 MW_{el} Siemens Energy PEM electrolyser to produce hydrogen, which is primarily used to decarbonise its chemical production process, and a small portion is planned to go to mobility. It was officially open in May 2025.

Partners

Developer: BASF

EPC Contractor: N/A

Offtaker: BASF

OEM: Siemens Energy

Technology and capacity

ELY technology: PEM

ELY capacity (MW_{el}): 54

H2 production (tonnes/year): 8,000

Funding

Source (public): IPCEI

Amount (public): €124m

Investment amount: €150m

Hydrogen Europe

Production type

Water electrolysis

Status

Operational

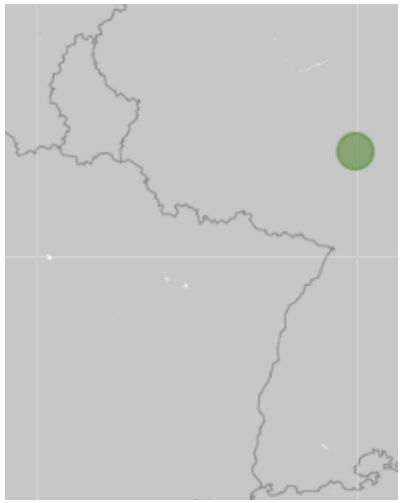
End-use

Ammonia, other industry, mobility

2022 — Project announced

Under construction/FID — **2023**

2025 — **Project Started Q1 2025**



Regulation Node: Clean hydrogen in the chemical industry

From energy carrier to industrial feedstock

Nicolai Romanowski
Senior Energy Manager
Cefic

The chemical industry: a pillar of the European economy

- The chemical industry is the **4th largest** producer in EU manufacturing
- Europe is the **2nd largest** chemical producer in the world
- **15%** of world's chemical production stems from Europe
- **20 million jobs** (1.2m direct, 19m indirect across supply chains)
- Facing one of its most severe crises, with a projected 20% drop in production capacity—ten times the historical average.
- Our essential materials are contained in **95% of all manufactured goods**
- Downstream **users of gas molecules** from the chemical industry *(few examples)*

Fertilizers

Active Pharmaceutical Ingredients

Façade walls

(Strength, UV protection, transparency…)

Curious what your life would be like without chemistry?

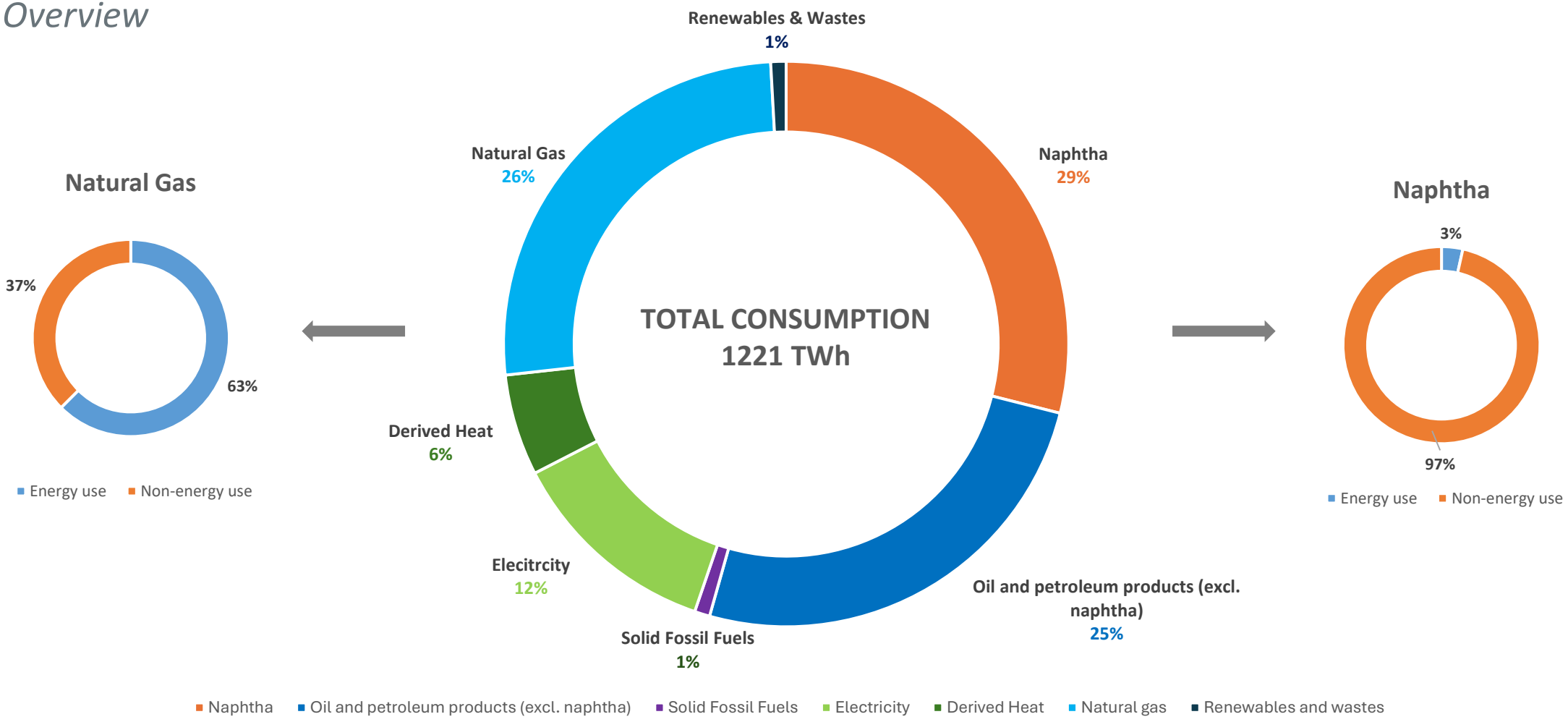
Check this out !!!

👇👇👇

(link)

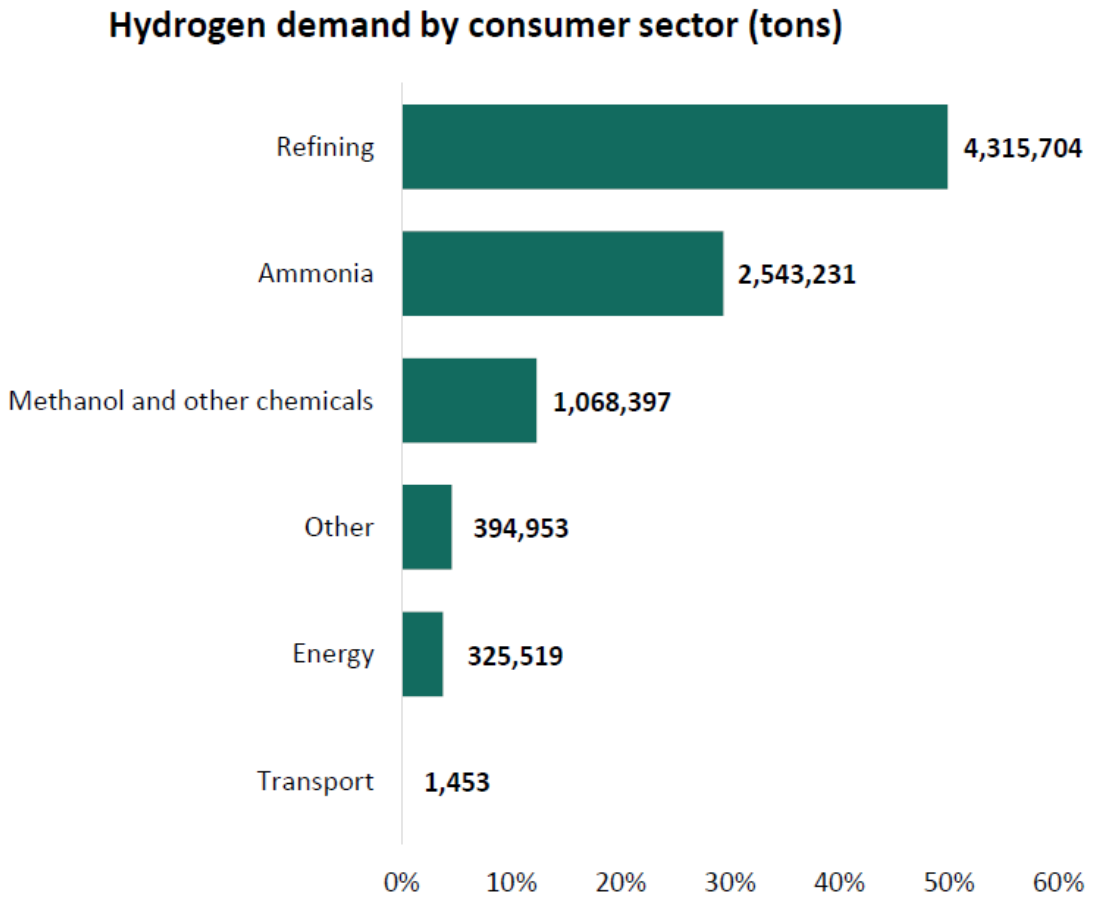
Energy & Feedstock Consumption in the Chemical Industry (2024)

Overview



H2 Consumption by End-use Sector

Overview



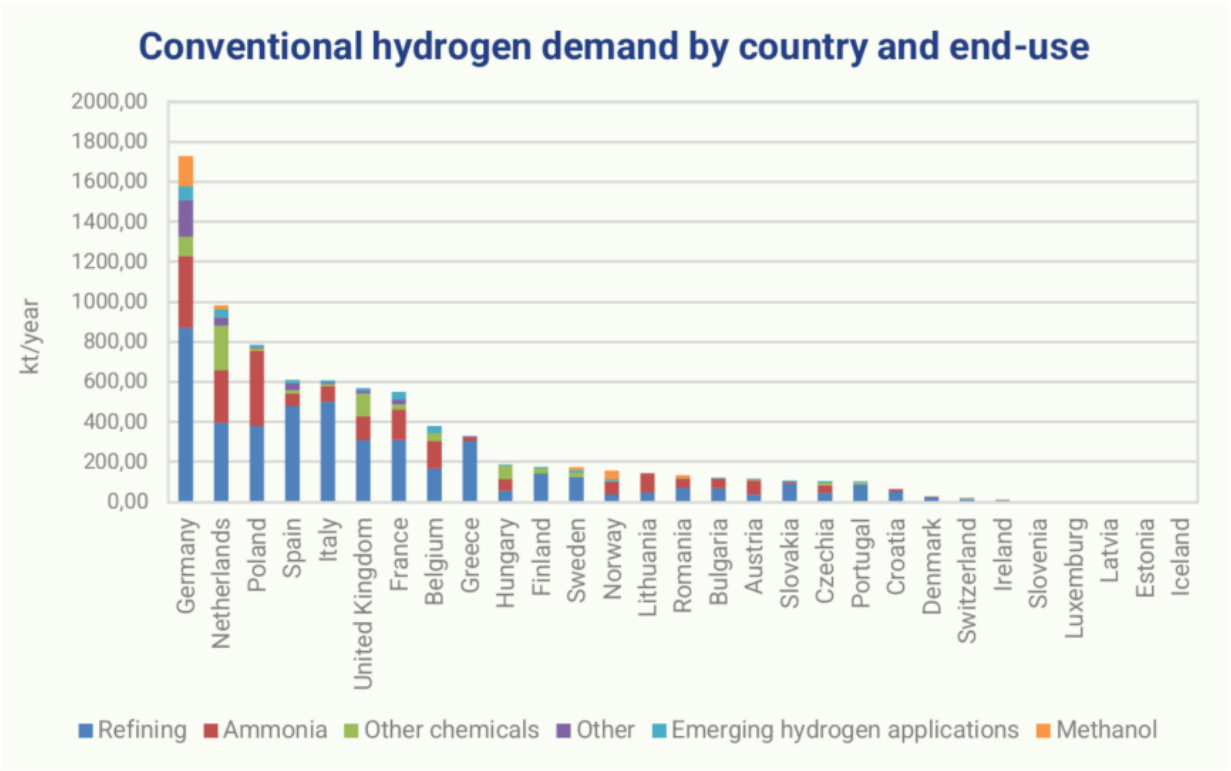
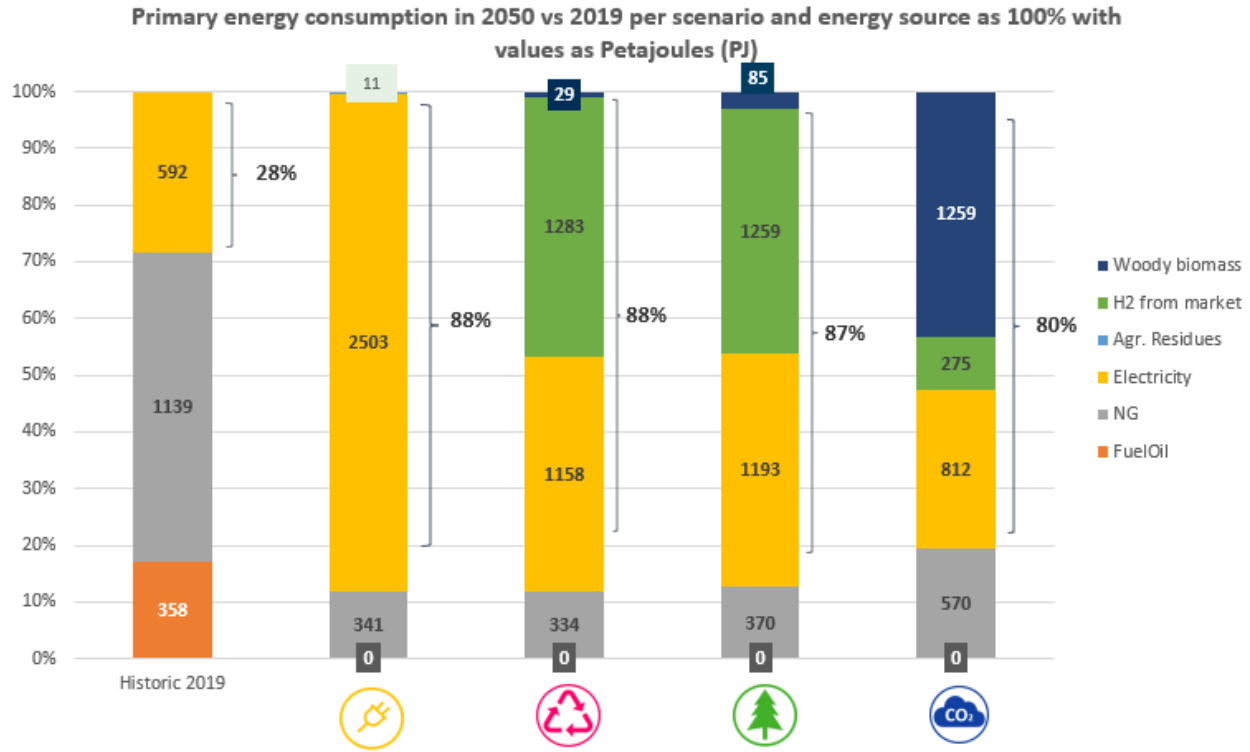


Figure 31.Conventional hydrogen demand by country and end-use

Source: Fuel Cells and Hydrogen Observatory

Chemical Industry Decarbonisation Pathways

iC2050 Study



- No clear energy vector for heat emerges. Hydrogen is favoured when the electricity mix decarbonised and the hydrogen is **available at competitive cost.**
- Techno-economic limitations for electrifying high-heat applications (>500 degrees) exist – complementarity with other energy carriers is necessary (biomass, hydrogen,…)

Source: Cefic iC2050 Model

Hydrogen in the Chemical Industry – Regulatory drivers

RED III Targets

- **RED III mandates on hydrogen use in industry are intended to drive substitution from fossil-based reforming to renewable electrolytic hydrogen – but struggle to take off.**
  - The cost gap between renewable and fossil-based hydrogen remains high and cannot be bridged by carbon pricing alone. Subsidy volumes can help but are naturally limited.
  - High production costs and a lack of end-use demand undermine the hydrogen mandates in industry.

- **Short-term: Address regulatory cost drivers of hydrogen production/ consumption.**
  - Common sense changes to the production criteria of renewable hydrogen lower supply-costs.
  - Ending the cannibalisation between renewable and low-carbon pathways lowers the cost of decarbonisation.

- **Medium-term: End-use demand creation is the core to building an industrial business case.**
  - Up-coming report from the Critical Chemical Alliance will outline options, but it is clear that the complexity of the matter will take time to address – and vary between end-use sectors.

Hydrogen in the Chemical Industry – Non-regulatory drivers

H2 Quality Standard

- **Feedstock use dominates the hydrogen consumption in our sector – and is highly sensitive to even low concentrations of contaminants.**
  - Chemical processes which consume hydrogen produce, amongst others, aniline, butanol, butanediol (BDO), hydrogen-peroxide, propylene-oxide and polyethylene, alcohols, solvents and ammonia….
  - **In anticipation of the up-coming standardisation request on hydrogen quality:** Mismatching hydrogen quality needs between end-users and the standard set in the backbone necessitates on-site purification – the resulting costs and permitting implications may well deter consumers from connecting to the backbone.

- **The purity standard the EU sets ought to guide investments and avoid stranded assets.**
  - A successive upgrading of standards risks investments in stranded assets for purification that can be avoided by setting a single, high level of purity in the backbone.
  - Adopt a minimum hydrogen purity standard of ≥ 99.9 mol-% (at the exit point) in the EU hydrogen backbone to facilitate the development of the EU hydrogen economy.

Thank you

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About Cefic

Cefic, the European Chemical Industry Council, founded in 1972, is the voice of large, medium and small chemical companies across Europe, which provide 1.2 million jobs and account for 15% of world chemicals production. Cefic members form one of the most active networks of the business community, complemented by partnerships with industry associations representing various sectors in the value chain. A full list of our members is available on the Cefic website.

Cefic is an active member of the International Council of Chemical Associations (ICCA), which represents chemical manufacturers and producers all over the world and seeks to strengthen existing cooperation with global organisations such as UNEP and the OECD to improve chemicals management worldwide

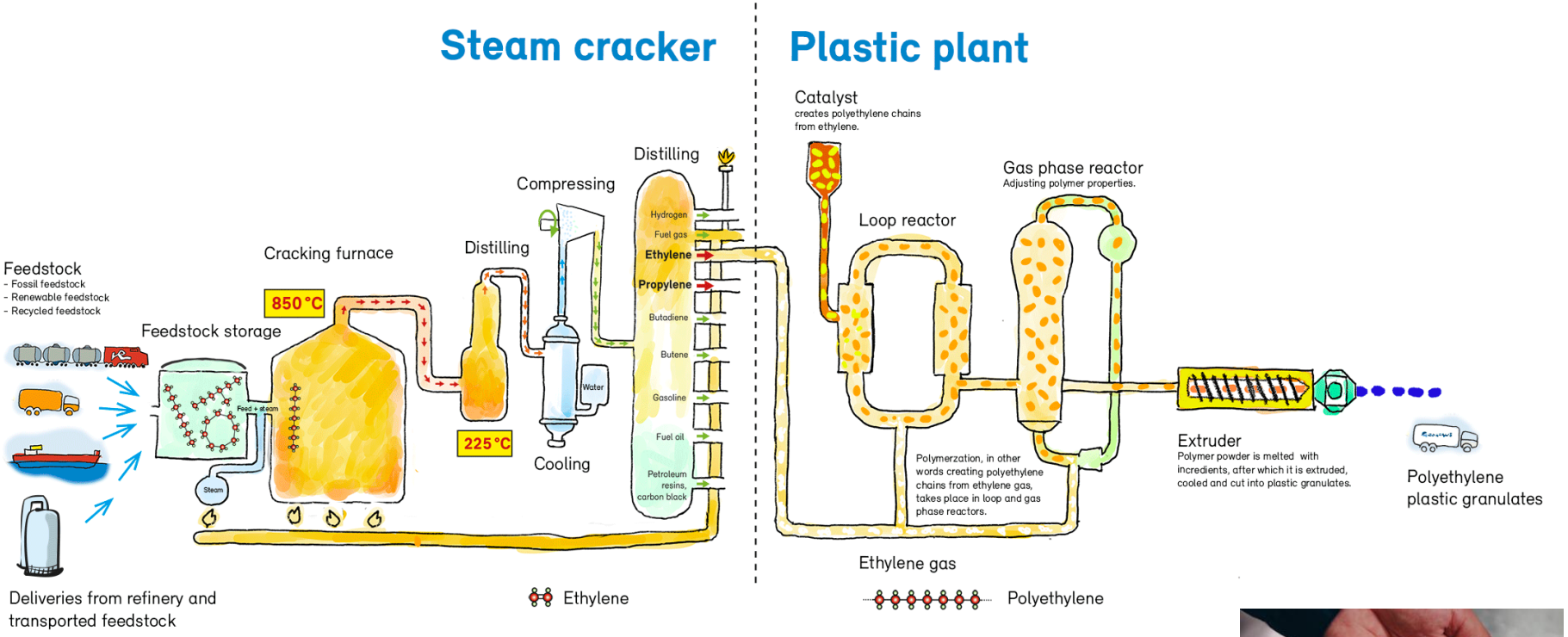
2.6.2026

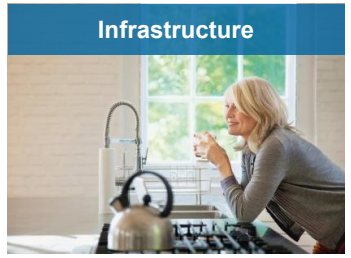
BOROUGE INTERNATIONAL

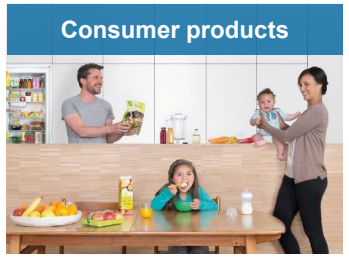
Clean hydrogen in chemical industry
Commentary view

Hydrogen’s role in polyolefins manufacturing

What are polyolefins?





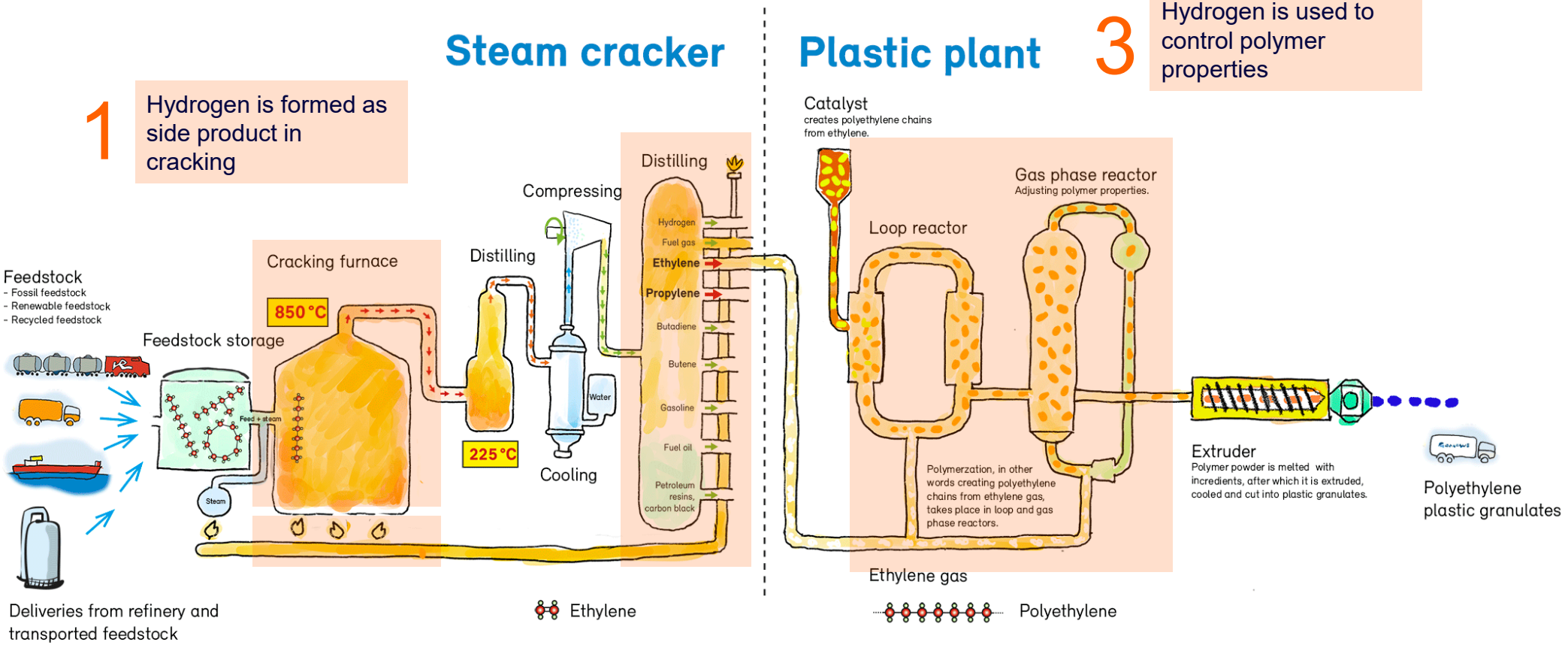


Role of hydrogen today

2 Hydrogen is used internally to remove impurities

3 Hydrogen is used to control polymer properties

1 Hydrogen is formed as side product in cracking



4 Remaining hydrogen is used as CO_2 neutral fuel or exported.

Role of hydrogen in the future

Feedstock processing

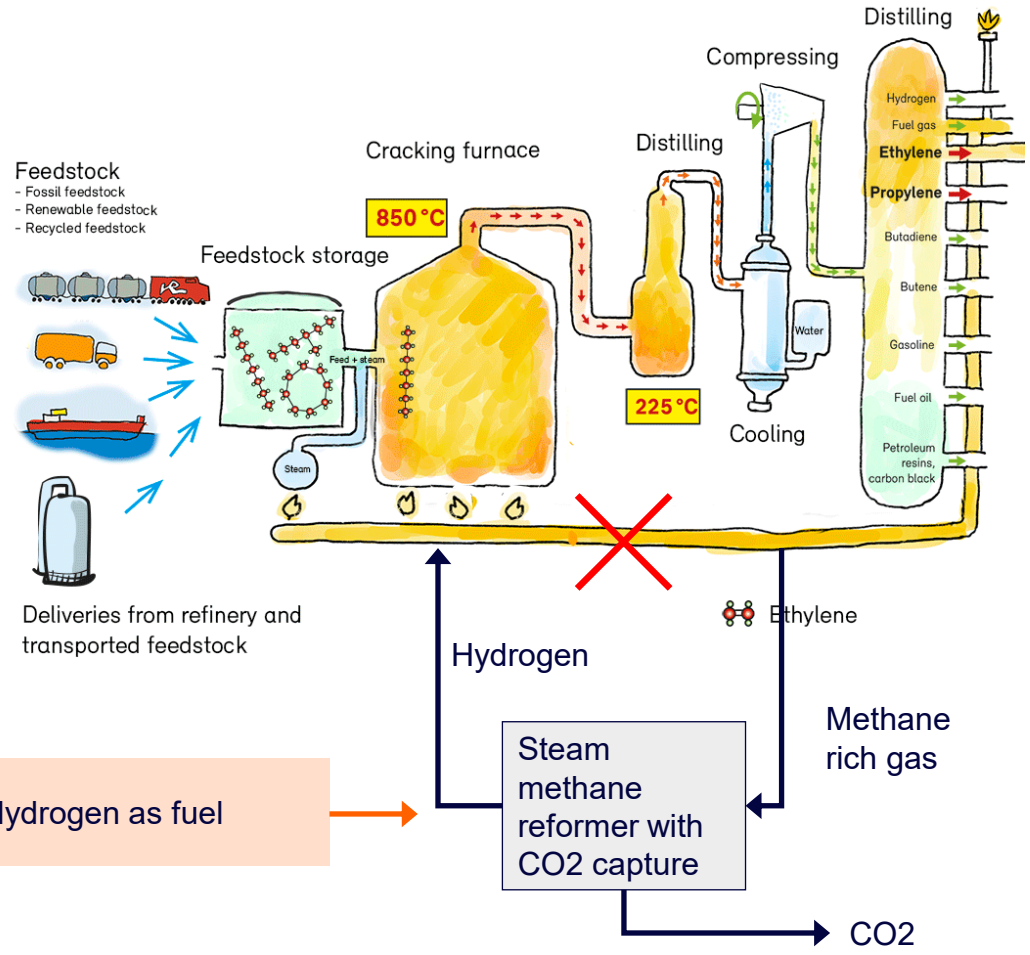
1 Processing of **renewable** feedstock

2 Processing of **circular** (chemically recycled) feedstock

3 Processing of **synthetic** (Fischer-Tropsch) feedstock

Processing of **methanol** feedstock

Steam cracker



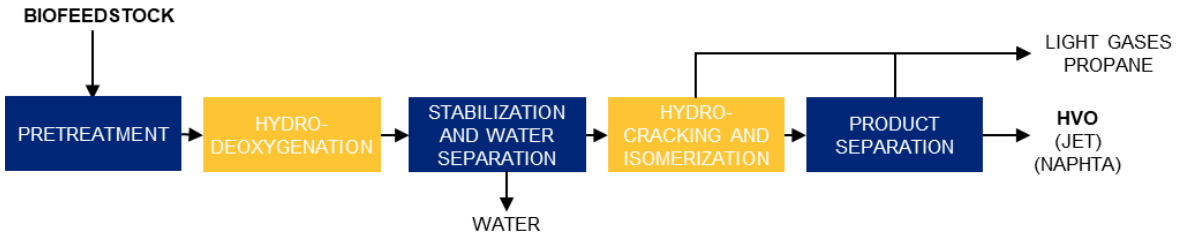
4 Hydrogen as fuel

Hydrogen demand

Hydrogen demand
t of H2 / t of cracker feed

Hydrogen demand
To cover all European ethylene production

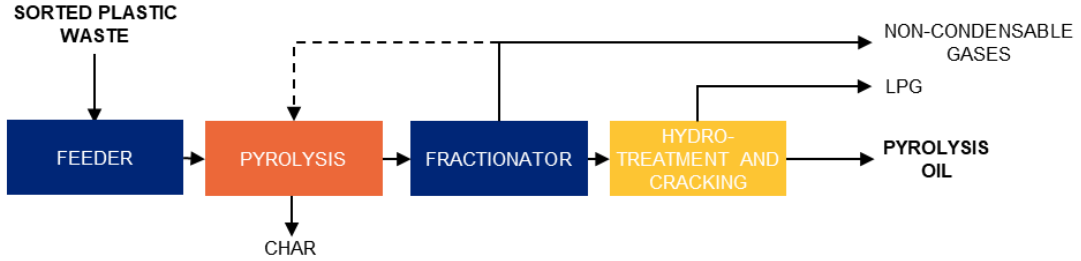
1 Processing of **renewable** feedstock



H2 demand
4 %

2060 kt/a

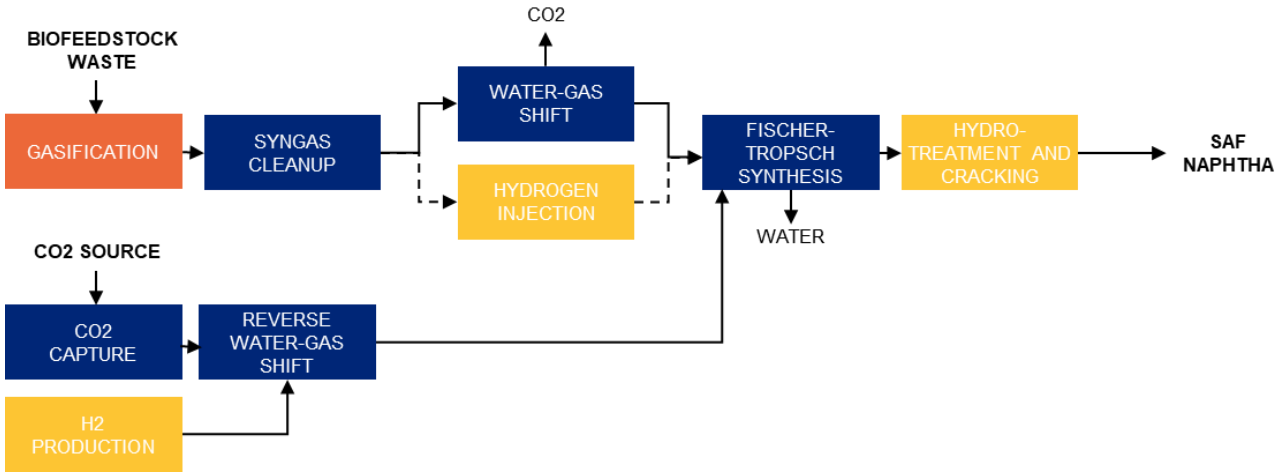
2 Processing of **circular** (chemically recycled) feedstock



H2 demand
3 %

1550 kt/a

3 Processing of **synthetic** (Fischer-Tropsch) feedstock



H2 demand
WGS 4 %
Injection 21 %
CO2 based 57 %

2060 kt/a
10820 kt/a
29350 kt/a

Conclusions

1 Transport fuels set the demand and pricing renewables

Transport fuels have mandated uses (SAF, HVO) which also impact the pricing of chemical feedstock.

Chemical industry can however benefit from transport fuel production as alternative outlet for the products or by utilizing side products (e.g. naphtha fraction).

2 Regulation outlook unclear

The usage of renewable feedstock is currently fully voluntary; the regulation outlook is scattered but there are several application areas where regulations to use renewables or materials with proven GHG reduction is being developed

Packaging and packaging waste regulation (PPWR) will require an increased share of post-consumer plastics. Chemical recycling of plastics will require hydrogen, but there are no direct requirements for the type of hydrogen used.

3 Outlook for hydrogen

Hydrogen is an expensive raw material. Low carbon hydrogen even more expensive.

Chemical industry side product hydrogen should ideally get a recognition as recycled carbon.

Chemical recycling and processing or renewables increase demand for hydrogen, but the impact is rather limited.

Synthetic feeds (Fischer-Tropsch naphtha, methanol) require massive amounts of hydrogen. There the cost of hydrogen is critical: gasification routes favored due to lower hydrogen demand. Steam reforming with CO2 capture likely solution for high hydrogen demand applications.

Hydrogen is the catalyst
Circularity is the goal

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HiWHyV – High Coast to West Coast Hydrogen Valley

What we learn when trying to implement hydrogen ecosystems in practice

Anna Sager, RISE Research Institutes of Sweden

June 2nd 2026

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From Policy Ambition to Industrial Reality

"Hydrogen deployment requires coordination across sectors, value chains and stakeholders to shape a sustainable future."

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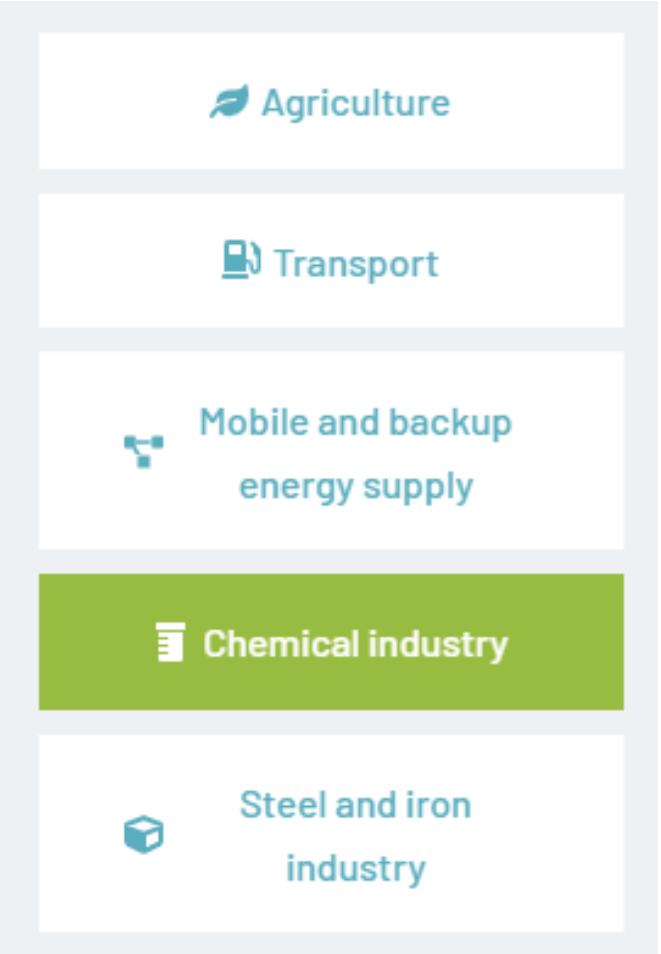
Hydrogen Is More Than an Energy Carrier

- Hydrogen as:
  - Industrial feedstock (ammonia, methanol, chemicals)
  - Energy carrier
  - System integration tool

- Key message:
  - Hydrogen is industrial infrastructure.



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The Real Barriers We See

- Technology is not the main barrier.

- Challenges:
  - Investment uncertainty
  - Infrastructure timing
  - Permitting processes
  - Skills and workforce
  - Demand creation and off-take

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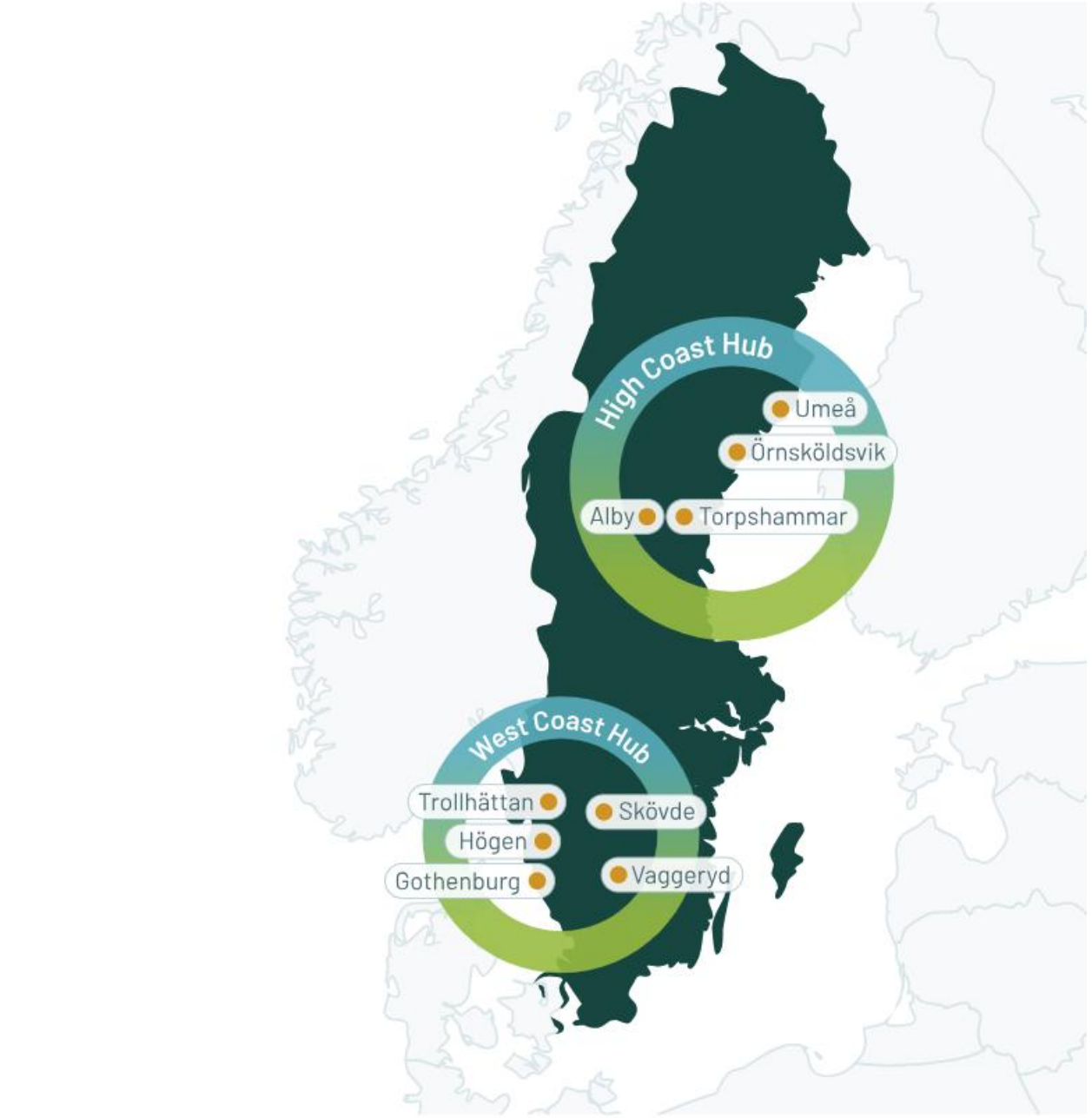
The HiWhyV project combines two vastly different, but important Swedish hydrogen areas. Focus is on mutual development, learning, communication and dissemination



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High Coast to West Coast Hydrogen Valley

Period: 2026–2031

Partners: 45 from 4 countries

Funding: €19.8 million (Lump Sum)

Programme & call: Horizon Europe – Clean Hydrogen JU

Coordinator: RISE Research Institutes of Sweden

Geography: Sweden with EU replication potential

Overall objective: To establish and scale a dual hydrogen valley integrating renewable hydrogen production, system integration, and end-use applications.

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High coast

- Industrial applications > 100 MW scale
- Land to build on and green CO_2.
- Early movers –> need to learn as they go. Increase efficiency, lower costs and find efficient business models
- Need for education and competence
- Need for investments in infrastructure

West coast

- Currently largest demand in Sweden (more than 90% of use)
- Hydrogen is a key in ensuring competitiveness and sustainability
- High cost and lack of power limits scale of investments ~10 MW, mainly focus on transport sector or smaller industry
- There is know-how, tech. development, work force and industrial infrastructure

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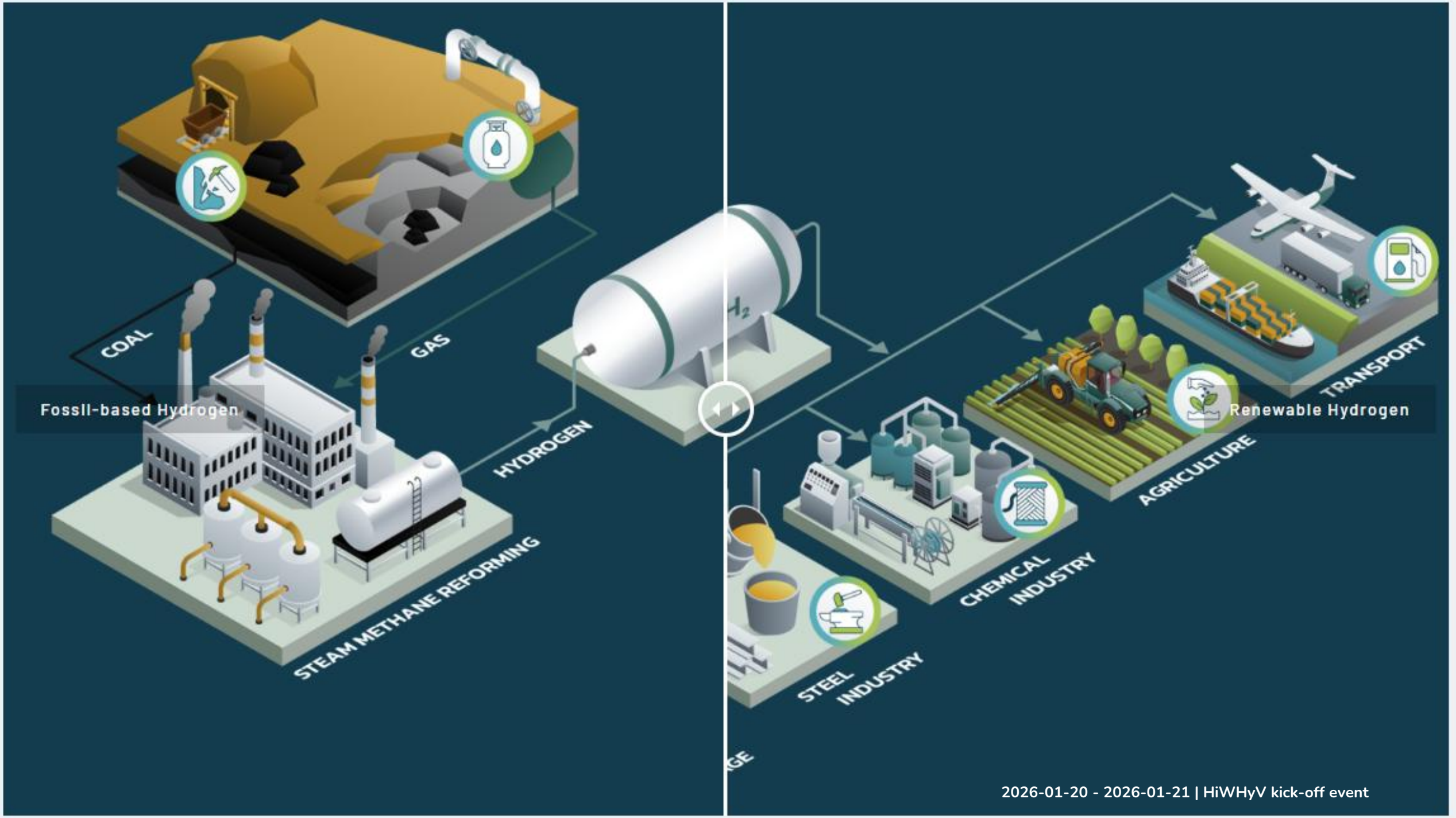
COAL
GAS
Fossil-based Hydrogen
HYDROGEN
STEAM METHANE REFORMING
Renewable Hydrogen
TRANSPORT
AGRICULTURE
CHEMICAL INDUSTRY
STEEL INDUSTRY

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How to pronounce the acronym:
HiWHyV = „*High-w-eah*“

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Tack!

Anna Sager

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