

Belgium as a hydrogen import hub

Roadmap towards 2030 and beyond

Webinar October 2nd 2023

Hydrogen Import Coalition



Short- and midterm action focussed roadmap

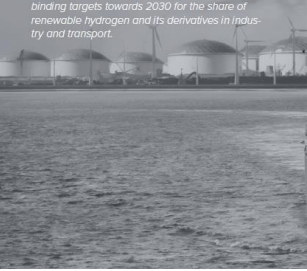
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Roadmap towards 2030 and beyond

Mission of the roadmap

On March 30th of 2023, a provisional but ambitious agreement was reached within the EU, for binding targets towards 2030 for the share of renewable hydrogen and its derivatives in industry and transport.



Way forward



Once the legislative process of RED III is completed, the new legislation will be formally adopted and enter into force. The implementation is key for a region like Belgium, that has all the assets, but also clearly the ambition to occupy a leading position within Europe in the roll-out of a hydrogen economy as stated in the October 2022 update of the federal vision and strategy on hydrogen²⁵. Belgium positions itself as a hub for the import and transit of renewable molecules in Western Europe based on the central geographic location, excellent targets, milestones and actions. The roadmap wants to set out steps and build trust within the community of future hydrogen consumers that there will be significant import of sustainable hydrogen and derivatives to feed growing demand towards 2030 and onwards and supporting security of supply. The roadmap is supportive to the entire sustainable hydrogen supply system but focuses mainly on the import via Belgian seaports of hydrogen derivatives and the hinterland transport of these derivatives in Belgium, the work to be done on the

"The roadmap wants to set out steps and build trust within the community of future hydrogen consumers"

General

The roll-out of supply, infrastructure and offtake will have to take place between today and 2030. The roll-out consists of 3 phases:

- 2023: planning and development
- 2026: local infrastructure and production
- 2027: first import
- 2028: interconnection with Germany
- 2030: upscaling of hydrogen economy

This roll-out requires the involvement, coordination and cooperation of numerous stakeholders from the complete supply chain, including policy. The roll-out is in full swing driven by stakeholders with ongoing key initiatives as the next paragraphs will show, but a lot of work still needs to be done and a lot of new milestones are ahead of us, including the timely implementation of measures like the introduction of market models, transport mechanisms, certification schemes, etcetera.

Considerations on import volumes and infrastructure sizing

In order to secure supply for projected offtake in 2030 in Belgium and transit, adequate import volumes and infrastructure needs to be developed. The Sankey diagram below gives an impression of the relative magnitudes in 2030 of the flows of renewable (RE) and low carbon (with carbon capture - LC) hydrogen and

3. OFFTAKE

The Belgian hydrogen market already amounts 15 TWh/year of almost exclusively fossil hydrogen. The demand for sustainable hydrogen and derivatives will scale up in the next years, stimulated by EU targets and legislation like RePowerEU, the Renewable Energy Directive, the Fuel EU Maritime Law and ReFuelEU for aviation. Several initiatives are ongoing to map the potential offtake by 2030, of which the following are the most important:

- The identification of hydrogen off-take clusters and a request for information by Fluxys, mainly in energy intensive sectors²⁶
- The roadmap by WaterstofNet and the Hydrogen Industry Cluster on offtake in all sectors²⁷
- Bilateral consultations with Germany²⁷
- Stimulus of co-operation throughout the value chain in the existing industrial ecosystems, Waterstof Industrie Cluster and H₂Hub, working together under the umbrella of the Belgian Hydrogen Council²⁸

Companies in organic chemistry, fertilizer industry, refining and steel industry are planning large scale projects for a partial substitution by or introduction of sustainable hydrogen. Engines using hydrogen, e.g. dual fuel, are available for coastal shipping and heavy duty applications and ammonia based engines for deep sea shipping will. Terminals and cracking facilities available in coming years.

THE HYDROGEN ECOSYSTEM AND EXPORT

Belgium holds a large ecosystem of companies and academia with high expertise in hydrogen technology. With regard to hydrogen production, Belgium has a strong representation of technology players, both in the field of electrolysis (alkaline and PEM) and reformers. There are large construction companies with expertise in pipeline construction or that focus on the construction of large hydrogen plants. There are also numerous technology players or players in the field of hydrogen applications in Belgium, such as compressors, storage tanks, hydrogen filling stations, various heavy duty and offroad vehicles, fuel cells, combustion engines, boilers, CHP,...

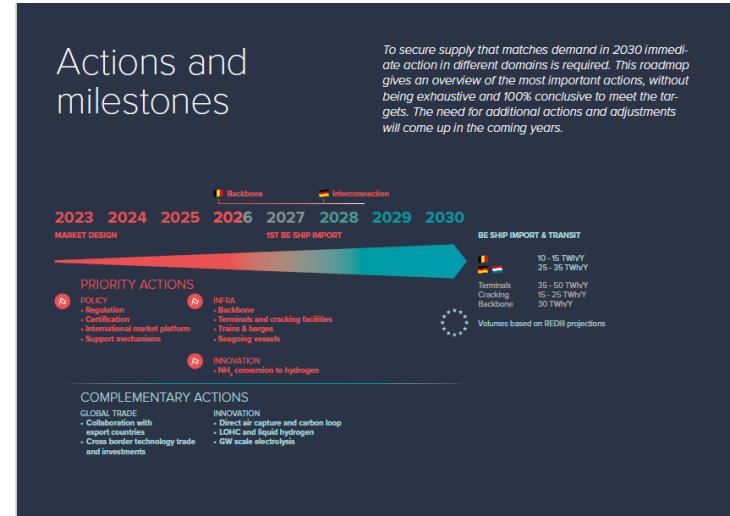
They have all a leading position globally generating significant export which must be maintained and strengthened.

25. <https://www.fluxys.com/en/energy-transition/hydrogen-carbon-infrastructure/hydrogen-anspiring-to-build-the-network>

26. <https://www.waterstofnet.be/nl/kenniscentrum/roadmap>

27. <https://www.hydrogenenergy.nl.com/industry/germany-wants-to-link-its-hydrogen-pipeline-with-belgium-by-2028-debate-concerns-about-readiness/2.14405470>

28. <https://belgianhydrogencouncil.be/>



Publication via partners communication channels in October 2023

There is a clear complementary role for hydrogen and its derivatives in the integrated energy system

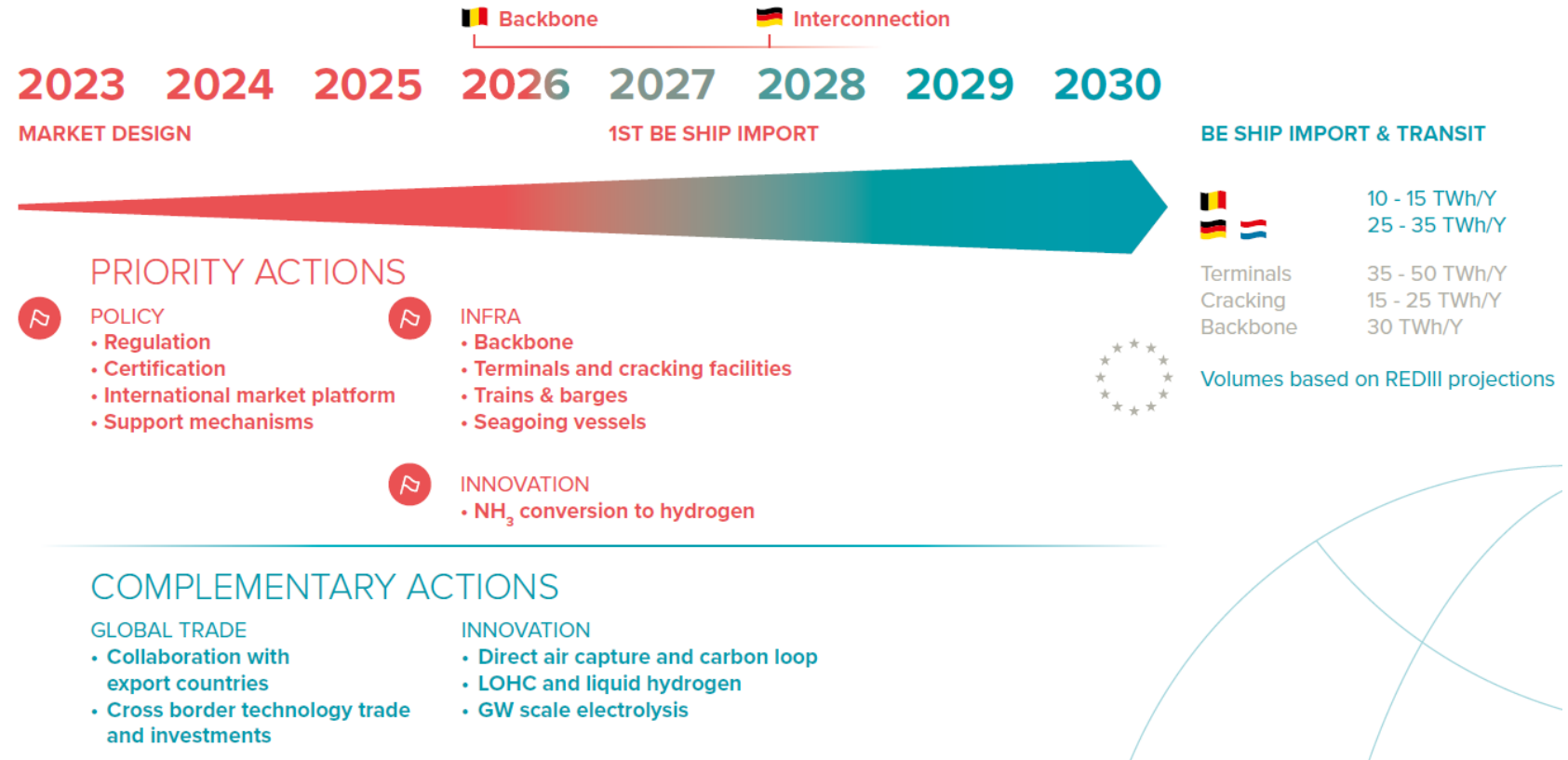
- Widely and concretely applicable
 - Industry
 - Shipping and aviation
 - Heavy duty road transport and machines
- Affordable and secure energy
- Indispensable storage in the energy system
- Hydrogen technology leadership and export opportunities



Source: EU Commission

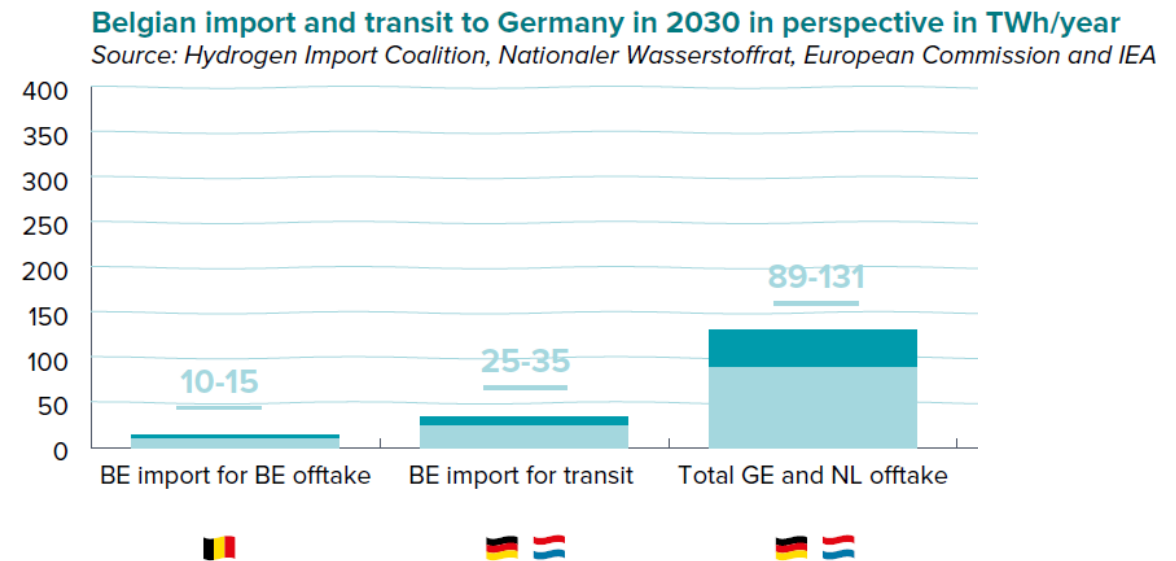
This roadmap calls for immediate action to position Belgium as a hydrogen hub

“The coalition calls to realism with regard to the 2030 targets. The EU targets are very ambitious, drastic and within reach, but immediate action is required, as pictured and flagged in the roadmap.”



The coalition's main demand assumptions

- Main driver by 2030 are EU targets (RED III provisional agreement)
 - **BE:** 10 to 15 TWh/year
 - **Transit:** 25 to 35 TWh/year
 - 30 to 50% import via BE-hub
 -  German Nationaler Wasserstoffrat
 -  Chemelot, EU targets (RED III)



Outstanding pipeline connectivity and tank storage of Belgian seaports

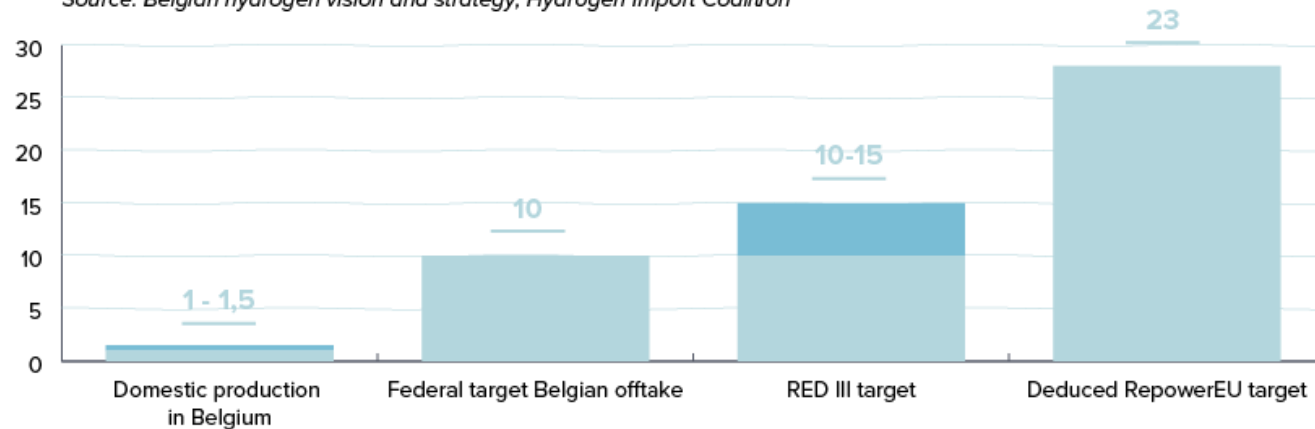
- Antwerp is the largest integrated chemical cluster in Europe
- Zeebrugge is a key gas import hub North-West Europe
- North Sea port

Clear conclusion: significant need for import

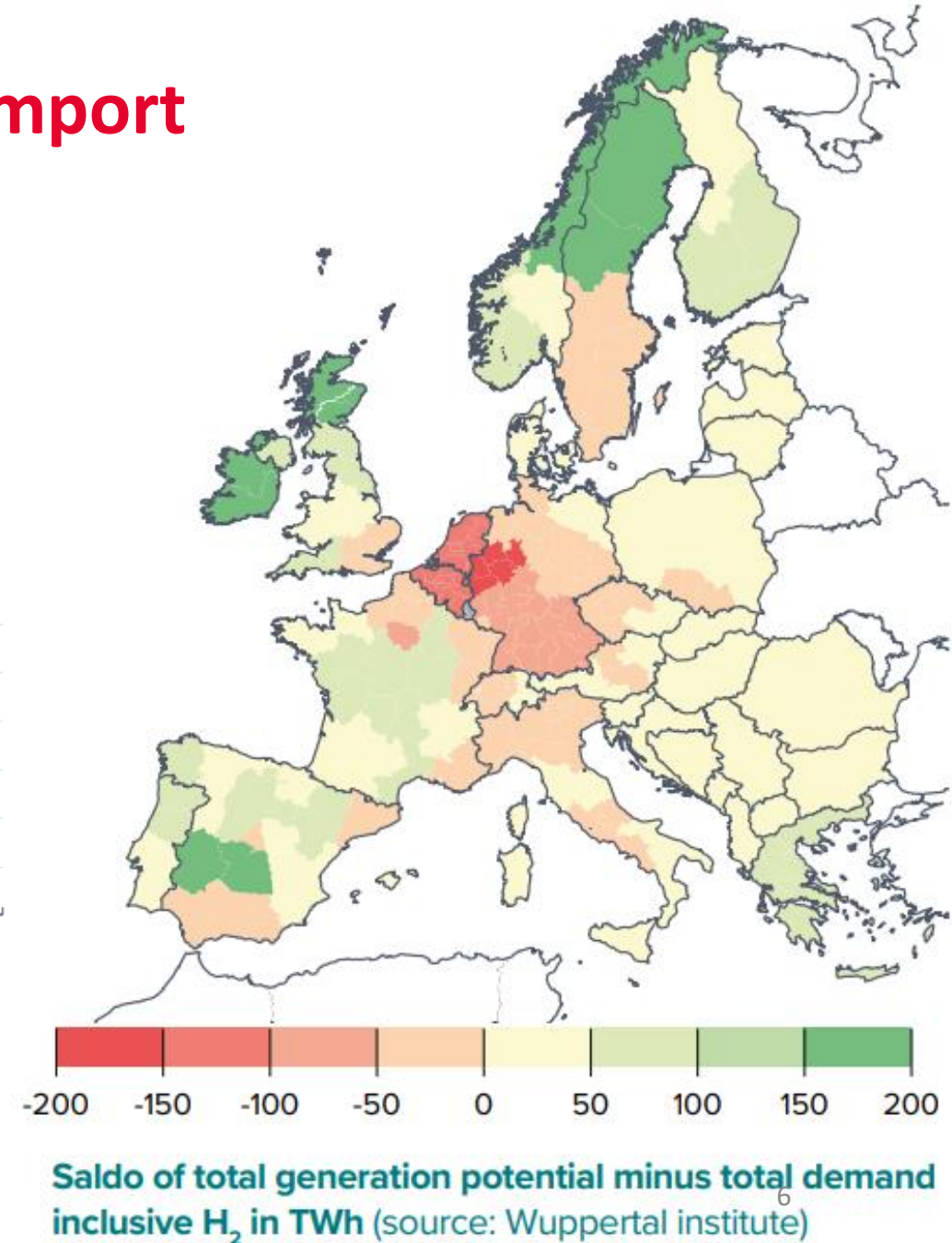
- Limited local production
 - ~300MW IPCEI + ~100MW local production in the pipeline <2030
 - competition with direct electrification / scarce renewables
 - effect additionally requirement RED

Domestic renewable H₂ production compared to targets in 2030 in TWh/year

Source: Belgian hydrogen vision and strategy, Hydrogen Import Coalition



- High energy demand – negative energy balance
- High hydrogen ambitions



Increasing global supply potential

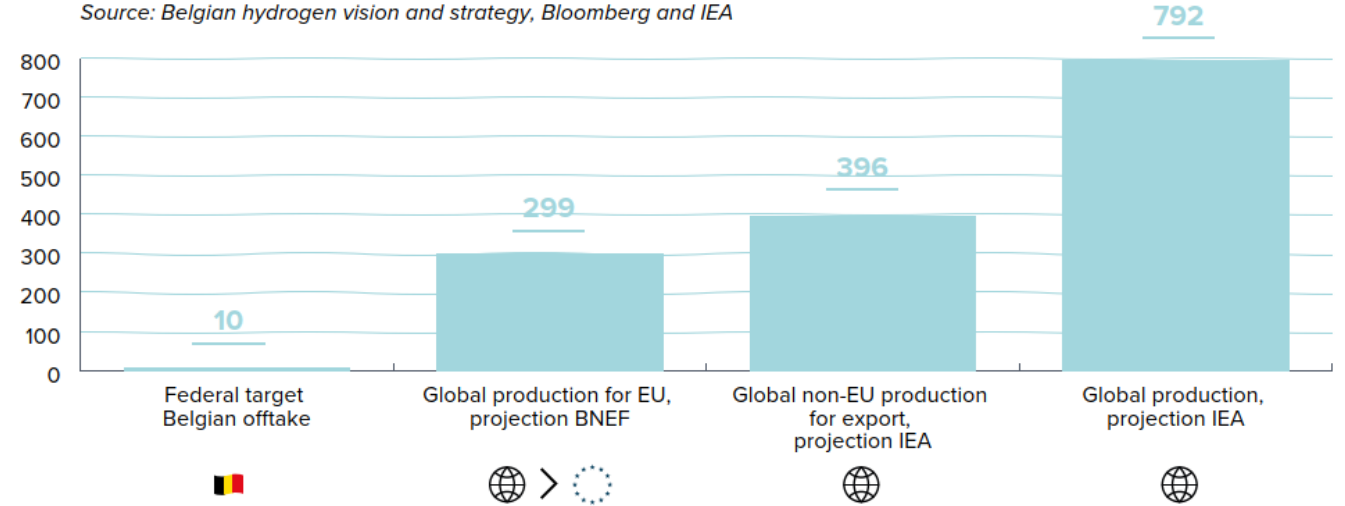
- Growing projections of global **renewable hydrogen** production based on IEA



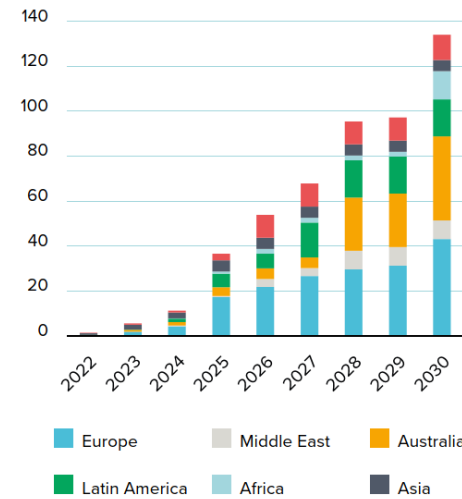
112
Gigascale production
 Renewable H2 Projects
 > 1 GW, low carbon
 H2 projects > 200 Kt / y

- Key driver is policy of frontrunning regions, EU up front

Projected availability renewable hydrogen versus federal target hydrogen use in 2030 in TWh/year
 Source: Belgian hydrogen vision and strategy, Bloomberg and IEA

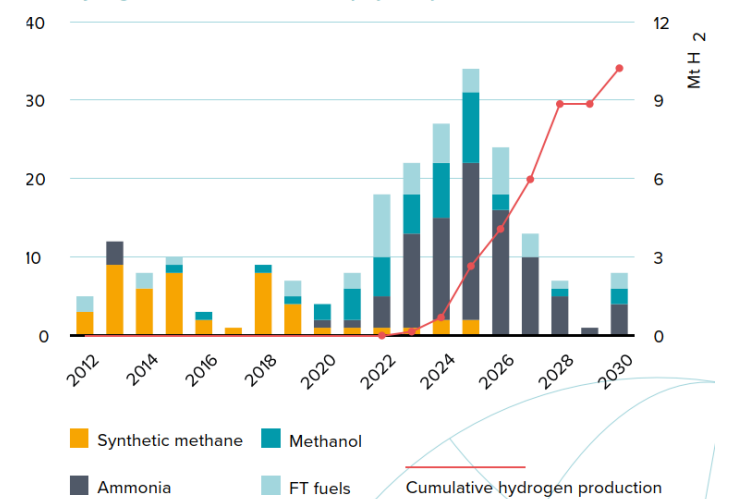


Total capacity by region (GW)



Source: IEA

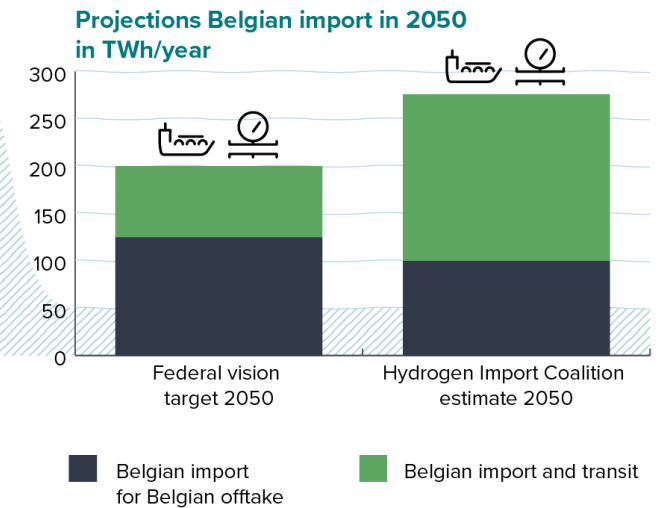
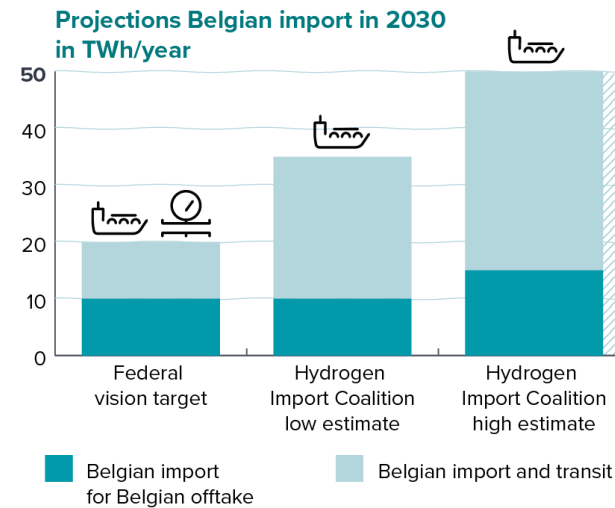
Hydrogen-derived fuels number of projects by fuel




Coalition's import projections on renewable hydrogen

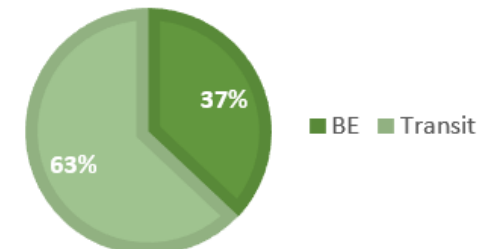
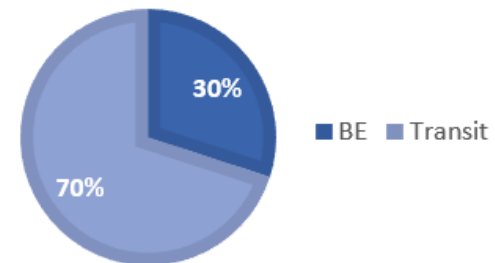
■ 2030

- **35-50 TWh of import**
- **BE-offtake:** 10 to 15 TWh/year
- **Transit:** 25 to 35 TWh/year
- 2 to 3 times projections of Federal H₂ vision
- Risk of limited supply via Northern Route pipeline



■ 2050

- **BE-offtake:** 100 TWh/year
- **Transit to**  175 TWh/year
- +37% vs projections of Federal H₂ vision



Matching supply & demand - Some implications

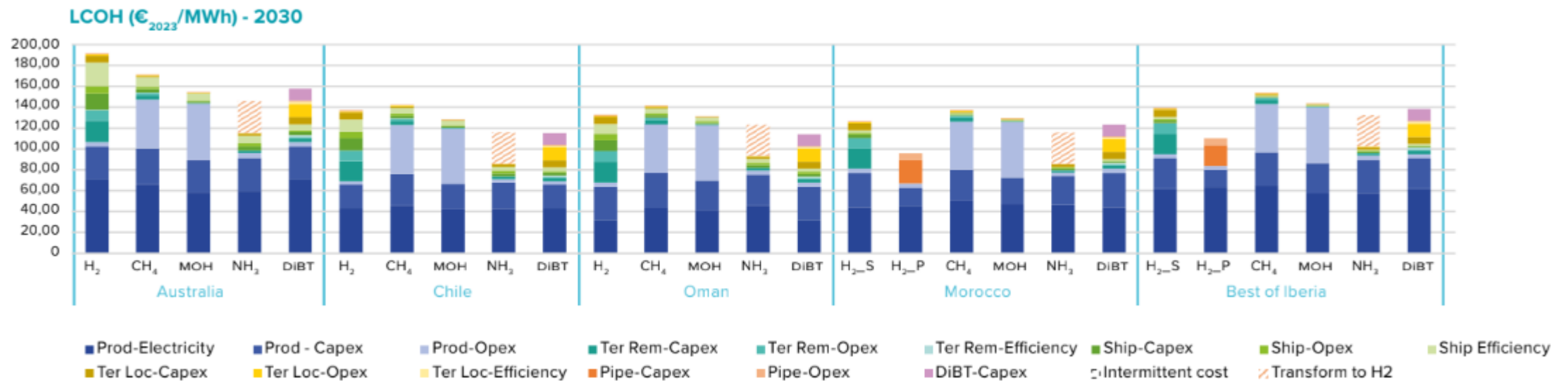
- Connecting supply and demand requires infrastructure integrated in the overall energy system



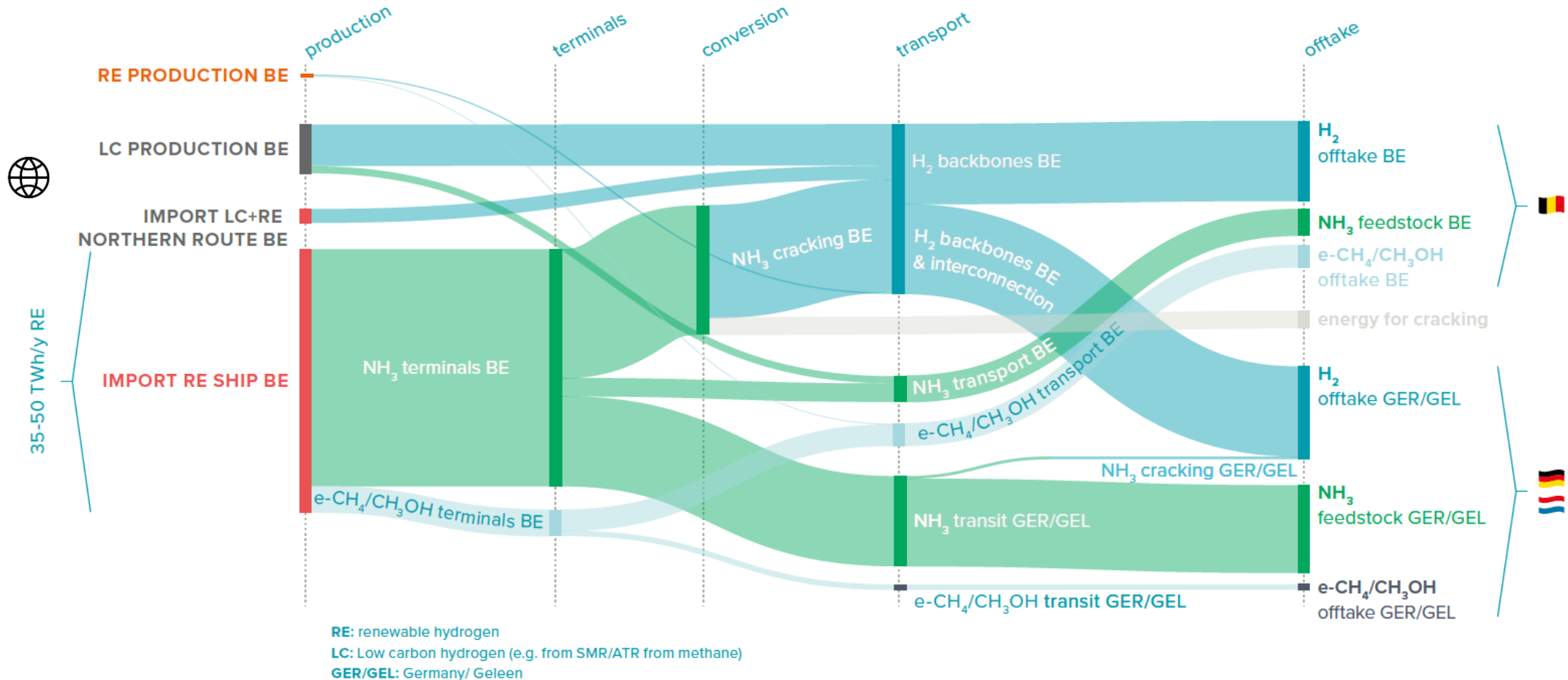
- Supply mix is not carved in stone – robust and flexible approach required
 - Ship import mainly NH₃: drop in feedstock, storage & distribution is existing, relative cost competitive, cracking feasibility, no CO₂
 - although MOH & CH₄ are runners up: easy of handling, e-fuel for ships, ...
- Pipeline transport is H₂
- End user offtake is initially mainly H₂ and NH₃
- => Conversion required

Imported hydrogen will be available at feasible cost

- Analysis of January 2021 updated to 2023
- Avg. impact of +33% on the LCOH in real terms while electricity and gas price outlooks have soared in Europe.

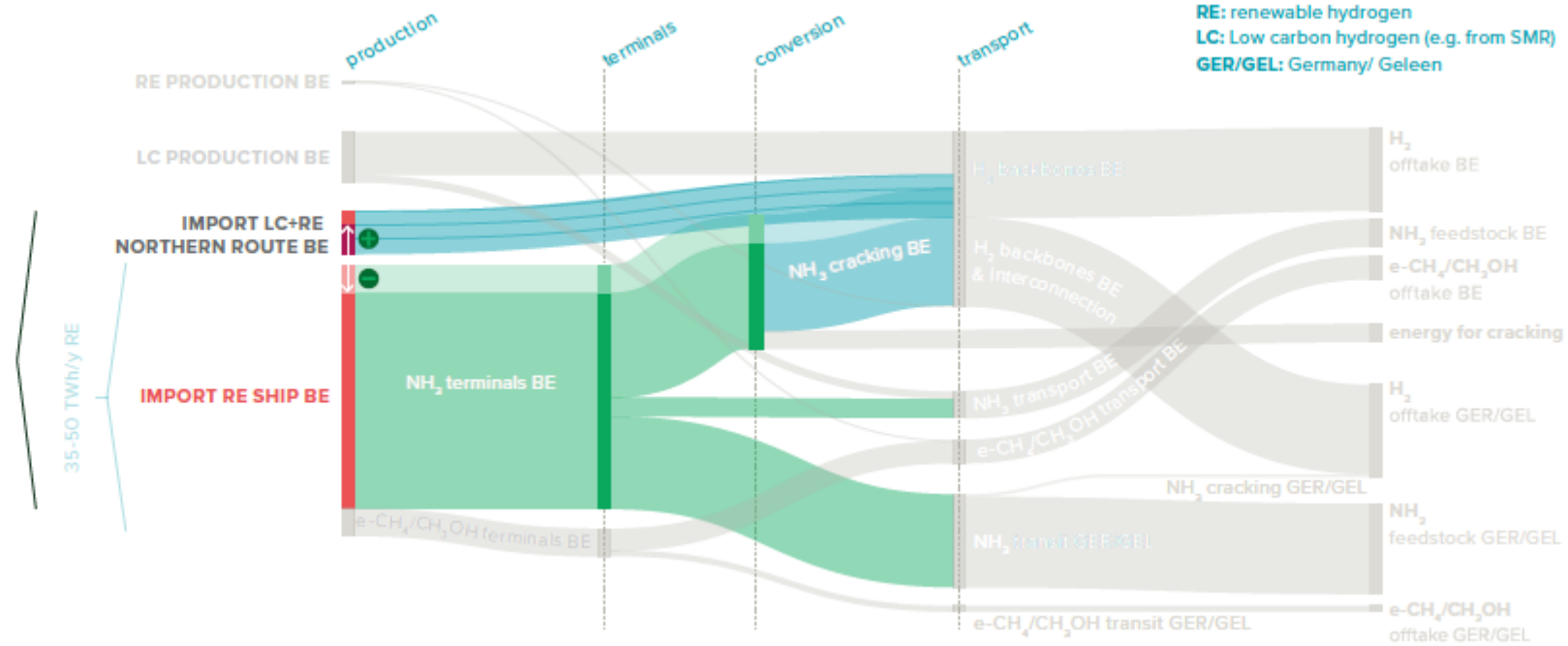


Hydrogen supply and demand will be connected in different ways integrated in the overall energy system



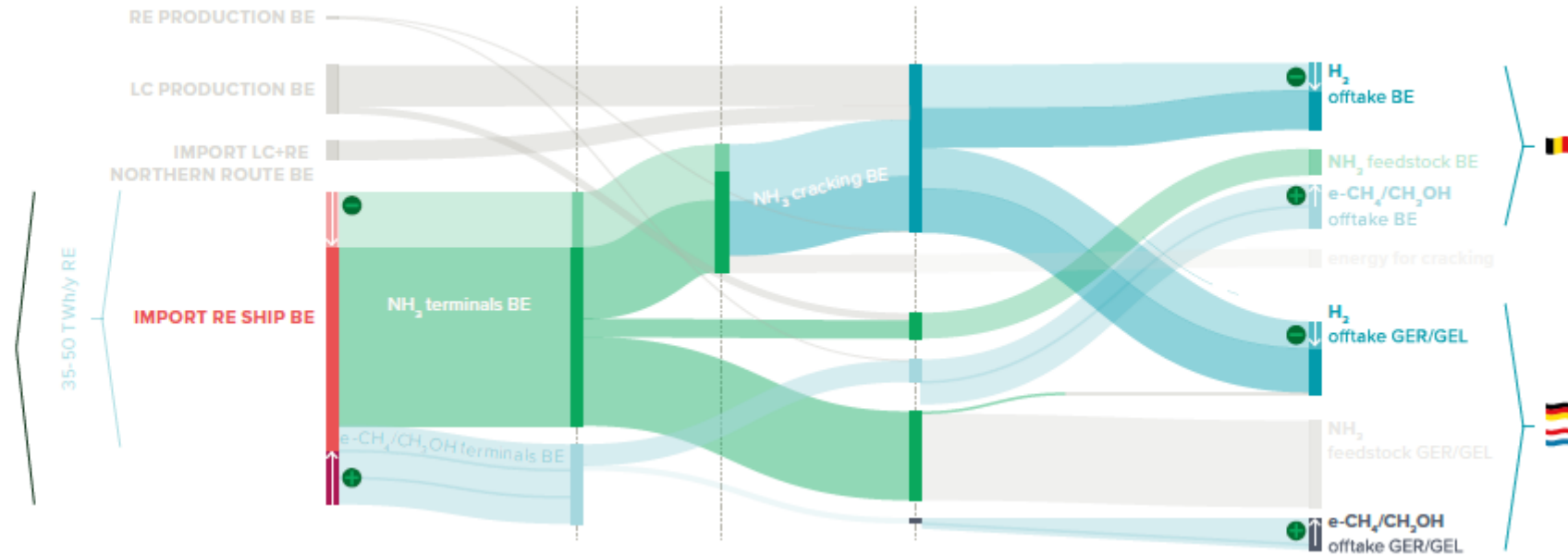
What if...

...by 2030 or soon after (eg 2035): The Northern Route supplies more renewable hydrogen?

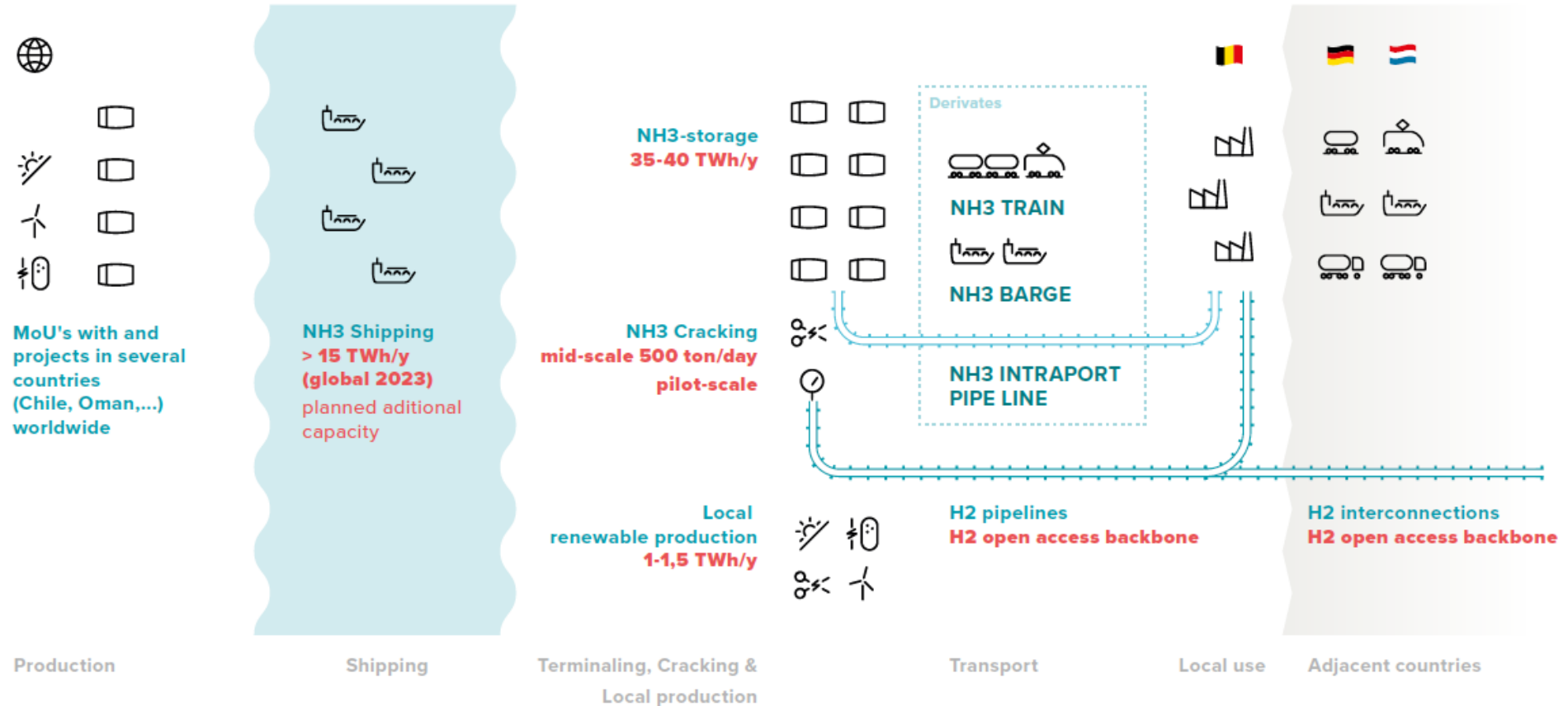


What if...

...there is a faster ramp-up in $\text{e-CH}_4/\text{CH}_3\text{OH}$ demand, e.g. as alternative fuel in NW Europe?



Key initiatives are ongoing today

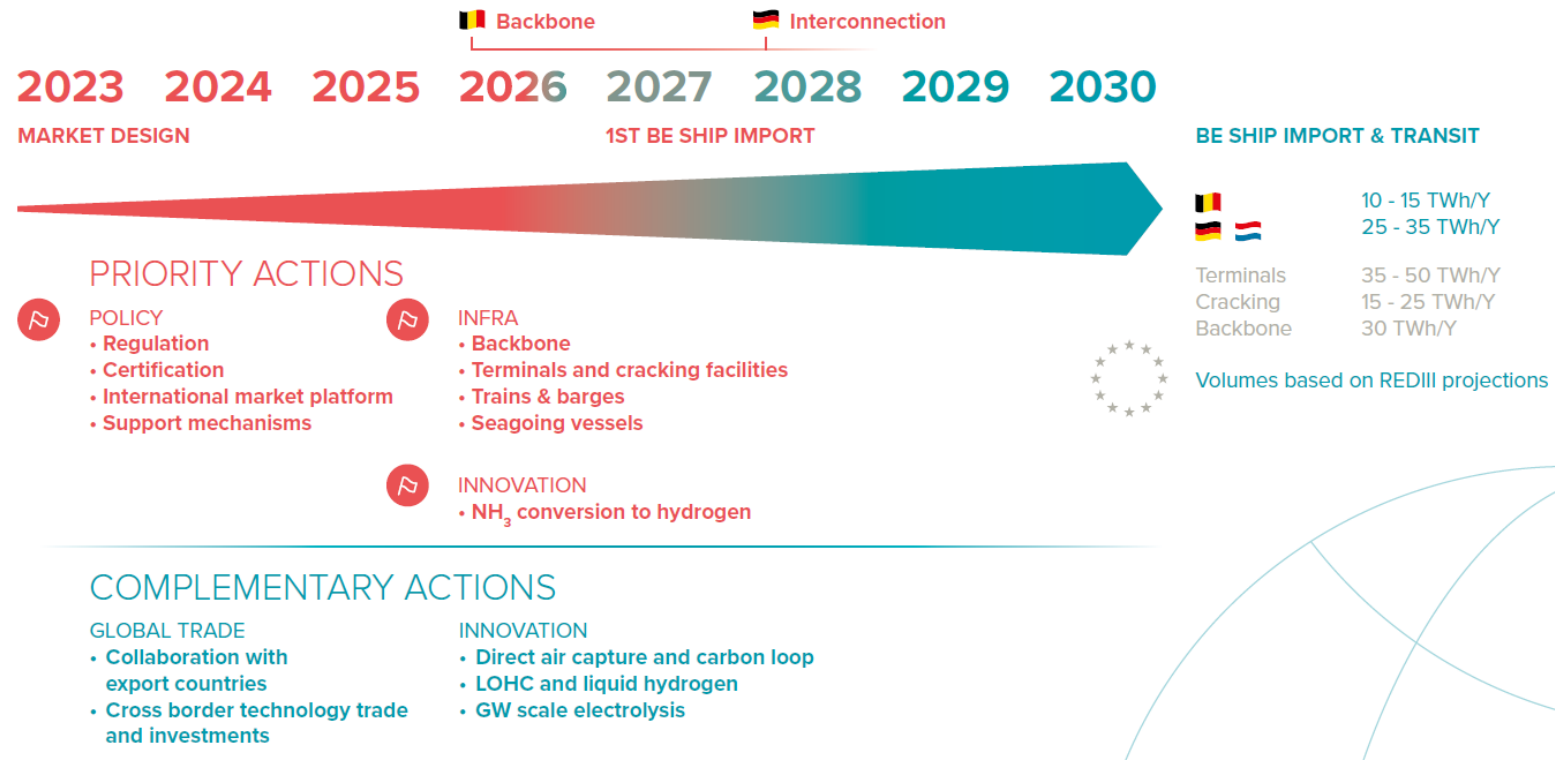


The coalition partners are involved as initiator, partner or stakeholder in the majority of the displayed ongoing new initiatives



Actions

- Call for immediate action
 - Prerequisites for offtake agreements
 - Regulation
 - Certification
 - Support mechanisms
 - International market platform (facilitating)
 - Terminals & cracking facilities
 - Backbone
 - Seagoing vessels, trains & barges
- Complementary actions
 - Global trade
 - Innovation



Conclusions

- Import by ship is the key for energy intensive NW Europe to meet EU hydrogen and ETS targets
- Belgium has the fundamentals to be a large-scale import and transit hub for NW Europe offtake (30 to 50% import share)
- 📌 Immediate policy action is required to translate ambitious targets in offtake agreements

Actions and milestones

To secure supply that matches demand in 2030 immediate action in different domains is required. This roadmap gives an overview of the most important actions, without being exhaustive and 100% conclusive to meet the targets. The need for additional actions and adjustments will come up in the coming years.

