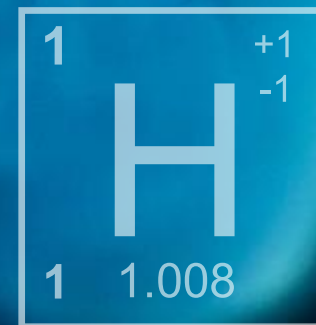




**Hydrogen Belgian  
Exchange:  
Creating a H2 & derivative  
market for commodities  
and certificates (TBC)**

**AEA – Establishing the market for  
low-emission ammonia:  
Connecting the customer, from  
first movers to global adoption**

**New Orleans - November 2024**



# ABOUT HINICIO

## STRATEGY AND TECHNICAL CONSULTING FIRM SPECIALISED IN HYDROGEN & DERIVATIVES

Founded in 2006, **we are recognized as a Leader in the hydrogen and derivatives industry. In our vision, we see hydrogen playing a central role in the future energy and process systems** to achieve climate objectives. We focus in the hard-to-abate sectors.

It is **our mission** to advise our clients and support the **building of successful strategies, projects, investments and public policies**. By doing so, we strive to be their preferred partner and attract best-in-class human capital.

We have offices in **Brussels, Paris, Rotterdam, Washington DC, Bogota, & Santiago**, and commercial representation in **Mexico**.

Part of the Vulcain group since December 2022

Anchor investors:



Business & Strategy



Project Development Assistance



Investment Advisory



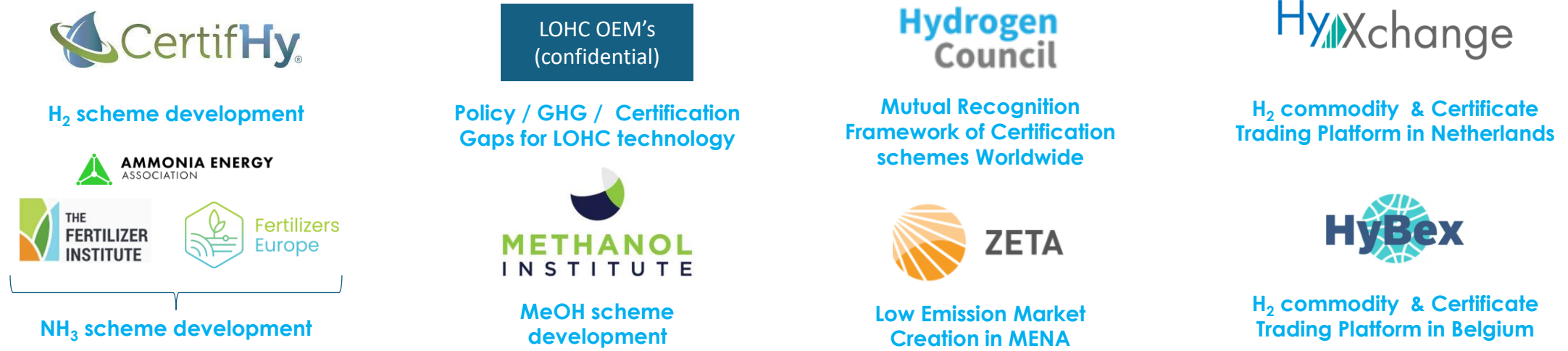
Policy & Regulation



Digital Solutions



# Hinicio is positioned on all H<sub>2</sub> energy carriers & leads the way on certification & market creation



**Ties along global PtX value chains:** Our experts have supported key US, EU and Japanese players in the hydrogen and renewable derivatives value chains.







# FROM MOLECULES TO PRODUCTS

It is not just the H<sub>2</sub> /PtX molecule , but its environmental attributes that determine the market value

Market	Maritime fuel	Aviation fuel	Renewable transport fuel: RFNBO	Renewable feedstock for industry: RFNBO	Import	ETS: carbon intensive industry, built environment, heavy transport
<b>Applicable molecules</b>	NH <sub>3</sub> , MeOH, e-diesel	e-kerosene	H <sub>2</sub> , NH <sub>3</sub> , MeOH, e-diesel	H <sub>2</sub> / Derivatives	Fertilizers (incl. NH <sub>3</sub> )	Any product that falls under ETS
<b>Product classification</b>	low carbon fuel	e-fuel	REDII compliant, renewable transport fuel	REDIII compliant, renewable transport fuel	NH <sub>3</sub>	Any product that falls under ETS
<b>Clients</b>	Ship operators	Fuel suppliers	Transport fuel suppliers	Industrial H <sub>2</sub> users (excl. conventional fuel production): - MeOH, NH <sub>3</sub> producers - Glass manufacturers - Semiconductor manufacturers - Steel making - Biofuel Refining	Any conventional product off-taker	Any conventional product off-taker
<b>Type of market</b>	Incentivized voluntary market	Mandatory market	Mandatory market	Mandatory market	Incentivised voluntary market	Incentivized voluntary market
<b>Applicable regulation</b>	FuelEU Maritime, ETS	ReFuel aviation	(RED II Art. 25-30)	(RED III Art. 22a)	ETS and CBAM interplay	ETS
<b>Client business model</b>	Avoid Carbon Penalty	Compliance	Compliance	Compliance	Benefit from carbon penalties in domestic production of ammonia	Benefit from carbon penalties in ETS industries
<b>Market size</b>	50% of fuel for int'l shipping: - 2% in 2025 - 6% in 2030 - 13% in 2035 - ... - 75% in 2050	eKerosene sub-mandate: - 0,7% in 2030 - 5% in 2035 - 8% in 2040 - ... - 28% in 2050	29% of EU (inland) transport fuels by 2030, with sub-quota of 1% for RFNBO & 5.5% for RFNBO+AB	42% of EU industrial H <sub>2</sub> usage by 2030		
<b>Product premium compared to fossil-based alternative</b>	<b>Product premium price / Willingness to Pay depends on regulatory drivers relevant of the market segment &amp; Country</b> (Transposition into MS legislation & availability of competing solutions): there is no reference today for any market segment					



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It is not just the H<sub>2</sub> /PtX molecule , but its environmental attributes that determine the market value

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<b>Applicable molecules</b>	NH <sub>3</sub> , MeOH, e-diesel	e-kerosene	H <sub>2</sub> , NH <sub>3</sub> , MeOH, e-diesel	H <sub>2</sub> / Derivatives	Fossil-based products	Product that falls under ETS
<b>Product classification</b>	low carbon fuel	e-fuel	REDII compliant, renewable transport fuel	REDIII compliant, renewable transport fuel	Fossil-based products	Any product that falls under ETS
<b>Clients</b>	Ship operators	Fuel suppliers	Transport fuel suppliers	Industrial manufacturers (e.g., steel, methanol, biofuel Refining)	Any conventional product off-taker	Any conventional product off-taker
<b>Type of market</b>	Incentivized voluntary market	Mandatory market	Mandatory market (Art. 25-30)	Mandatory market (RED III Art. 22a)	Incentivised voluntary market	Incentivized voluntary market
<b>Applicable regulation</b>	FuelEU Maritime, ETS	EU Emissions Trading System (ETS)	EU Emissions Trading System (ETS)	(RED III Art. 22a)	ETS and CBAM interplay	ETS
<b>Client business model</b>	Avoid Carbon Penalties	Compliance	Compliance	Compliance	Benefit from carbon penalties in domestic production of ammonia	Benefit from carbon penalties in ETS industries
<b>Market size</b>	0% in 2025 - 10% in 2035 - ... - 75% in 2050	Kerosene sub-mandate: - 0,7% in 2030 - 5% in 2035 - 8% in 2040 - ... - 28% in 2050	29% of EU (inland) transport fuels by 2030, with sub-quota of 1% for RFNBO & 5.5% for RFNBO+AB	42% of EU industrial H <sub>2</sub> usage by 2030		
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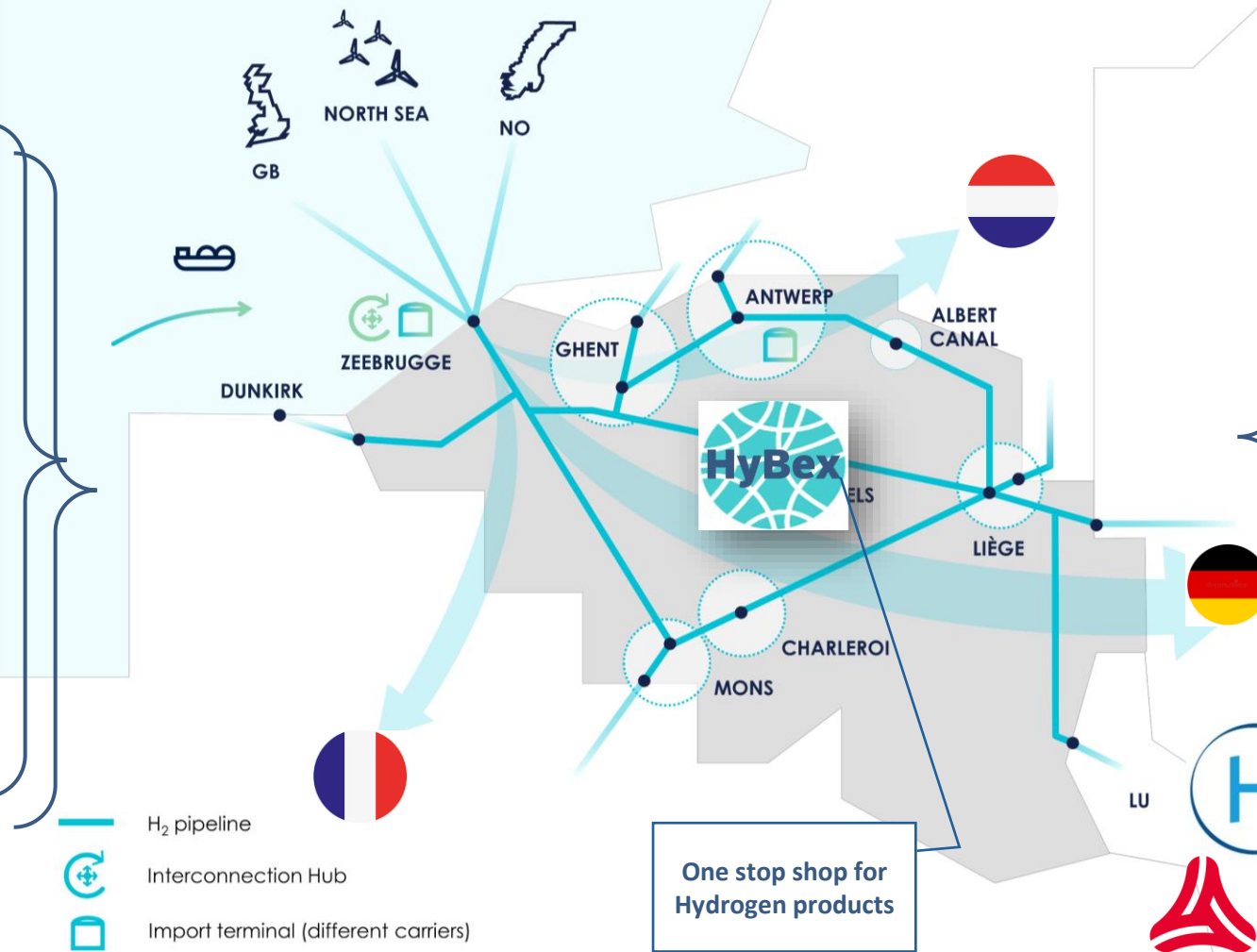
**« Green Ammonia does not exist » : RFNBO compatible NH<sub>3</sub>, EU Taxonomy compatible NH<sub>3</sub>, RED3 compliant Low Carbon NH<sub>3</sub>, CBAM compliant NH<sub>3</sub>, EU Fuel Maritime NH<sub>3</sub>... are products serving different markets**

# HyBex marketplace will bring together the producers, consumers, importers and exporters to exchange certificates, commodity and balancing products



Different technologies and flexibilities

- Producers
- Importers
- Consumers
- Exporters



Different products and valorizations

- Commodity H2
- Certificates H2
- Balancing H2 products

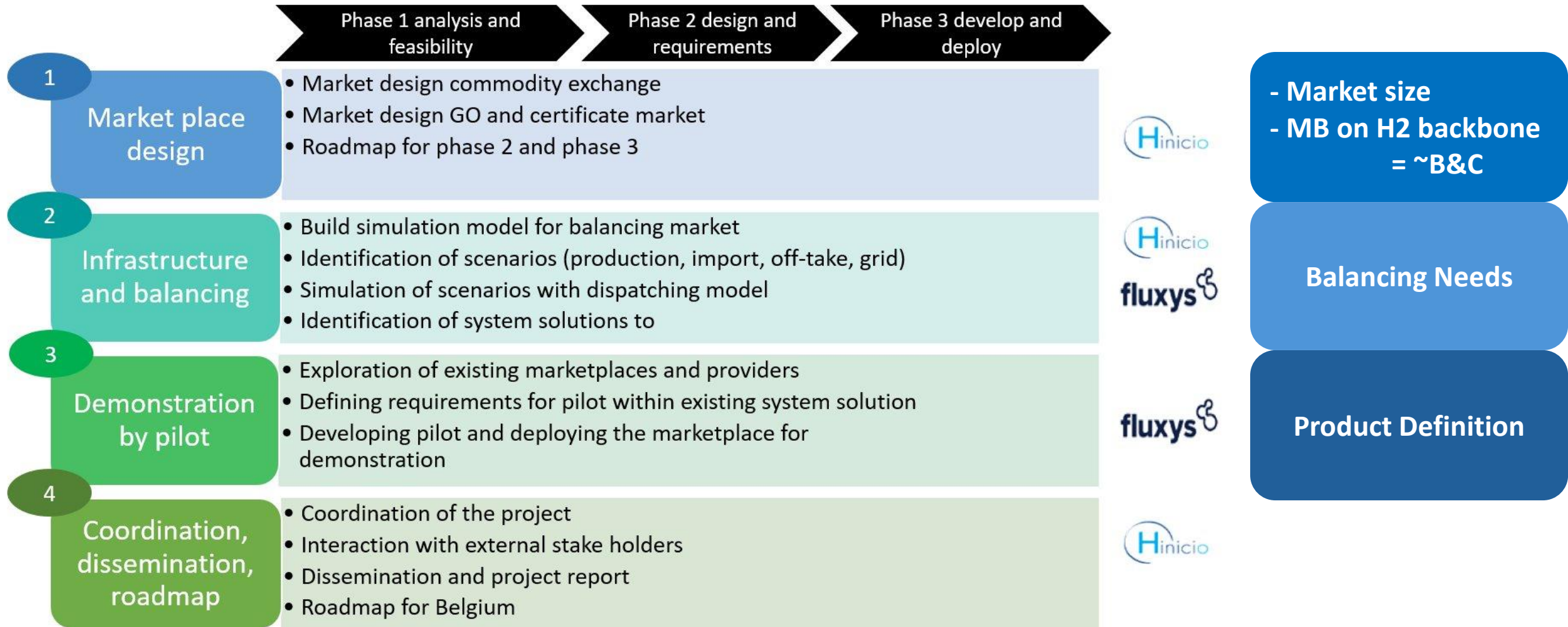
Bundled or Separate ?



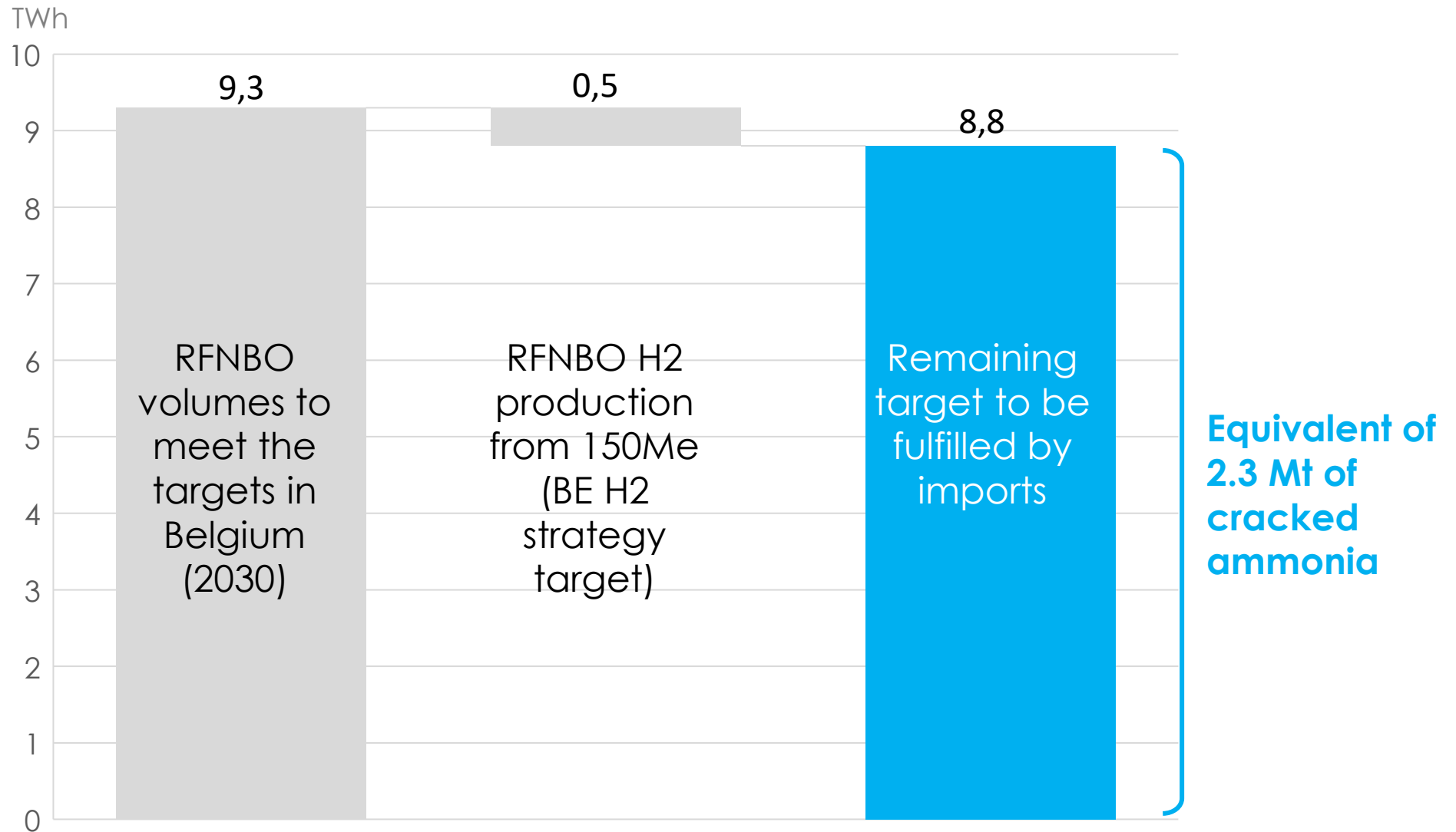
One stop shop for Hydrogen products



# In the context of the ETF, the consortium has defined four main workstreams










# Belgium will need H2 (derivative) imports to meet its EU RFNBO Target (and will need more for LC H2 & Derivatives and RFNBO / LC throughput to DE)



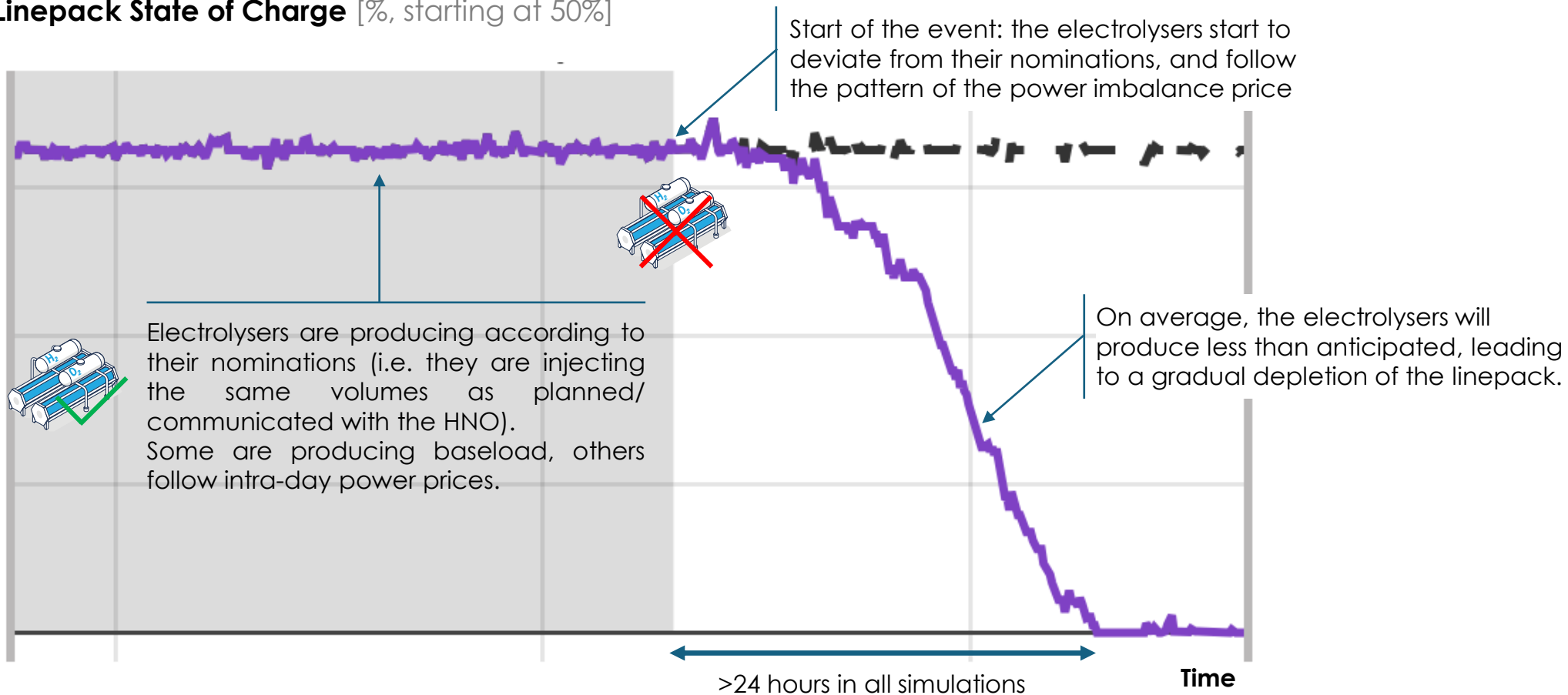


# The Belgian Hydrogen network will be more sensitive to imbalance events than the natural gas network

Properties important for balancing	 Natural gas network	 Hydrogen network	 Power network
<b>Stability of supply</b>	<b>Stable</b> (pipelines, LNG regasification)	<b>Mixed</b> mix of stable ( <i>cracking of ammonia, SMR</i> ) and <b>unstable</b> ( <i>electrolysis</i> ) sources	<b>Unstable</b> Mix of intermittent renewables and baseload assets
<b>Storage</b>	<b>Lot of storage</b> for geostrategic reasons 9,1 TWh in BE, 1139 TWh in the EU (1/4 of the annual EU consumption)	<b>Medium storage</b> mainly linepack, no large-scale scheduled in the short-term in Belgium	<b>Limited storage</b> Pumped storage and batteries
<b>Size of the linepack</b> (volume of gas in the network that can serve as buffer)	<b>Large linepack</b> 4000 km + distribution network	<b>?</b> (unspecified but less than 4000km, and a much smaller distribution network)	<b>No linepack</b>
<b>Energy density</b> (volume, atmospheric pressure, HHV)	<b>10,1 kWh/m<sup>3</sup></b>	>  <b>3,3 kWh/m<sup>3</sup></b>	<b>N.A.</b>
	 <b>No balancing assets or mechanisms are needed.</b> Every 24h, offsets between injections and nominated volumes are compensated the next day (by the causer)	 <b>The balancing mechanism needs to be investigated</b>	 <b>Ancillary services (balancing services) are in place to ensure that supply and demand remain balanced</b>

# The hydrogen network is likely able to cope with reactions from electrolyzers on power market price signals, yet needs balancing (either NH3 crackers or demand response) and suggest Capacity Reservation Mechanism

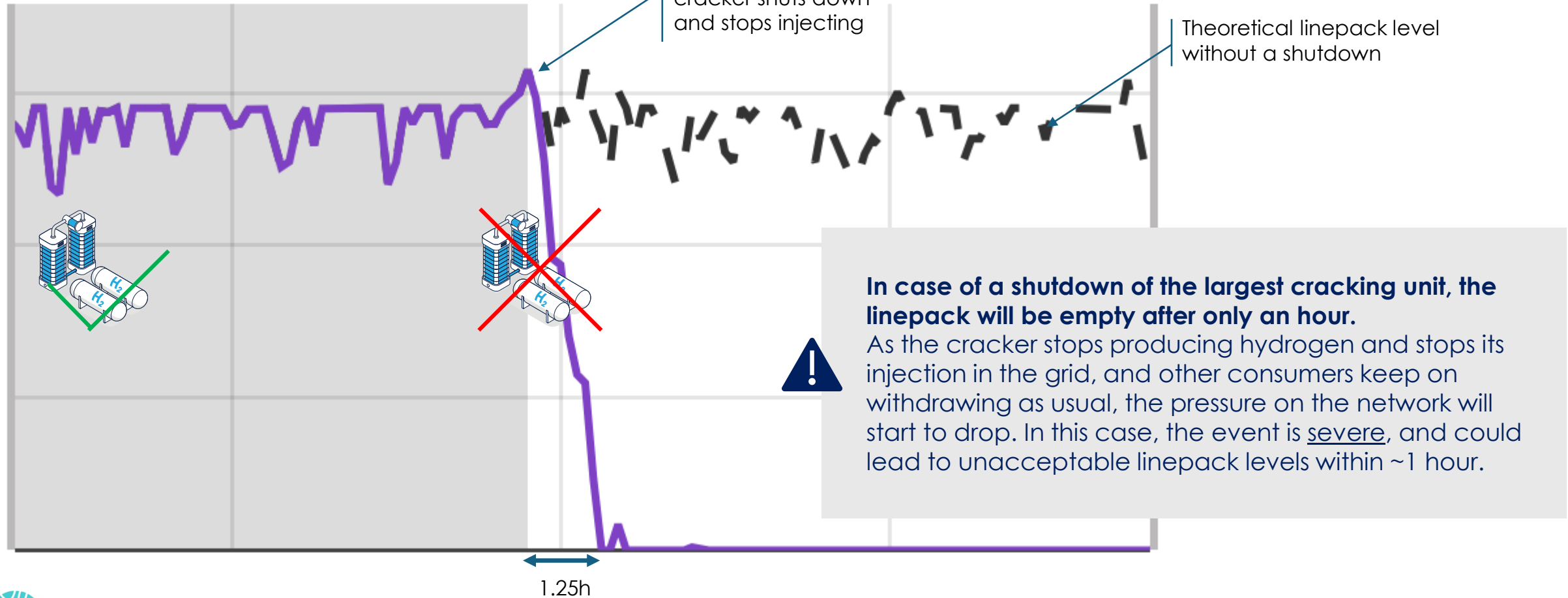
Linepack State of Charge [%, starting at 50%]



This simulation shows that the linepack is able to cope with unexpected events

An outage of a large ammonia cracking unit can lead to a system failure within **1 hour and 15 minutes**, suggesting the need for multiple crackers (+ demand response)

Linepack State of Charge [%, starting at 50%]



# Evolving towards a balancing model for hydrogen in Belgium

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## Approach towards Code of Conduct

Further **elaborate the result of the model**  
and possibly run more scenario's



Develop **evolutive answer to the basic question** relevant for balancing

Discuss the proposal **with the regulator for approval and consult with market**

Set-up the necessary tools and systems for balancing a.o. **a balancing market**





# In a next phase of the project, a market pilot will be launched, including definition of tradable product

					To be defined	
Term	Definition	Examples	Proposed starting point for discussions	Commodity	Certificate	
Bid definition	<b>Delivery time</b>	Time at which energy will be delivered	15h00 – 16h00h	<ul style="list-style-type: none"> <li>to be assessed based on simulation</li> <li>Interaction with market required</li> </ul>	✓	N.A.
	<b>Unit &amp; price</b>	Amount of product for buy & sell orders	Ton H2, €/MWh	<ul style="list-style-type: none"> <li>€/MWh H2 (HHV)</li> <li>Interaction with market required</li> </ul>	✓	N.A.
	<b>Delivery zone</b>	Area or region where energy is physically delivered	Antwerp, Bruges (or interconnected Belgium)	<ul style="list-style-type: none"> <li>Depending on the physical grid interconnections</li> </ul>	✓	✓ (PoS only)
Bid rules	<b>Product granularity</b>	Time interval of product delivery	15', 30', 60', yearly, monthly, quarterly, etc.	<ul style="list-style-type: none"> <li>15' for spot markets (similar to spot markets) but to be assessed based on simulation</li> <li>Interaction with market required</li> </ul>	✓	N.A.
	<b>Unit</b>	SI unit used to measure the quantity of product that is traded	Kg H2, Ton H2, MWh (HHV),...	<ul style="list-style-type: none"> <li>€/MWh (HHV)</li> <li>Interaction with market required</li> </ul>	✓	Defined
	<b>Min &amp; max price</b>	Maximum and minimum allowed prices for orders. Typically coming from regulations.	€2000 MWh in DA markets	<ul style="list-style-type: none"> <li>no caps</li> <li>Interaction with market required</li> </ul>	✓	N.A.
	<b>Tick size</b>	Smallest allowable change in price	0.01 €/kg H2	<ul style="list-style-type: none"> <li>€/MWh H2 (HHV)</li> <li>Interaction with market required</li> </ul>	✓	Defined
	<b>Volume increment</b>	Minimum quantity of energy that can be traded at one time	0,1 tonH2 per hour	<ul style="list-style-type: none"> <li>MWh H2 (HHV)</li> <li>Interaction with market required</li> </ul>	✓	Defined
	<b>Block orders</b>	Linking several delivery periods together to form a larger order encompassing several hours at the same price.	6 hours at specified price (€/kg H2)	<ul style="list-style-type: none"> <li>Block orders should be allowed</li> <li>Interaction with market required</li> </ul>	✓	N.A.
Market exch. rules	<b>Trading procedure</b>	Set of protocols governing the process of buying and selling energy.	Continuous, auction	<ul style="list-style-type: none"> <li>DA &amp; IDA should be continuous at first</li> <li>Interaction with market required</li> </ul>	✓	✓
	<b>Gate closure time</b>	Deadline for market participants to submit their bids / offers for the next trading period.	12:00pm CET	<ul style="list-style-type: none"> <li>Should be aligned with power/NG markets</li> <li>Interaction with market required</li> </ul>	✓	✓



Port of  
Antwerp  
Bruges

Join us at our webinar presenting the pilot market platform tool by registering through the link below: [Hybex: Pilot Demonstration](#)

Material from previous webinars:

- [HyBex: Hydrogen market design](#)
- [HyBex: Hydrogen market balancing](#)



With the support of the Belgian energy transition fund (ETF)

