Welkom op het online congres ‘Waterstof, the Next Level’

@WaterstofNet

13.30 – 13.40u:

Welkom

Bert De Colvenaer

Voorzitter raad van bestuur WaterstofNet

13.40 – 14.00u:

Perspectieven voor duurzame waterstof in Europa en de Benelux

Diederik Samsom
Kabinetschef Eerste vicevoorzitter van de Europese Commissie
Frans Timmermans

14.00 – 14.20u:

De waterstofbackbone

Yves Vercammen
Transformation Projects Director Fluxys

Waterstof, the next level

Y. Vercammen

Director Transformation Projects

December 7th 2020

shaping together
a bright energy
future

Fluxys: independent midstream gas infrastructure company

Upstream — Transmission — Storage — LNG terminalling — Downstream

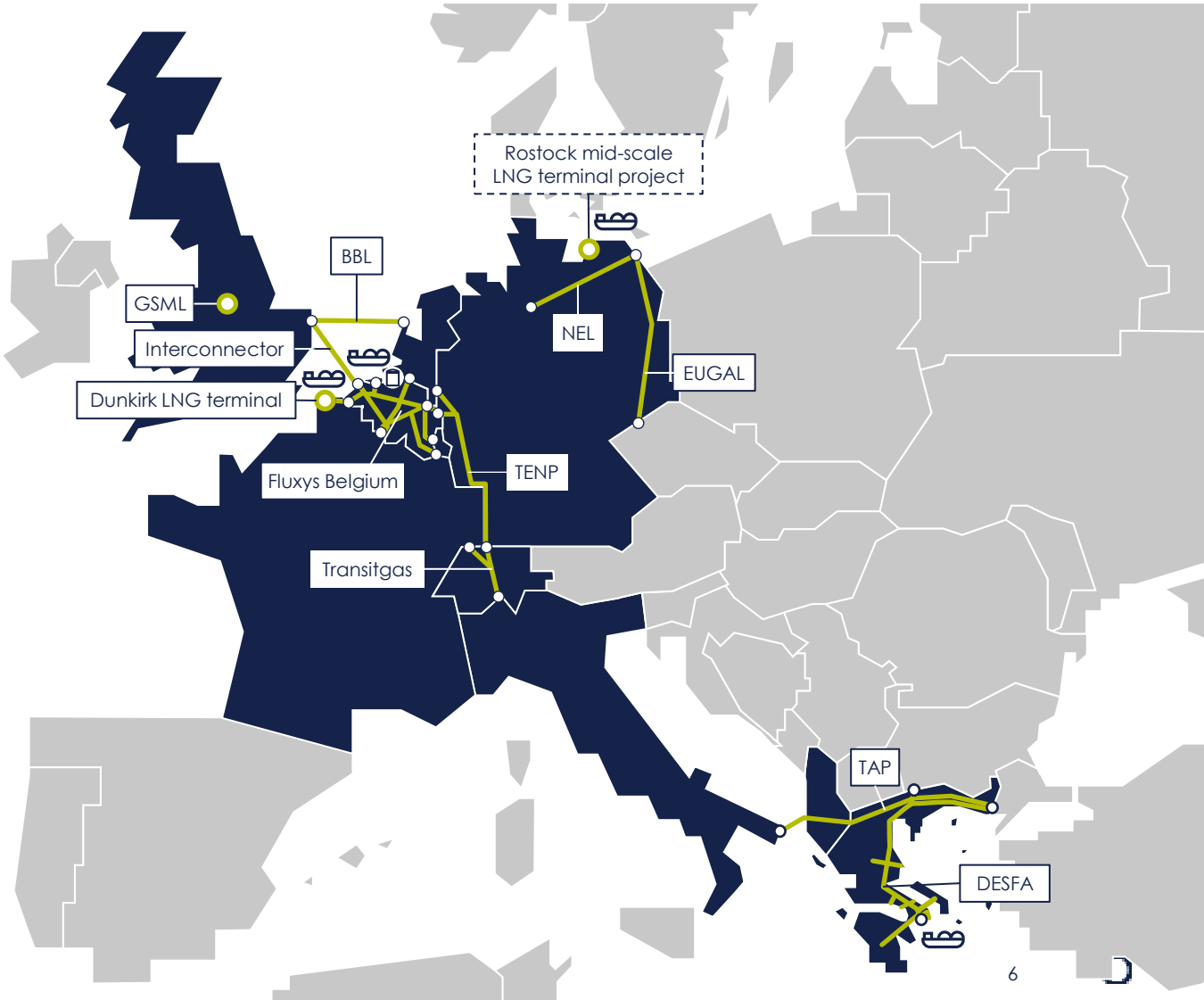
Our strategy: en route for a green tomorrow with investments in Belgium, Europe and beyond

Be the transporter of the future energy carriers

We support biomethane initiatives, invest in hydrogen and CO_2 transport projects and explore new technologies

Be fit and grow in Belgium and Europe

Invest outside Europe

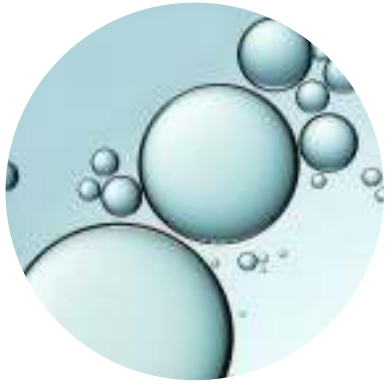


Fluxys partner in many early development projects in Belgium

Biomethane market development

•

Biomethane injection and transmission



Hydrogen market development

•

Power-to-hydrogen & hydrogen transmission and import

Carbon capture and utilisation/storage

•

Carbon transmission

Making the right choices today for a well-balanced energy system is the key to a successful energy transition

A climate-neutral Europe by 2050

A Green Deal for Europe

By 2030: increase the reduction in greenhouse-gas emissions from 40% to 55%

Need for a hybrid energy system: green electricity, green gases and biofuels

EU recovery plan

An investment driver: €750 billion for the recovery of EU Member States – an opportunity to be seized to ensure the energy transition in Belgium

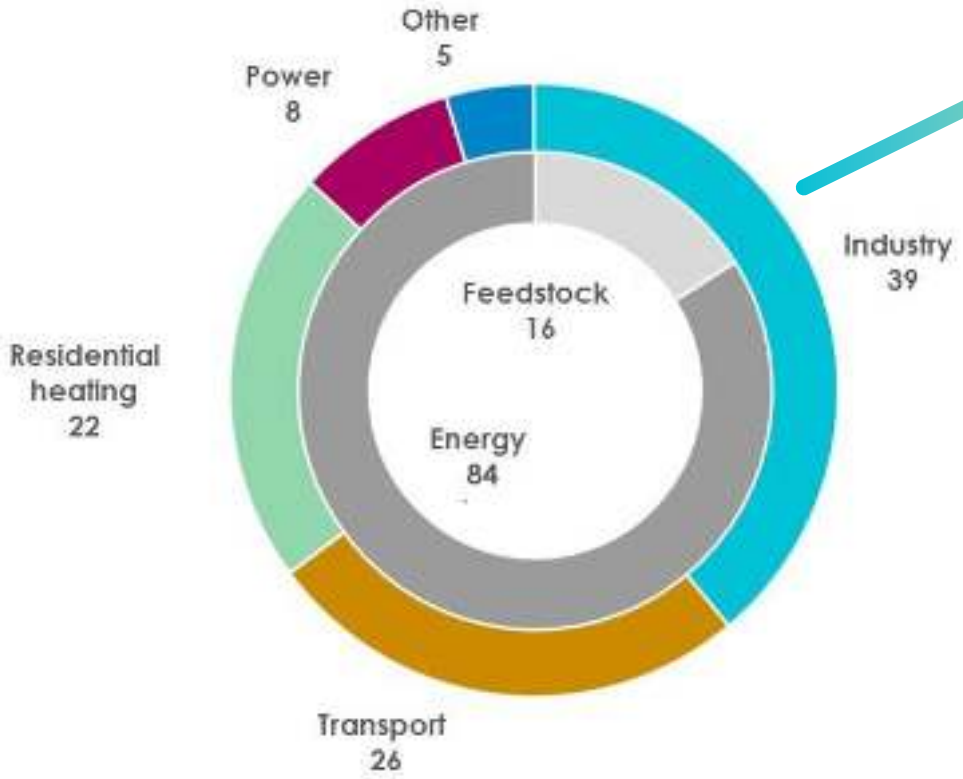
European Green Deal instrumental to sustainable recovery and growth: increasing the production of green electricity, hydrogen and biomethane and making greater use of carbon capture

Industry

Through our contacts and projects: Belgian industry is ready to move forward.

Fluxys is already working on this at full tilt:
let's join forces to step up this new momentum to achieve a carbon-neutral energy system

Achieving Belgium's climate targets requires industry to become carbon neutral : Fluxys is joining forces with industry



Belgium :
100 mt/y CO_2 emissions

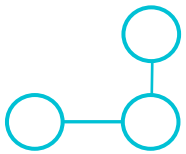
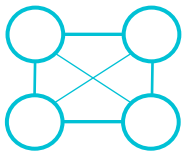
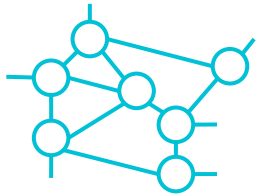
Developing a **hydrogen/CO_2 backbone**

→ enable industry to meet the strong CO_2 emissions reduction objectives, **particularly by targeting sectors requiring alternatives for electricity or with hard-to-abate processes**

→ Re-using infrastructure

→ Integrated / gradual development

In line with European approach to develop hydrogen infrastructure progressively

Local clusters	Connecting clusters	Mature backbone
		
Phase 1 **2020 - 2024**	**Phase 2** **2025 - 2030**	**Phase 3** **2030 onwards**

Leading to an ambitious 2030-2050 vision for our Belgian energy infrastructure

The Belgian hydrogen/CO_2 backbone horizon 2030

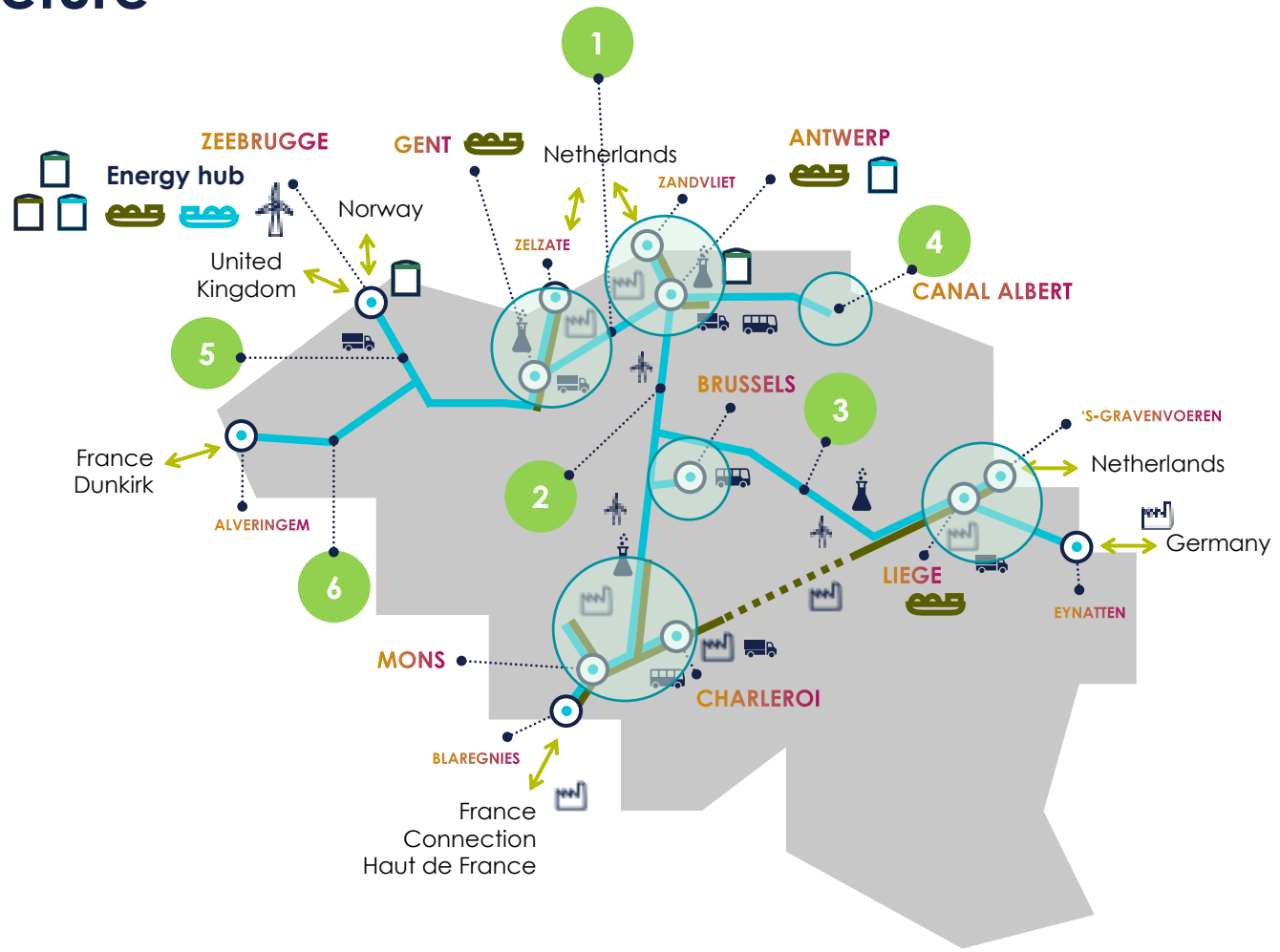
→ develop industry clusters

→ connect and develop clusters

→ provide additional interconnections

→ connect and develop clusters & provide overseas import capacity and additional interconnections

Maximum reuse
Minimal cost for society

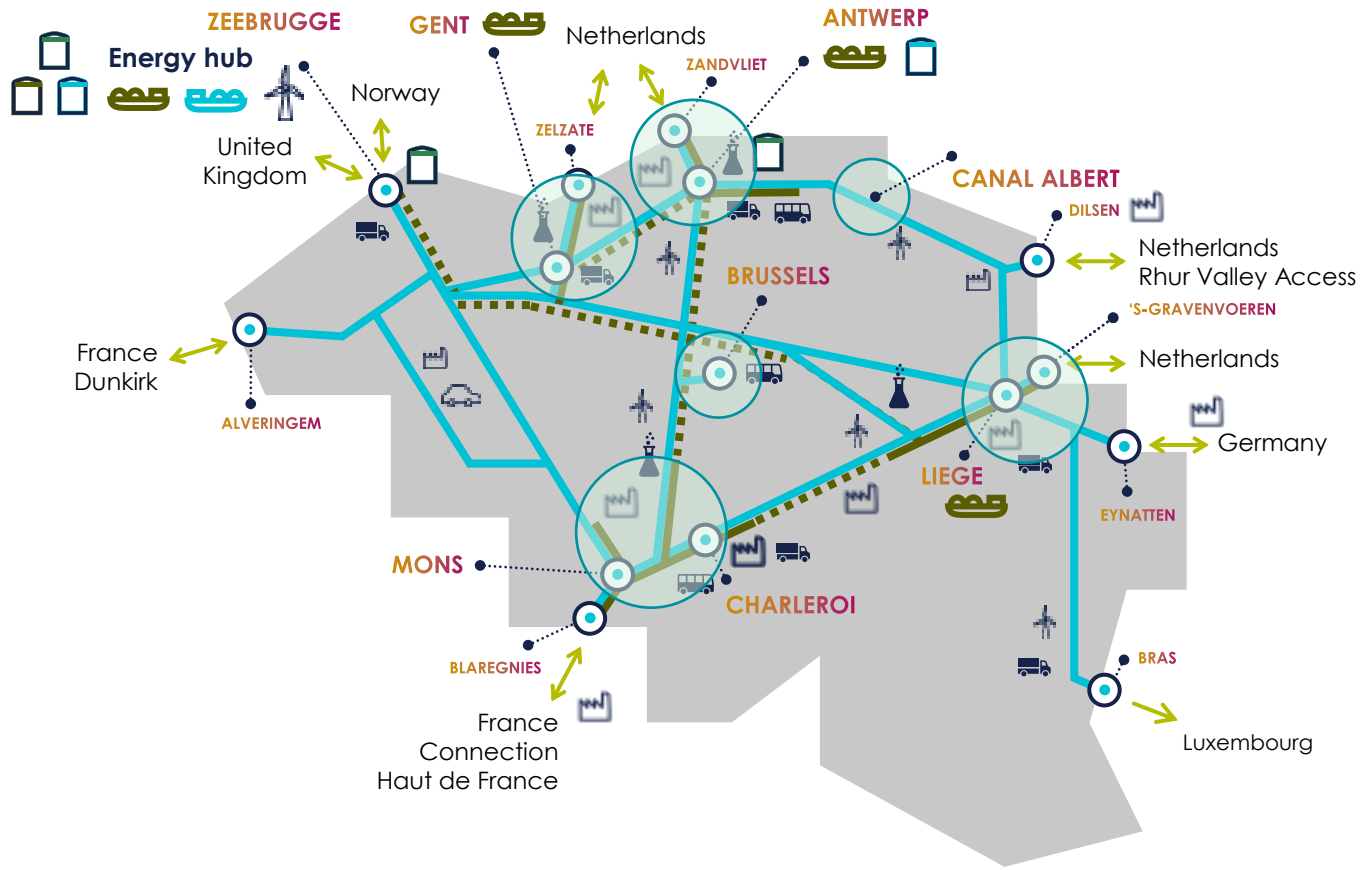


- CH4 storage (liquid / gas)
- CO2 terminalling Buffer storage (liquid)
- H2 terminalling – buffer storage blue hydrogen production
- CO2 overseas export
- H2 import (different carriers)
- H2 pipeline
- CO2 pipeline
- Power-to-Gas (e to H2)
- Local carbon usage (eg. methanation)

Leading to an ambitious 2030-2050 vision for our Belgian energy infrastructure

The Belgian hydrogen/CO_2 backbone: long-term vision horizon 2050

Maximum reuse
Minimal cost for society



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- CO2 overseas export
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- CO2 pipeline
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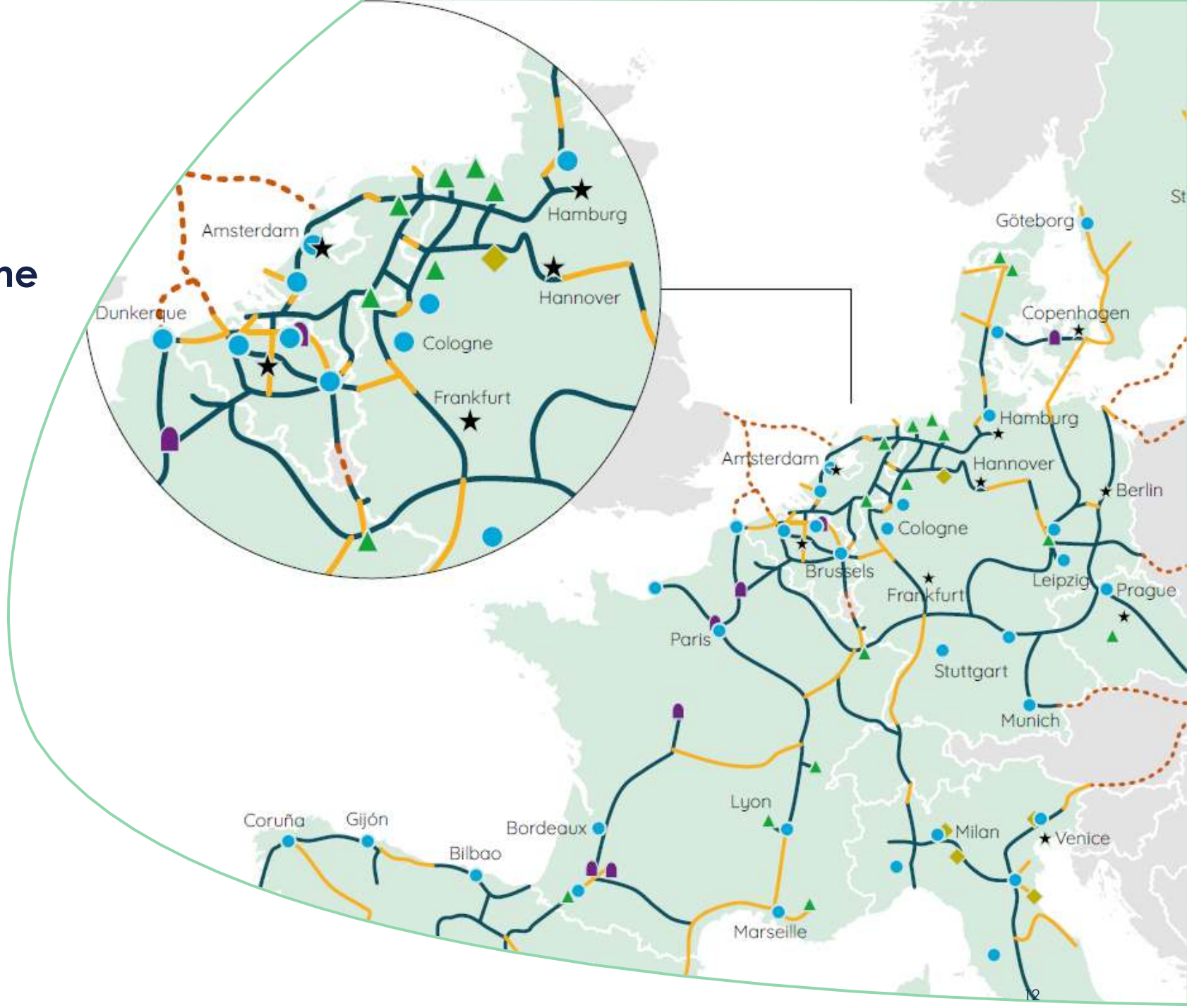
- Local carbon usage (eg. methanation)

As part of an integrated European Hydrogen backbone

- Re-using infrastructure
- Cross-border interconnections
- Import facilities
- Within EU wide regulatory framework

Import hydrogen

Offshore wind: sea + inland pipes
Europe: wind + sun regions: pipe + ship
Outside Europe: import terminals + pipes



In a nutshell

- Carbon neutral molecules will be key part of future energy system
- Fluxys fully committed to the energy transition and accommodating hydrogen
- Integrated Infrastructure approach to support the energy transition is required :
  - Maximising the re-use of infrastructure
  - Gradual buildup
  - Interconnections/import to ensure competitiveness and security of supply
    - Within Europe
    - From outside Europe

shaping together a bright energy future

fluxys


fluxys

14.20 – 14.40u:

Import van waterstof in een havenomgeving

Jacques Vandermeiren

CEO Havenbedrijf Antwerpen

14.40 – 15.00u:

Waterstof voor maritieme toepassingen

Alexander Saverys
CEO CMB

Waterstof voor Maritieme Toepassingen

Congres “Waterstof the next level !”

7 December 2020 – Alexander Saverys

CMB.TECH

Content

- CMB
- CMB.TECH : Hydrogen for the Industry
- Green H2 and NH3 can decarbonize shipping
- H2ICE technology
- CMB.TECH hydrogen projects
- Q&A

CMB BOCIMAR BOCHEM DELPHIS CMB.TECH RESLEA MCA

92 ships

- ✓ 35 Capesize
- ✓ 5 Post-Panamax
- ✓ 2 Kamsarmax
- ✓ 7 Ultramax
- ✓ 27 container ships
- ✓ 9 chemical tankers
- ✓ 2 LR2's
- ✓ 5 H2

CO2 NEUTRAL

CMB.TECH : Hydrogen for the Industry

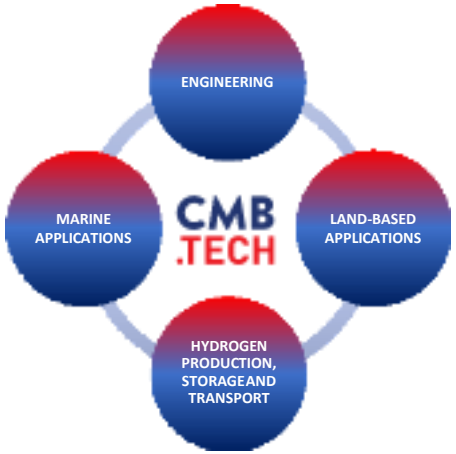
CMB.TECH was founded in 2016 with the development of the **Hydroville**, the world's first hydrogen powered passenger ferry

CMB.TECH's core technology is the **hydrogen internal combustion engine (H2ICE)** :

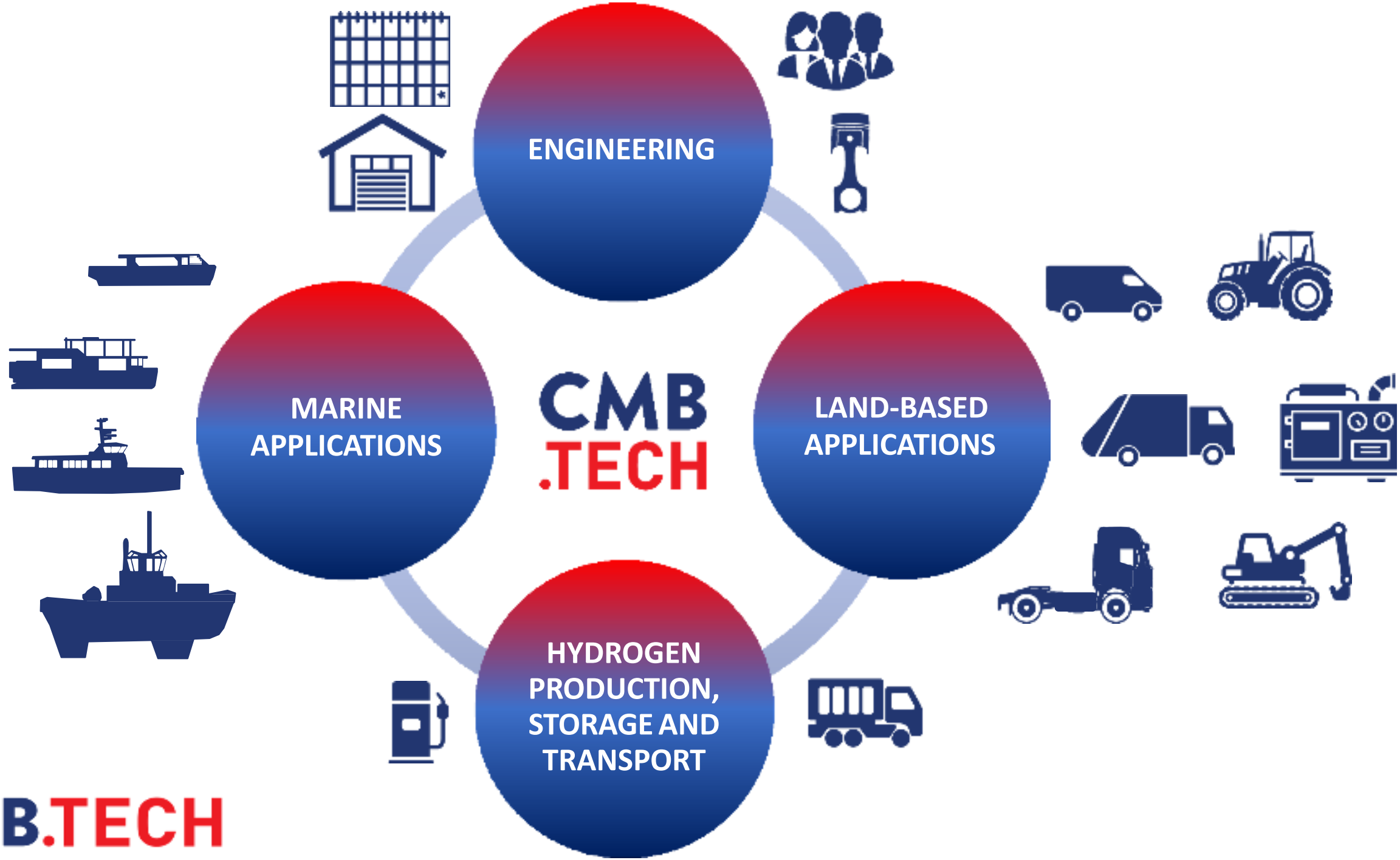
CMB.TECH's team consists of 40 **highly skilled engineers** supported by the commercial, financial and operational teams at CMB

CMB.TECH has offices in **London, Antwerp, Hamburg and Tokyo**

CMB.TECH operates in **4 divisions**



CMB.TECH


ENGINEERING
MARINE APPLICATIONS
CMB .TECH
LAND-BASED APPLICATIONS
HYDROGEN PRODUCTION, STORAGE AND TRANSPORT

CMB.TECH

Engineering team and facilities

25 years of experience as engineering and design team with a proven track record in the automotive industry

15 years of experience in engineering of low carbon solutions

A team of 40 skilled engineers

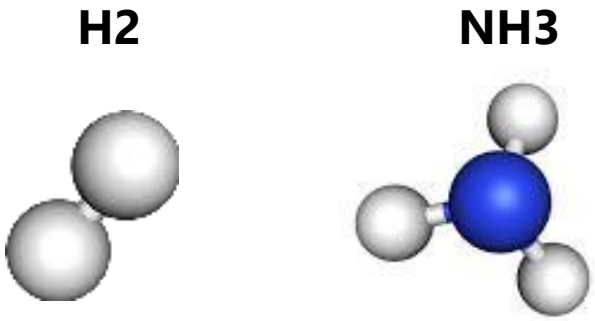
Facilities include:

- Dyno test facilities
- Engine build workshops
- Prototyping
- Electrical & electronics build lab
- Fabrication
- Model studio

CMB.TECH

Green H2 and NH3 can decarbonize shipping

- Green hydrogen (H2) and ammonia (NH3) can decarbonize shipping
- How ?
  - Mass production of green H2/NH3
  - Lower the price of green H2/NH3
  - Develop applications that can use green H2/NH3
  - Develop and lower the cost of H2 storage
  - Develop safety barriers for NH3 (toxicity)

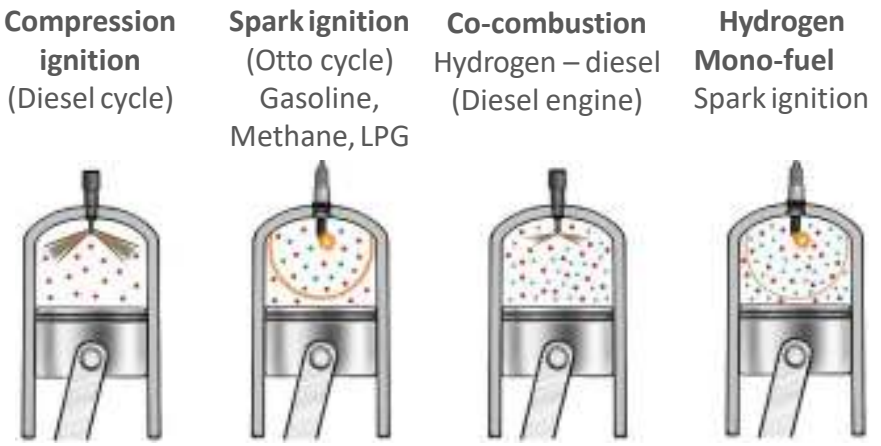


- **CMB's view :**
  - **Compressed hydrogen for smaller ships/applications where frequent refuelling is possible**
  - **Ammonia for larger vessels needing longer range/autonomy**

CMB.TECH

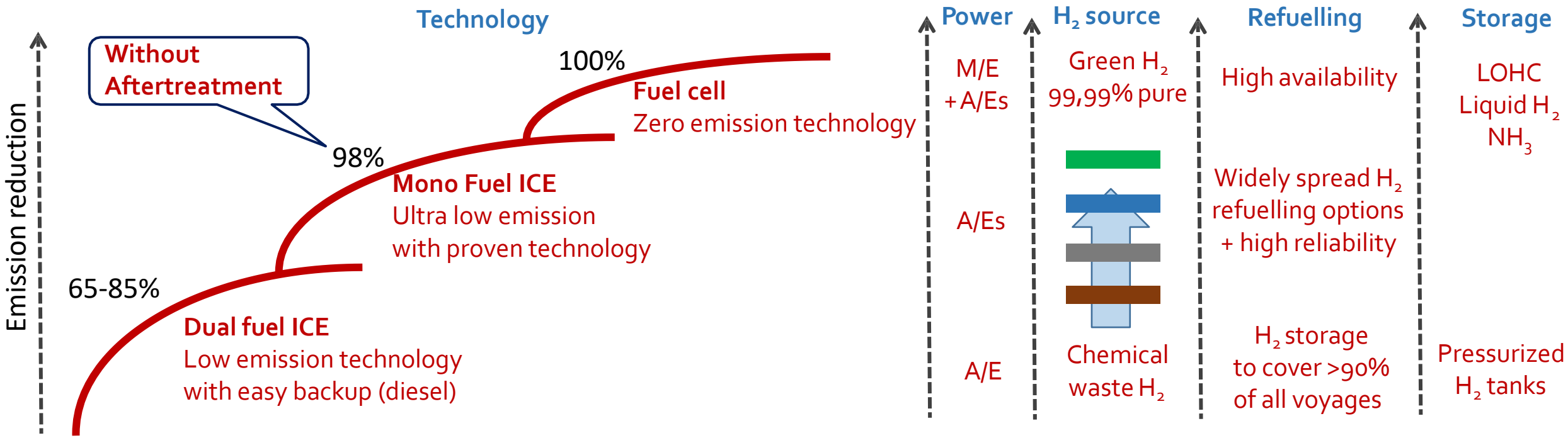
H2ICE technology

- There are two types of Hydrogen Internal Combustion Engines (H2ICE)
  - Dual fuel diesel-hydrogen engines
  - Monofuel hydrogen engines (spark-ignited)
- The H2ICE is a green, reliable and affordable technology
  - **GREEN** : burning hydrogen emits no CO2
  - **RELIABLE** : dual fuel technology allows for 100 % diesel back-up; mono-fuel hydrogen engines are robust, tried and tested technology
  - **AFFORDABLE** : H2ICE is only 10-30 % more expensive than regular diesel engines and much cheaper per kW than hydrogen fuel cells (high speed engines 100 USD per kW vs. 1.000 USD per kW for PEM fuel cells)



CMB.TECH

Heavy industries (such as shipping) require incremental innovation instead of disruptive innovation



➔Dual fuel technology is a first step towards the zero emission goal, while the service can be guaranteed as one always can rely on diesel

CMB.TECH

CMB.TECH hydrogen projects

CMB.TECH

CMB
.TECH

Hydroville

Launched November 2017

Hydroville is the first certified passenger shuttle that uses hydrogen to power a diesel engine.

Launched September 2020

Medium speed engine development

(1-> 2.66MW power range)

Dual fuel H_2-diesel as well as mono fuel H_2

HydroBingo

Delivery Japan Q1 2021

Shuttle (80pax) for the Japanese coastal waters. Powered with 2x 400kW hydrogen diesel combustion engines

Hydrotug

Delivery Q3 2022

Hydrotug is a tractor tug built for the port of Antwerp. The vessel has 2x 2MW hydrogen diesel engines and 400kg of H_2 storage for daily use.

HydroCat

Delivery Q2 2021

Hydrocat is CTV (Crew Transfer Vessel) to be used for offshore wind parks in the North Sea

NH3 Bulker

Delivery China Q3 2023

210.000 dwt bulker powered by dual fuel ammonia-diesel engine

NH3 6.000 TEU

Delivery China Q4 2022

6.000 TEU ice class 1A high reefer container ship powered by dual fuel ammonia-diesel engine

Mobile shore power solution

In tendering with Port of Rotterdam

A BeHydro medium speed gen-set will be used to supply a large sea going ship with clean shore power.

Hydrogen Power Barge

Concept study ongoing

Mono fuel BeHydro gensets and hydrogen storage are installed on a barge to provide clean energy to ships. The barge can also be used for refuelling.

H2 freight locomotive

Feasibility phase

A 1MW freight locomotive will be retrofitted with 30kg of hydrogen storage to reduce emissions

Maritime & public H_2 Refuelling Station

Delivery Q1 2021

CMB is developing the first maritime & public H_2 refuelling station which is equipped with a 1.2 MW PEM electrolyser and 500bar tube trailer filling station

A unique combination of a public and marine refuelling station

H2 fuelled tractor

Launched October 2020

CMB.TECH has developed a hydrogen powered tractor together with Blue Fuel Solutions and New Holland

Green NH3 production facility

Concept study

Construction of a 1,000,000 tonnes green NH3 plant, 200 MW electrolyser and H2 powered back-up generator unit in Namibia

CMB.TECH

Alexander Saverys
CEO CMB
alexander.saverys@cmb.be

CMB.TECH
De Gerlachekaai 20
2000 Antwerp, BE
T: +32 3 247 59 11
www.cmb.tech
enquiries@cmb.tech

15.15 – 15.45u:

Waterstofproductie via elektrolyse

Piet Berens

Managing Director Cummins-Hydrogenics

Pascal Juéry

CEO Agfa

Waterstof productie via elektrolyse

Piet Berens, Managing Director
Cummins - Hydrogenics

'Waterstof, the next level' - Online congres
Waterstof Industrie Cluster, 30 Nov 2020

CUMMINS WATERSTOF

Technologieen

- Alkaline Electrolysis
- PEM Electrolysis
- Solid Oxide Fuel Cells
- PEM Fuel Cells
- Hydrogen storage tanks

- Recente **acquisities en samenwerkingen**

- General Electric (US)
- Hydrogenics* (Belgie, Duitsland, Canada)
- MOU with Hyundai
- Loop Energy (Canada)
- JV with NPROXX (Duitsland)

**Air Liquide is aandeelhouder voor 19% van*

WATER ELECTROLYZERS : PRODUCT LINE

	Alkaline			PEM (Proton Exchange Membrane)		
						
	HySTAT®-15-10	**HySTAT®-60-10**	**HySTAT®-100-10**	**HyLYZER® -500-30**	**HyLYZER® -1.000-30**	**HyLYZER® -4.000-30**
Output pressure	10 barg (27 barg optional)			30 barg		
Design	Indoor/outdoor	Indoor/outdoor	Indoor/outdoor	Indoor/outdoor	Indoor	Indoor
Number of cell stacks	1	4	6	2	2	8
Nominal hydrogen flow	15 Nm^3/h	60 Nm^3/h	100 Nm^3/h	500 Nm^3/h	1.000 Nm^3/h	4.000 Nm^3/h
Nominal input power	80 kW	300 kW	500 kW	2.5 MW	5 MW	20 MW
AC power consumption (utilities included, at nominal capacity)	5.0 to 5.4 kWh/Nm^3			≤ 5.1 kWh/Nm^3	DC power consumption: 4.3 kWh/Nm^3 ± 0.1 (at nameplate hydrogen flow)	
Turndown ratio	40-100%	10-100%	5-100%	5-100%	5-125%	
Hydrogen purity	99.998% O2 < 2 ppm, N2 < 12 ppm (higher purities optional)			99.998% O2 < 2 ppm, N2 < 12 ppm (higher purities optional)		
Tap water consumption	<1.4 liters / Nm^3 H2			<1.4 liters / Nm^3 H2		
Footprint (in containers)	1 x 20 ft	1 x 40 ft	1 x 40 ft	2 x 40 ft	(LxWxH) 8.4 x 2.3 x 3.0 m	20 x 25 m (500 m^2)
Utilities (AC-DC rectifiers, reverse osmosis, cooling, instrument air, H2 dryer)	Incl.	Incl.	Incl.	Incl.	Optional	Optional

CURRENT DEVELOPMENT
2,5 MW PEM CELL STACK

1

MW Scale Electrolyzer Stack

3.0 MW industry benchmark

2

Reduction of Plant Capital Costs

Achieved target system cost

3

Stack Efficiency Improvements

Leading industry performance

	1500E cell stack (high)	1500E cell stack (small)
Nominal input power (Max)	**2,5 MW** (3 MW)	**1,25 MW** (1,5 MW)
Nominal H2 flow (Max)	**500 Nm³/h** (620 Nm³/h)	**250 Nm³/h** (310 Nm³/h)
Operating pressure	30 barg	30 barg

4

Fast Response and Dynamic Operation

Key requirement established

5

Very compact

Lowest footprint on the market

6

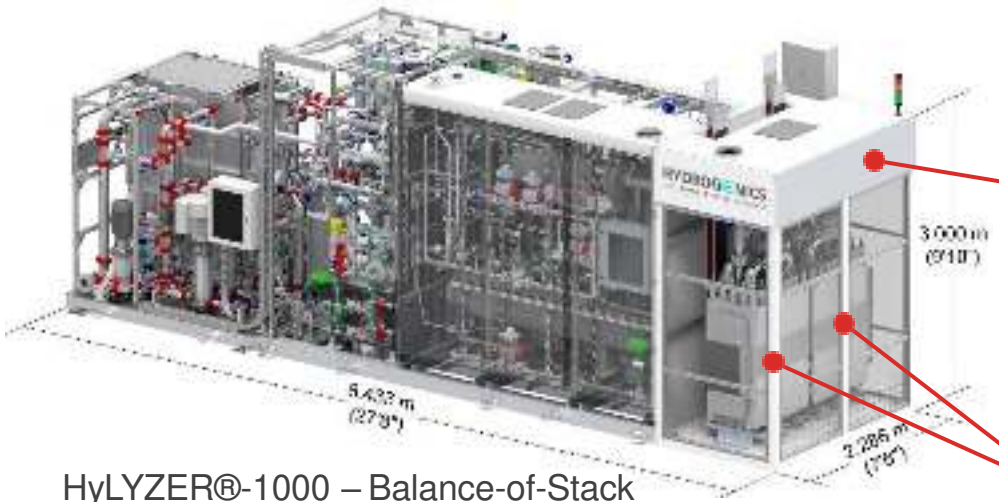
Reduced Maintenance

Limited and optimized

HyLYZER® 200/300/400/500-30

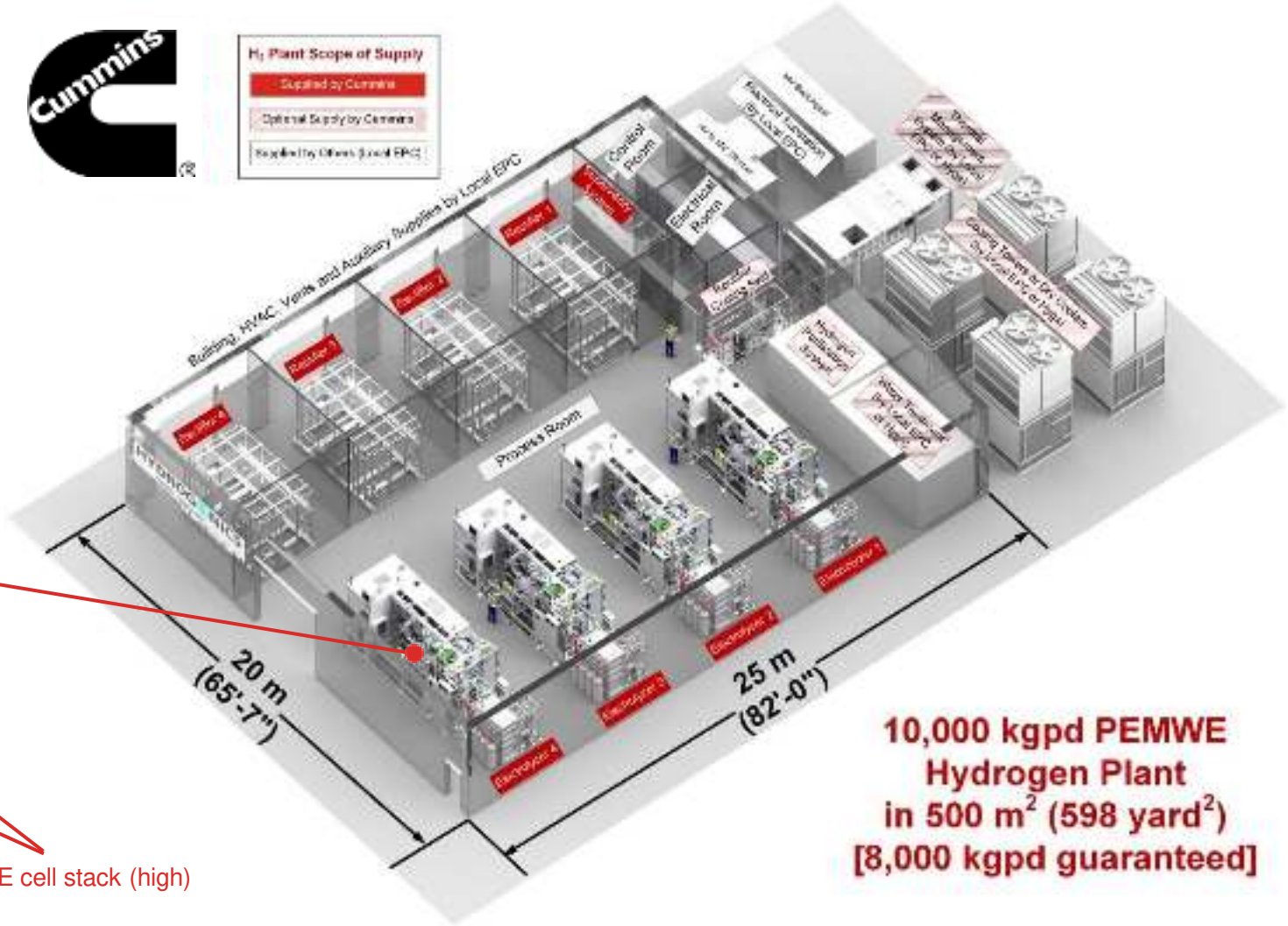
Dual stack platform (up to 2 cell stacks of 250 Nm³/h)

SCALABLE PRODUCT PLATFORM
8,000 KG/DAY / 20MW / 4X HYLYZER®–1000

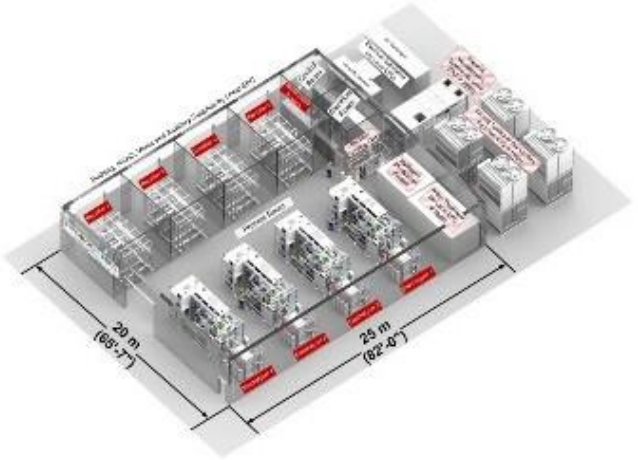


HyLYZER®-1000 – Balance-of-Stack
1000 Nm³/h (~5 MW) in total

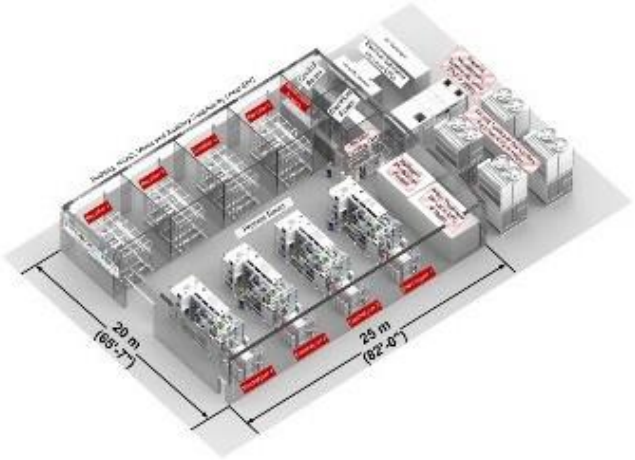
2x 1500E cell stack (high)



10,000 kgpd PEMWE
Hydrogen Plant
in 500 m² (598 yard²)
[8,000 kgpd guaranteed]



Air Liquide Becancour, Canada
HyLYZER® 1000-30 - indoor



Air Liquide Becancour, Canada
HyLYZER® 1000-30 - indoor

IPCEI ‘GW FAB’
PEM WATER ELEKTROLYSE IN VLAANDEREN

- Cummins is **wereldleider in waterelektrolysesystemen** en heeft vandaag zijn belangrijkste productiesite in **Vlaanderen** (Oevel)
- Cummins heeft een ambitieus **IPCEI-projectvoorstel** ingediend bij de BE-autoriteiten voor de oprichting van een GW-fabriek voor PEM-elektrolyzers in de **haven van Antwerpen (NextGen District)**
- Voor zijn groei in binnen- en buitenland **zoekt Cummins talenten**, voornamelijk technische profielen
- Cummins verwacht **positieve rendementen voor Vlaanderen en spillovereffecten** op de hele waterstofwaardeketen
- Maar er is een sterke **trend in Europa naar lokale productie**: "Made in my Country"

- Een duidelijke waterstofstrategie in België / Vlaanderen ontbreekt ter ondersteuning van:
  - de ontwikkeling van de lokale markt voor waterelektrolyse-apparaten
  - de exportmarkt voor waterelektrolyzers (zie 2 B € in Duitsland)
  - de import van waterstof geproduceerd in het buitenland met Vlaamse technologieën (cf. Waterstof import coalitie)

WIE IS CUMMINS?

Engines

Power generators

Electrification

Hydrogen & Fuel Cells

190
Actief in landen

61.6K
Werknemers wereldwijd

1.4M+
Motoren geproduceerd in 2019

8K
Distributor & dealer locaties

$1B
Investering in ontwikkeling en innovatie in 2019

100 jaar
of industrie leiderschap

*

CUMMINS IN EUROPA

11	Productie
18	Distributie en Dienst na Verkoop
300	Dealers
7,000	Werknemers
€70m	R&D in Europa , gemiddeld per jaar
€3.63bn	Goederen per jaar gemaakt in Europa

CUMMINS IN BELGIE

Cummins Global Logistics
Rumst

Hydrogenics Europe
Oevel

Cummins Mechelen
Mechelen

MAIN HYLYZER® REFERENCES

Power-to-Gas

1,5 MW, WindGas Reitbrook, Germany

Power-to-Power

1 MW, P2P EGAT, Thailand

Power-to-Fuels

1 MW, MEFCO2, Germany

Power-to-Mobility

Power-to-Industry

1,2 MW, HyBalance, Denmark

Power-to-Gas

Power-to-Mobility

2,4 MW, Wind to Gas Energy, Germany

Power-to-Gas

2,5 MW, Markham Energy Storage, Canada

THANK YOU

AGFA


the art of
taking
pictures
AGFA
Agfa

AGFA


ZIRFON
H2 ADVANCED2
AGFA
Agfa


€
Vlaanderen
is ambitieus
European Clean
Hydrogen Alliance
Kick-starting the EU Hydrogen Industry to
achieve the EU climate goals
AGFA
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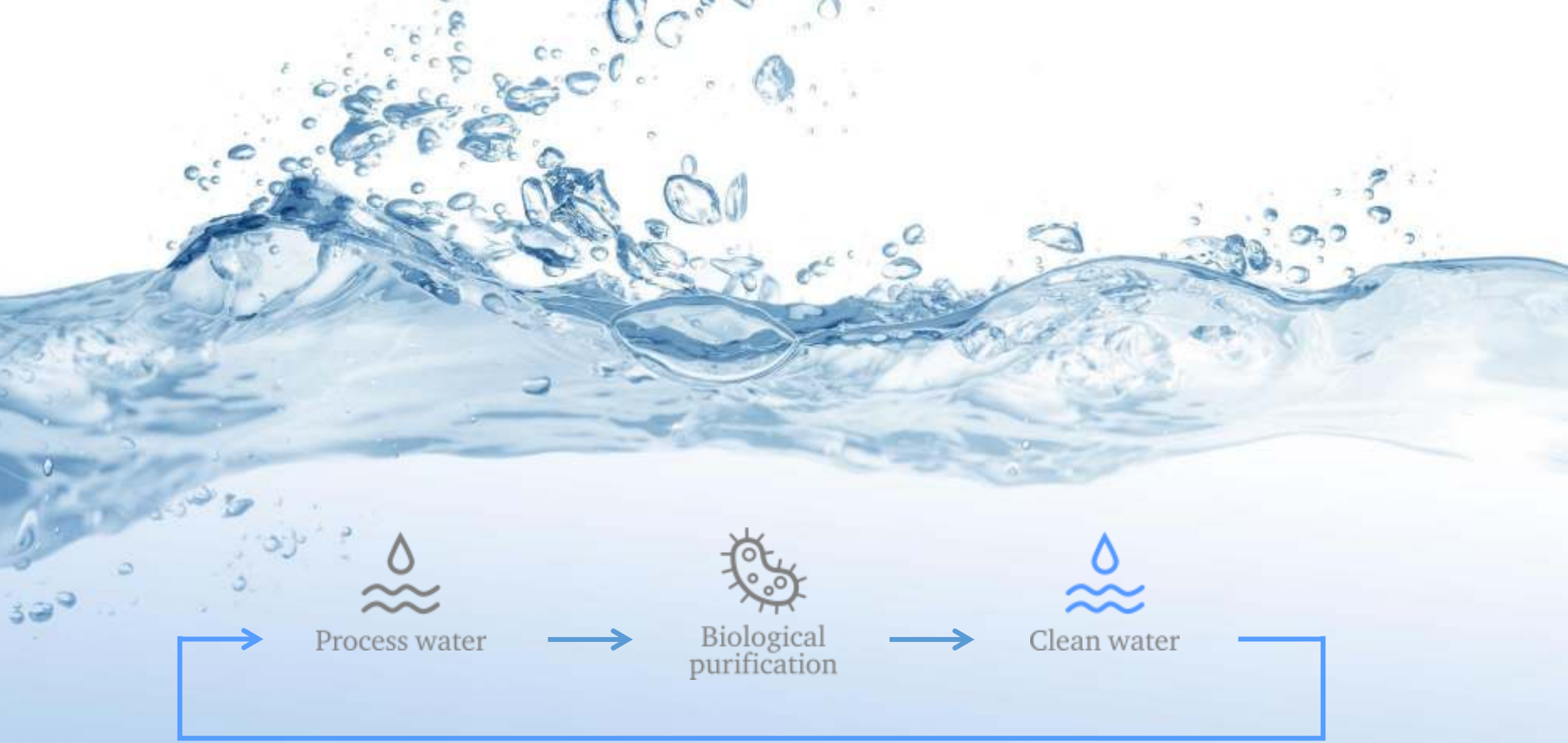
Process water
Biological purification
Clean water


AGFA
Agfa
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15.45 – 16.05u:

Project Hytrucks

Diederick Luijten

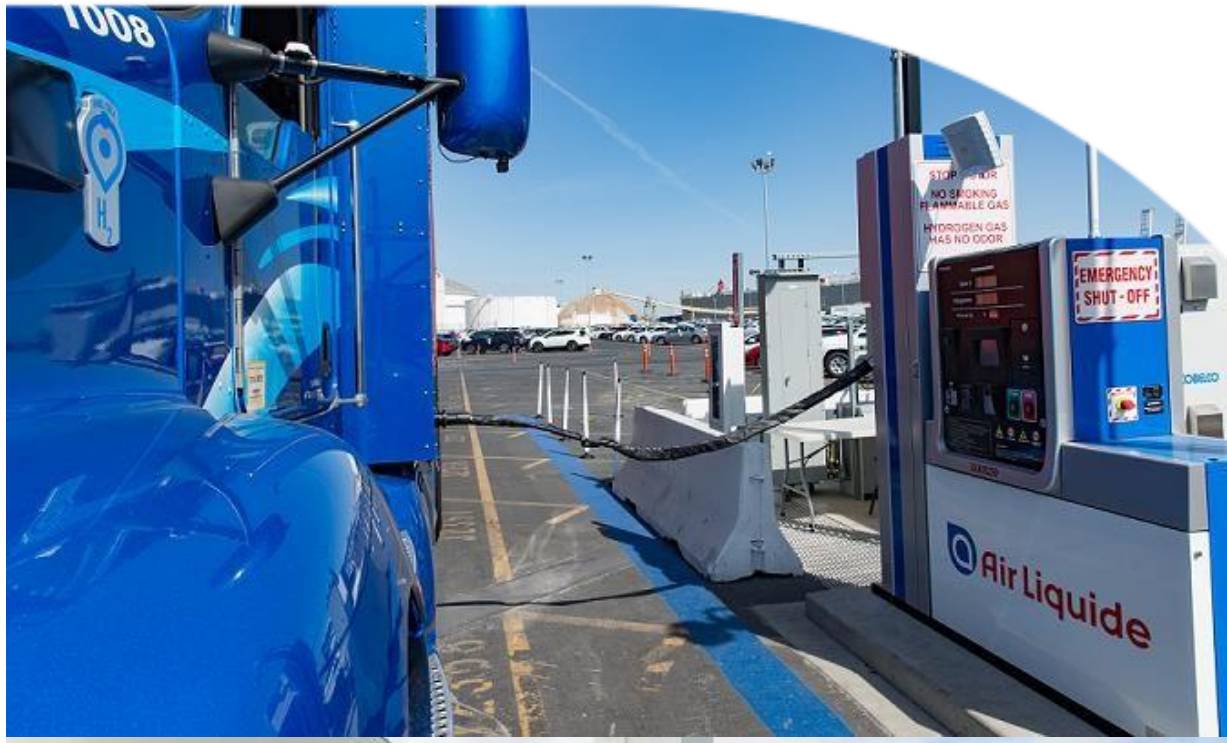
Vice President Hydrogen Energy Air Liquide

Air Liquide
creative oxygen

WATERSTOF INDUSTRIE CLUSTER

HyTrucks

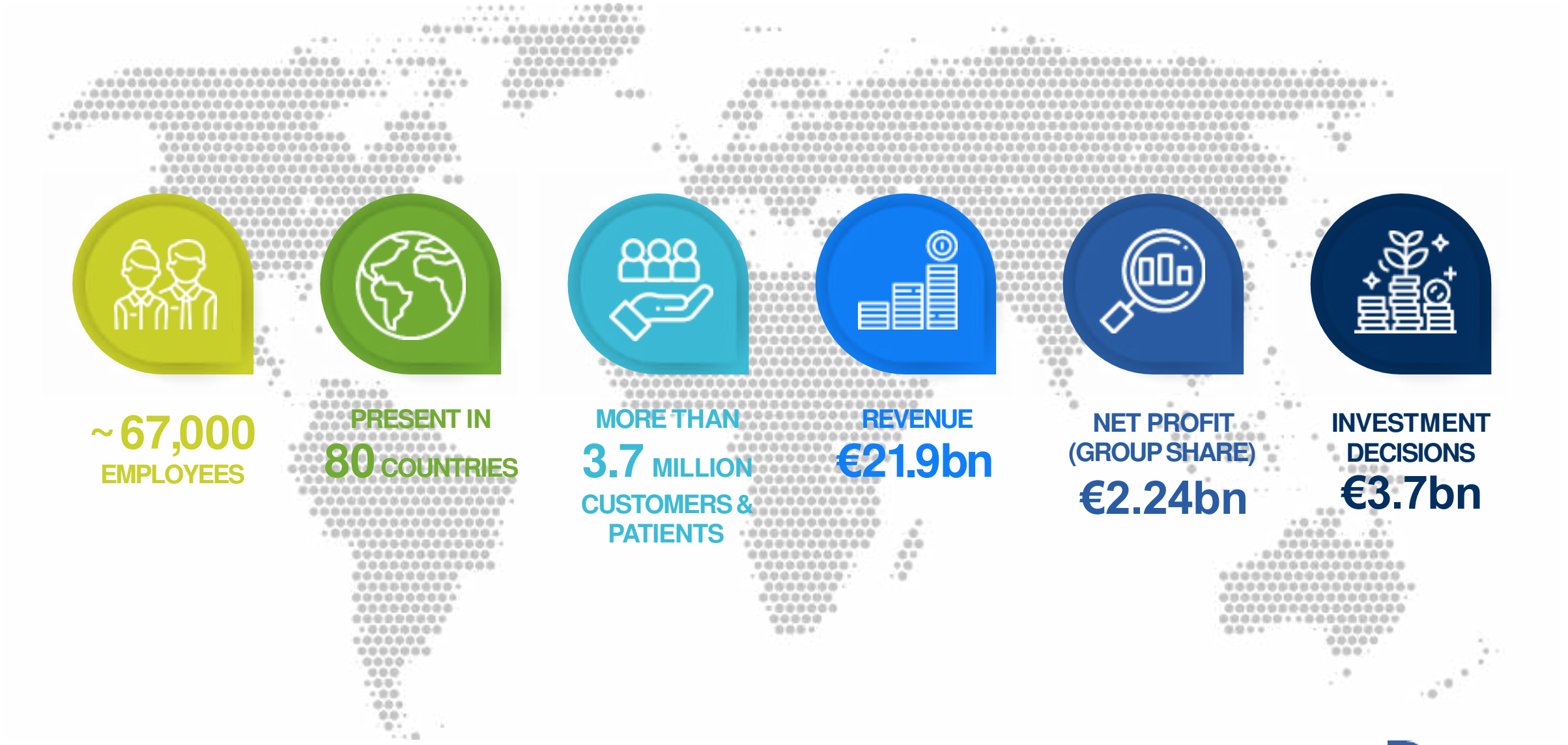
WaterstofNet



Building the European clean heavy-duty transport market

H2E

Key figures of the Air Liquide Group 2019



~67,000
EMPLOYEES

PRESENT IN
80 COUNTRIES

MORE THAN
3.7 MILLION
CUSTOMERS & PATIENTS

REVENUE
€21.9bn

NET PROFIT (GROUP SHARE)
€2.24bn

INVESTMENT DECISIONS
€3.7bn

Group revenue at €21.9bn

2019 figures

96% **GAS & SERVICES**

Industrial Merchant
Large Industries
Healthcare
Electronics
H2 Energy

ENGINEERING & CONSTRUCTION **1%**

Air Separation Units
Hydrogen and CO production units
Technologies

GLOBAL MARKETS & TECHNOLOGIES **3%**

Markets:
Energy transition (H2E, biomethane…)
Deep tech

Significant growth potential for the near future

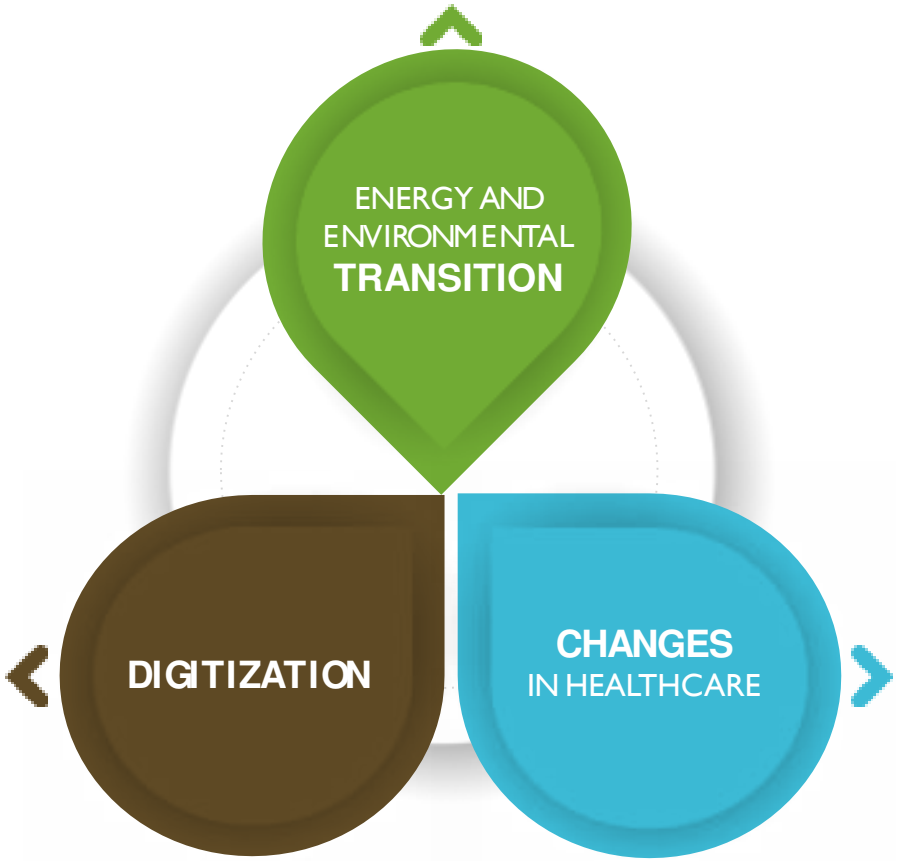
Air Liquide

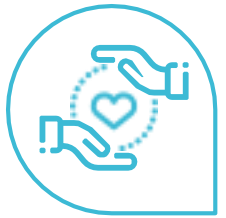
Our ambition

Major Trends are Shaping our Markets

- Global warming
- Degradation of air quality
- Natural and energy resource constraints
- Increasing environmental concerns

- Development of connected devices and infrastructures that can store massive amounts of data
- New needs and new usages (new ways of living, working, traveling, communicating, etc.)



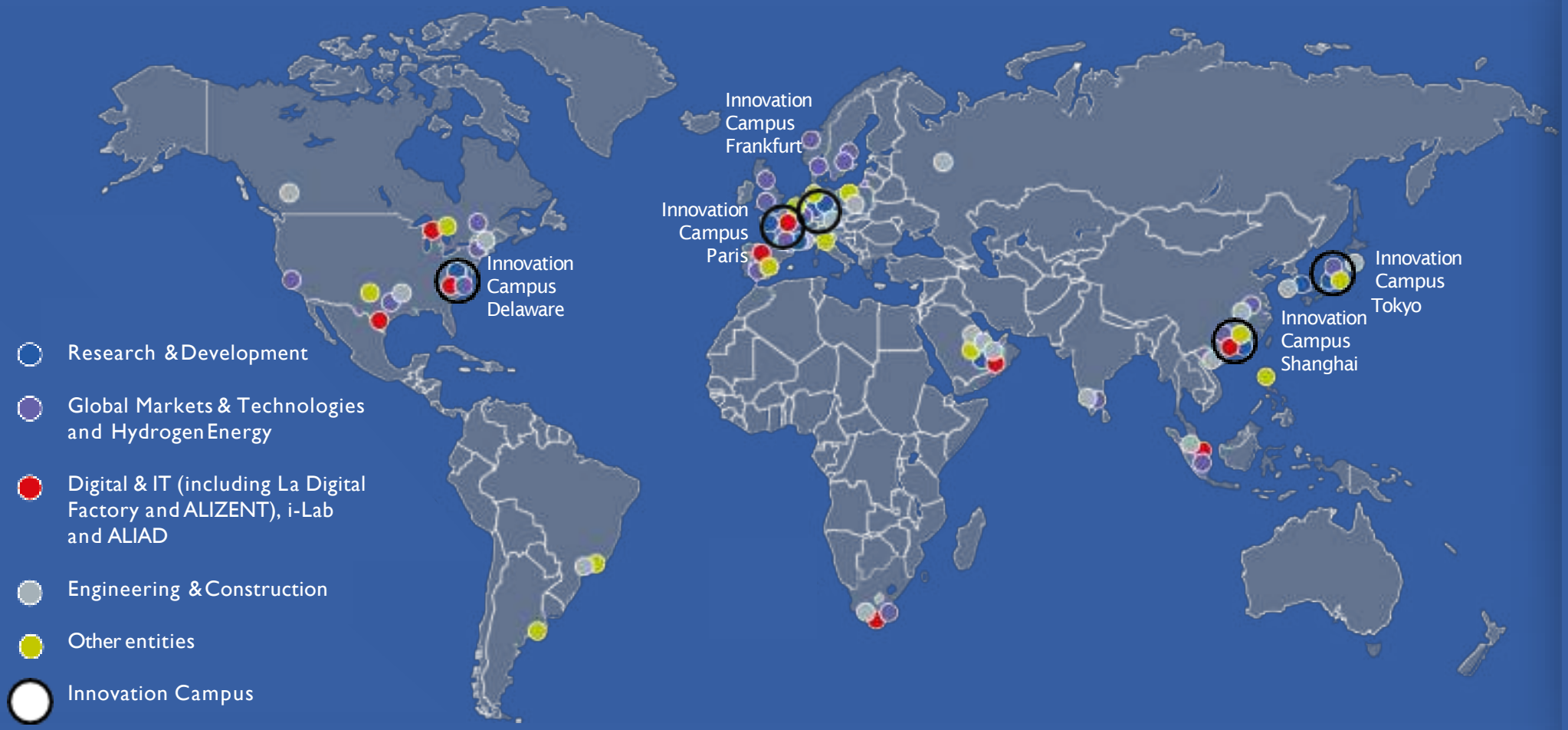


- Longer life expectancy
- Increase in chronic diseases
- Increasing demand for hygiene products
- Growing demand for medical treatment
- Evolution of healthcare systems
- Increasing importance of health and well-being

Air Liquide

An Innovative Group

Innovation is at the heart of the Group's customer-centric transformation strategy



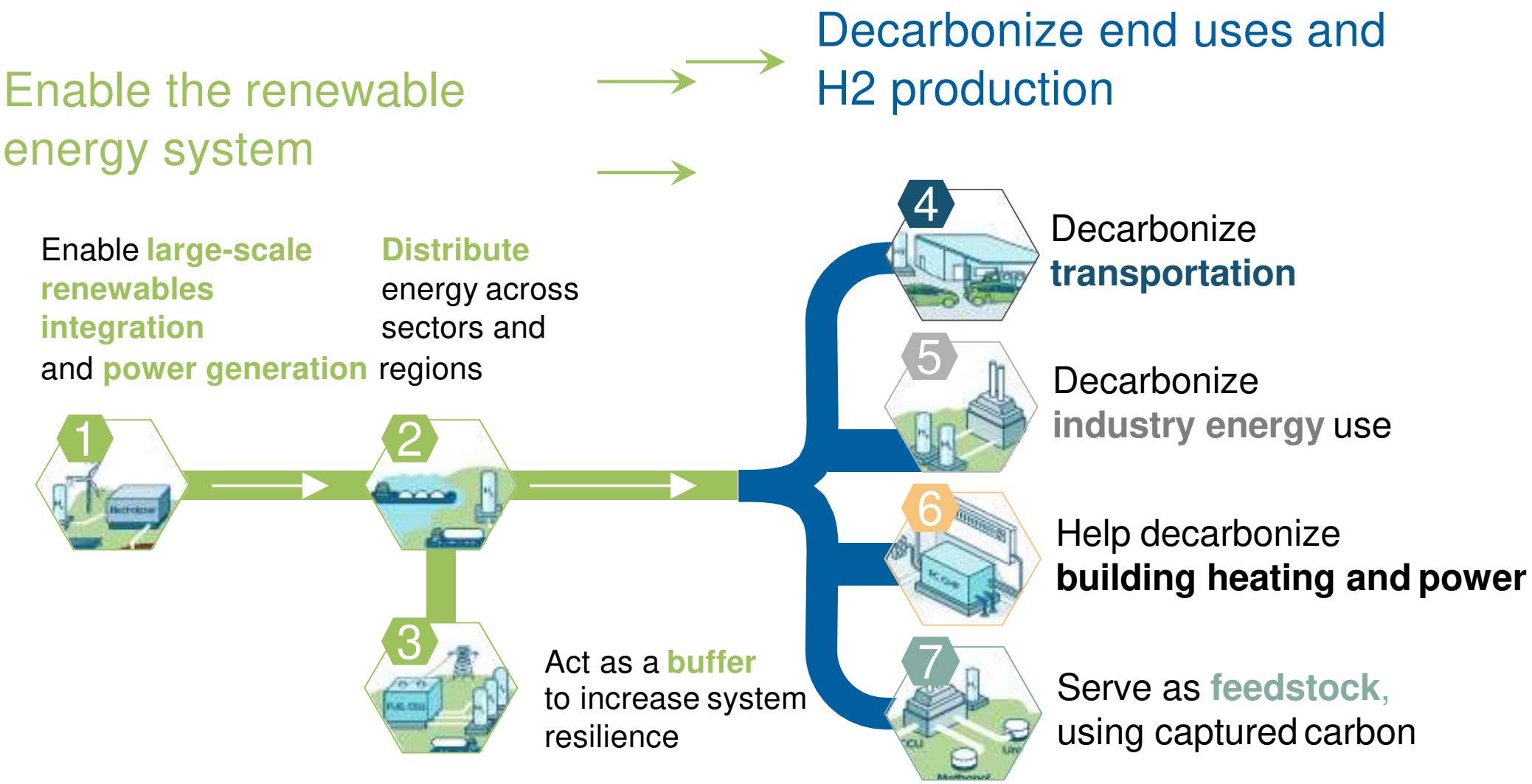
330
new patents filed in 2019

4,300
employees (1) contribute to innovation

€317m
innovation expenses (1)

(1) 2019 Figures OECD Definition.

Air Liquide: mastering all seven roles for hydrogen in the energy transition



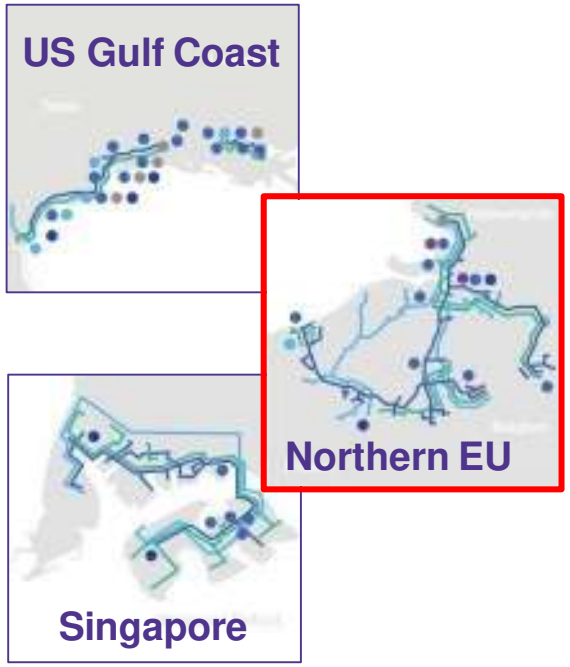
40+ years of development in Hydrogen for our customers

Production & Supply chain

Production

Supply-chain

Distribution Networks



Markets Segments

Process industries

Oil & Gas

Steel, Glass

Electronics

Mobility

Space

Key Figures

- > 14 bn m^3/yr
- > 1,850 km H_2 pipeline
- > 46 large H_2/CO plants
- > 40 electrolysers in operation
- > 2 bn € sales

HyTruck

The European Zero Emission truck market failure

- **European heavy-duty market:** 300k new registrations per year, 20% of EU transport-related GHG emissions

- **Strong pressure for CO2 emissions reduction:**
  - EU regulation reduction targets: -15% CO2 in 2025, -30% CO2 in 2030
  - 2030 target impossible to meet without ZE trucks (Daimler estimate: 10k FC trucks, Iveco estimate: 30k ZE trucks), but the high fines could be fatal to OEMs
  - Low emissions zones enforced all over Europe, clear national ambitions
  - Societal pressure on transport pollution

- **Strong demand from customers for greener road transport**
  - Need of transport companies for a ZE solution meeting their operational requirements
  - Shippers and end-users are eager to lower the carbon footprint of their operations

- However, there is currently **no offer from European OEMs for ZE heavy-duty trucks** (high market entry cost, large technical and value chain challenges)
- **No consensus** on refueling technical solution (350/500/700b, LH2, refueling protocol)

HyTrucks in one view - first phase

- **Purpose:**
  - Lower CO2 emissions in heavy duty transport sector
  - Help to reach GHG objectives in 2030
  - Shift from diesel to hydrogen
  - Make hydrogen tractors commercially viable for transport companies asap
  - **In and between Ports of Rotterdam, Port of Antwerp, Port of Duisburg**
- **Benefits**
  - Construction of renewable power generation
  - Production of blue or green hydrogen for the transport sector
  - Roll-out large scale modern hydrogen tractors
  - Build HRS infrastructure for HDV, but also for buses, rigid trucks, LCV and harbor handling equipment
  - Scalable to all other major logistics hubs
- **Countries first phase: Netherlands, Belgium, Germany**

1000

Blue and green

Heavy Duty HRS

>50 companies

CCS
Wind / Solar

-117 KT/a

Why the HyTrucks project?

- **The market failure for ZE heavy-duty trucks will be addressed with H2**
  - BEV is not an option for heavy-duty applications (range limited to ~200km, limited payload, poor operational flexibility)
  - FC trucks are widely recognised as the solution to ZE trucks
- **Location: North-Western Europe ports are ideal (start and incubators)**
  - The first FC truck fleets will very probably be deployed in the Netherlands (ambitious emissions reduction targets, strong political and societal push for H2 with associated subsidies)
  - In the Netherlands, the first FC trucks should come in the Port of Rotterdam: clear local plan to reduce emissions (windmills to come), large semi-captive fleets with intensive usage, H2-favourable (plans for their own H2 pipeline network)
  - There is already a strong hydrogen infrastructure between Port of Rotterdam and Antwerp
- **The proposed scheme is suited to all major EU ports -> replication & scale-up**
  - Rotterdam: major hub and in close connection with Antwerp
  - Rhine river ports: very favourable political context, major hubs, close connection with Rotterdam
- **The timing is favourable**
  - 2025 target achievable, IPCEI scheme scale-up opportunity, **The project touches R&D and Innovation, First Industrial Deployment of H2 tractors and contributes strongly to Energy, Environment and Transport.**
    German subsidies for FC trucks, first small demos already running

HyTrucks: a large consortium to align interests and de-risk the project.

A full system approach

OEMs & component suppliers:

Truck R&D and First Industrial Deployment (large scale)

Transport companies: from Demo to large scale utilisation

Customers for the trucks and H2

Industrial gas companies, Technology companies, Stations operators & Fuel retailers:

Scale-up Blue / Green hydrogen production, HRS R&D, Innovation, dvt, construction, operation and land provision

Other sponsors

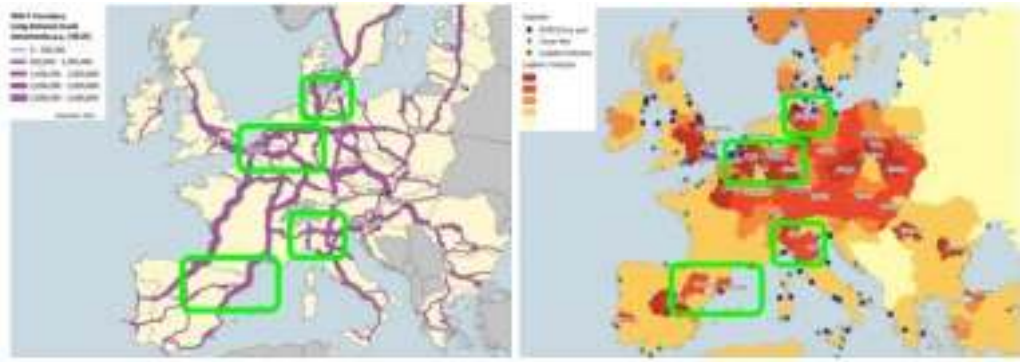
Shippers:
Engagement to green their operations via contract with transport companies

Financers (public and private)

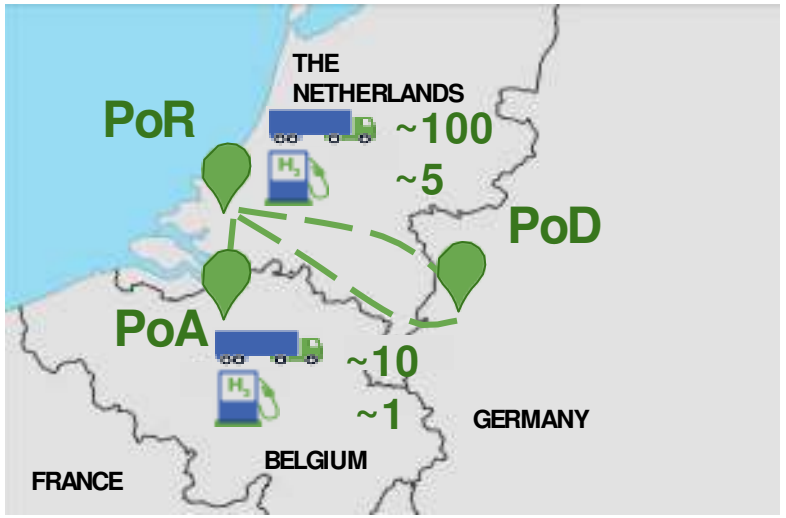
Local, national and EU authorities
Including the portauthorities; local planning, permitting, funding, political support

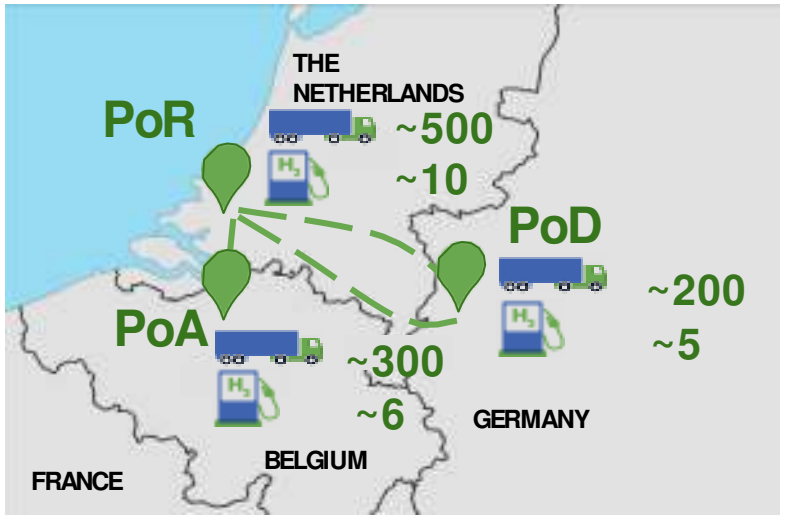
Planning & realisation | H2E | Clean H2 production, Storage & distribution | Compon ent suppliers | HRS construc tion | Retailers | HyTrucks | HRS / operation | OEM | Transport companies | End user/ shipper | Financing / subsidy

HyTrucks deployment phasing From PoR/PoA/PoD to Europe



2022 → 2023 → 2025

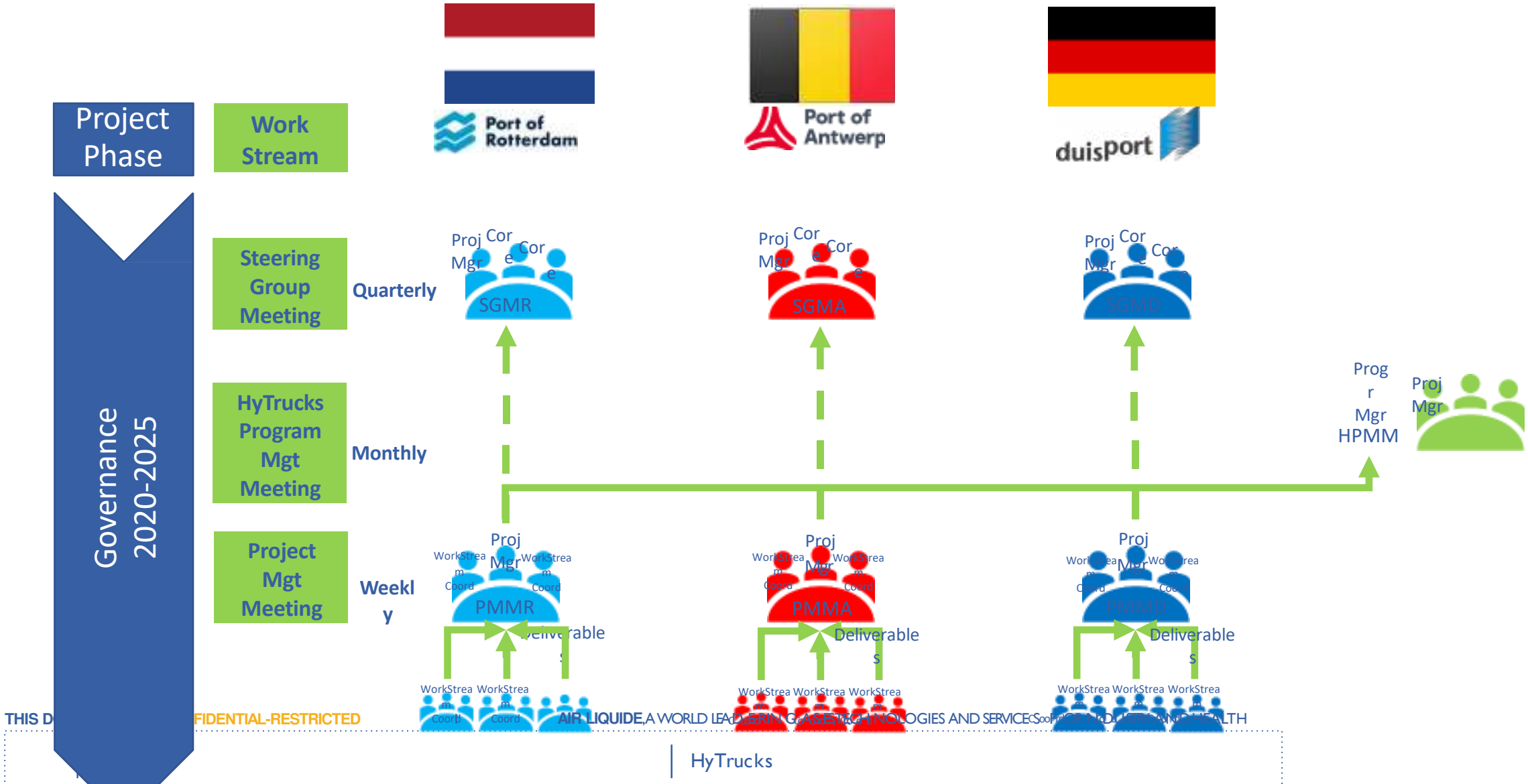




PoR = Port of Rotterdam
PoA = Port of Antwerp
PoD= Port of Duisburg

+ complementary refueling infrastructure at key locations on main corridors

3 countries, 3 consortia, 1 project!



Timeline

HyTrucks

Mid 2020
IPCEI submission
PDA signature
Appointment of project manager

Mid 2020 - End 2022
Project development phase:
elaboration of business model and financial structure, elaboration of technical solution, prototyping and testing planning, permitting & certification pre-assessment contracts

2023 - 2025
Manufacturing, Construction and Deployment phase

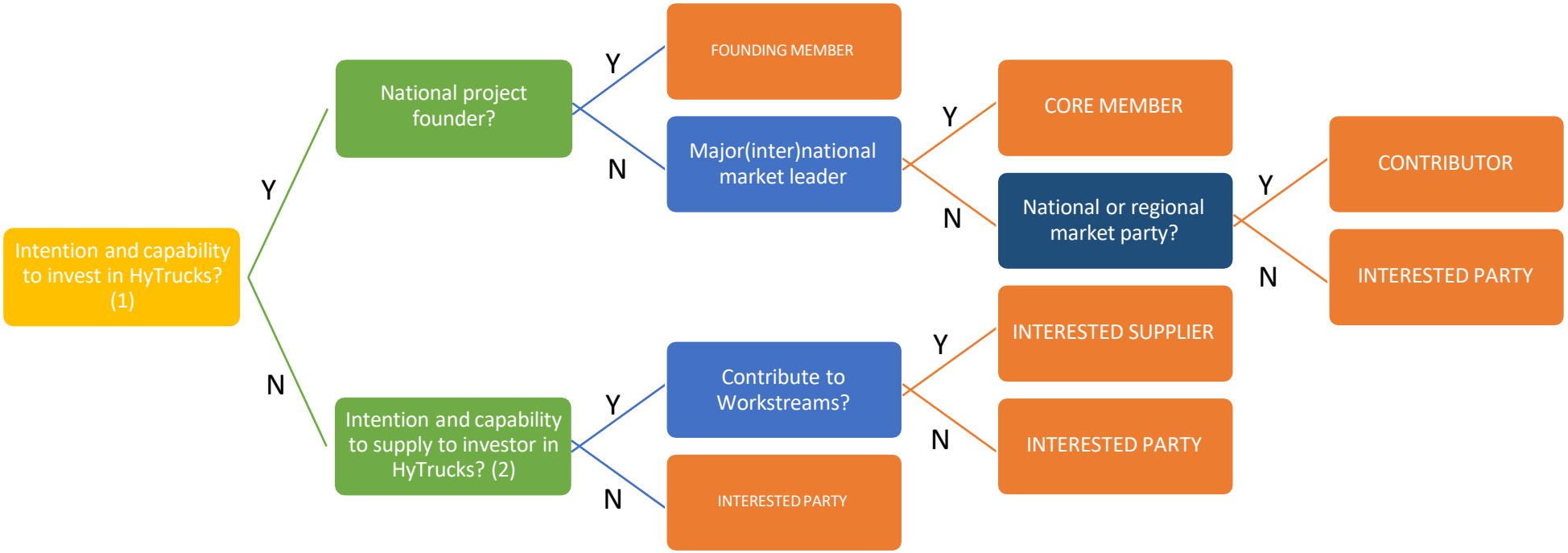
Q1 2020
MoU
Early discussion
Business scoping event (April)

Mid 2020
Kickoff

End 2022
Go - No Go
Final Investment Decision

Become also a HyTrucks member!

Looking for Shippers and Transport companies…..



For more information

1. Tijl van Criekingen | Air Liquide | tijl.vancriekingen@airliquide.com
2. Chris Lefrere | Waterstofnet | chris.lefrere@waterstofnet.eu
3. Bart Buelens | DATS24 | bart.buelens@dats24.be
4. Joachim Verheyen | Port of Antwerp | joachim.verheyen@portofantwerp.com

Air Liquide

Thank you

"Hydrogen is really at the heart of the energy transition.

We have created a momentum and now it's all about scaling up and acting smart and fast !"

16.05 – 16.25u:

Waterstofontwikkelingen en -perspectieven in de Lage Landen

Jörg Gigler
Managing Director TKI Nieuw Gas

Adwin Martens
Managing Director WaterstofNet

TKI NIEUW GAS
Topsector Energie

Waterstofontwikkelingen en –perspectieven in de lage landen

Jörg Gigler (directeur)

7 december 2020
Congres WaterstofNet “Waterstof, the next level!”

Nederland en waterstof

Milestones:

- juni 2019: **Klimaatakkoord**
- januari 2020: **Innovatie-agenda Waterstof**
- maart 2020: **Kabinetsvisie Waterstof**

Europa:

- **Green Deal** (New EC)
- **Economic Recovery Plan** (Covid-19)
- **European Hydrogen Strategy** (6 GW 2024, 40+40 GW in 2030)

Kabinetsvisie Waterstof: erkenning!

- Waterstof is nodig om klimaatneutraliteit in 2050 te bereiken
- Waterstof vervult een belangrijke systeemfunctie
- Inzet op groene en blauwe waterstof
- Waterstof creëert kansen voor bedrijven en de innovatie-community
- Internationale samenwerking is onontbeerlijk

➔ Nationaal Waterstof Programma (2021)

Innovatie-agenda Waterstof

1. Van Visie naar BELEID

2. DEMONSTRATIE in praktijkprojecten (R&D, pilots, demo's, implementatie)

3. Creëren van de juiste RANDVOORWAARDEN

Wetgeving, marktordening, financiering, infra, veiligheid etc.

4. R&D voor de lange termijn: R&D > 2030

5. FLANKERENDE ACTIVITEITEN voor implementatie

Maakindustrie, HCA, opleidingen, communicatie, acceptatie

Nederlands beeld inzake projecten

- Inventarisatie heeft geleid tot ruim 100 projecten
- Hele waterstofwaardeketen is gedekt
- Goede deelname van bedrijven, overheden en KI
- Diversiteit aan onderwerpen: projecten, veiligheid, innovatie, beleid, import, financiering
- Weinig *concrete* projecten: uitzonderingen!
- “Spelregels” zijn nog niet volledig ontwikkeld

SAMENWERKING Vlaanderen en Nederland

De opgave is te groot om alleen aan te kunnen: samen komen we verder!

We hebben veel raakvlakken (naast taal en cultuur) – enkele voorbeelden:

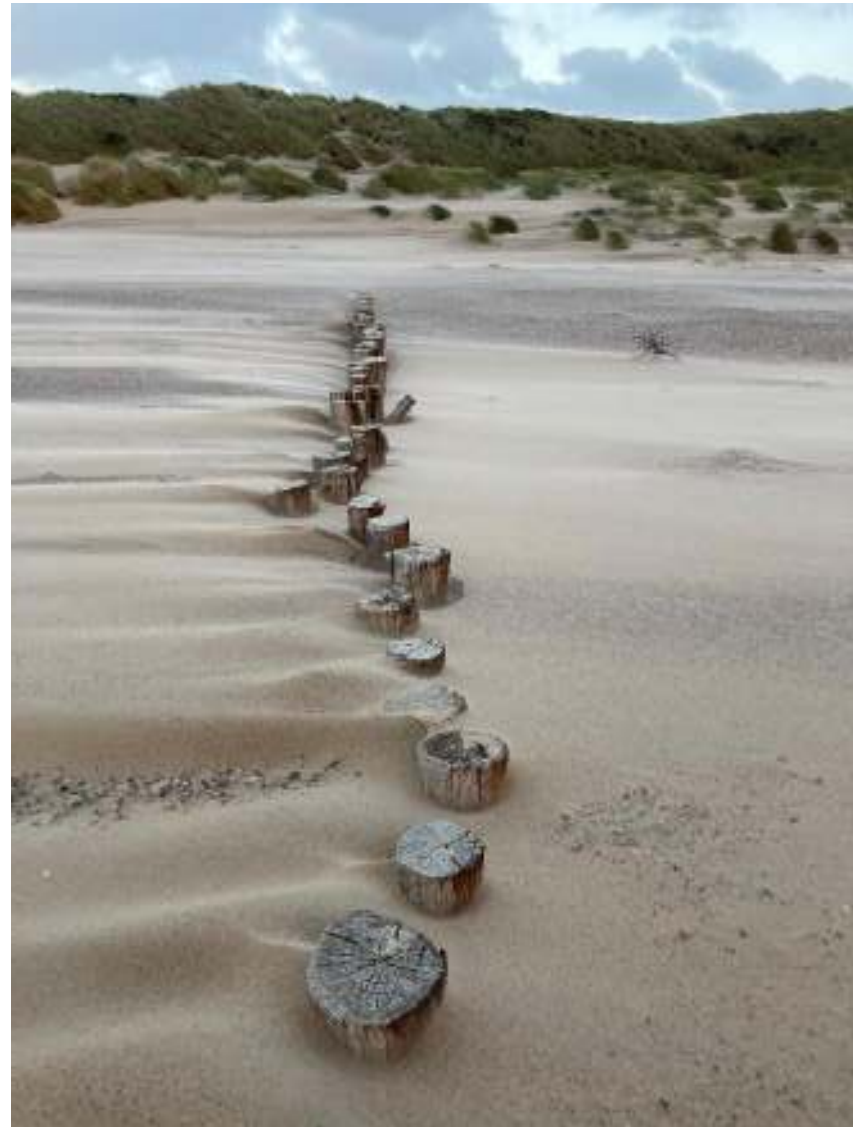
- **Maakindustrie (incl. toeleverende industrie)**: elektrolysers en componenten, zware voertuigen (trucks, bussen), …
- **Infrastructuur en import**: leidingnetwerken, havens en opslag
- **Toepassingen mobiliteit**: binnenvaartschepen en vervoer in havens
- **Verduurzaming industrie**: o.a. staal
- **Offshore wind**: aanlanding en gebruik elektriciteit
- **Kennis en innovatie**

Conclusies: stepping stones naar succes

TKI NIEUW GAS
Topsector Energie

- Verkenning van samenwerkingsmogelijkheden (vervolg op top 4 november)
- Uitbreiding naar Duitsland en Frankrijk: sterk Europees cluster
- Toegangspoort naar Europa voor productie en import

NU is de tijd om van papier naar projecten te gaan!



Dank voor uw aandacht

TKI NIEUW GAS
Topsector Energie

Jörg Gigler (jorg@gigler.nl, +31 6 4525 1571)

Downloads:

- Government Strategy on Hydrogen

https://www.topsectorenergie.nl/sites/default/files/uploads/TKI%20Gas/nieuws/Hydrogen-Strategy-TheNetherlands.pdf

- Hydrogen for the Energy Transition – Innovation strategy (2020)

https://www.topsectorenergie.nl/sites/default/files/uploads/TKI%20Gas/publicaties/7017-TSE%20Programmatische%20Aanpak%20Waterstof_EN-web.pdf

- Overview of 99 Dutch Hydrogen Projects (projects and plans)

https://www.topsectorenergie.nl/sites/default/files/uploads/TKI%20Gas/Overview%20Hydrogen%20projects%20in%20the%20Netherlands%20versie%2021%20augustus%202020.pdf

- Outlines of a Hydrogen Roadmap (2018)

https://www.topsectorenergie.nl/sites/default/files/uploads/TKI%20Gas/publicaties/20180514%20Roadmap%20Hydrogen%20TKI%20Nieuw%20Gas%20May%202018.pdf

Adwin Martens

7 december 2020

Waterstofontwikkelingen en –perspectieven in de lage landen – Vlaanderen – Zuid-Nederland

WaterstofNet

“Waterstof is hot”

- Europa enorm ambitieus (juli 2020)
- Lidstaten presenteren waterstofvisies
- Powerpoints/studies/webinars overspoelen de markt
- Nederland profileert zich internationaal zeer sterk

….. en Vlaanderen ….

“Vlaanderen wil koploper worden in Europa”

Vlaanderen: beperkte powerpoints, wel unieke producten/realisaties







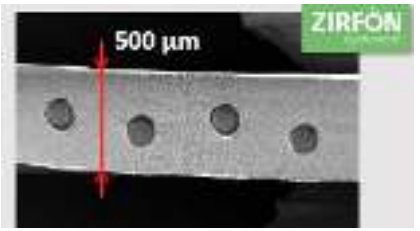






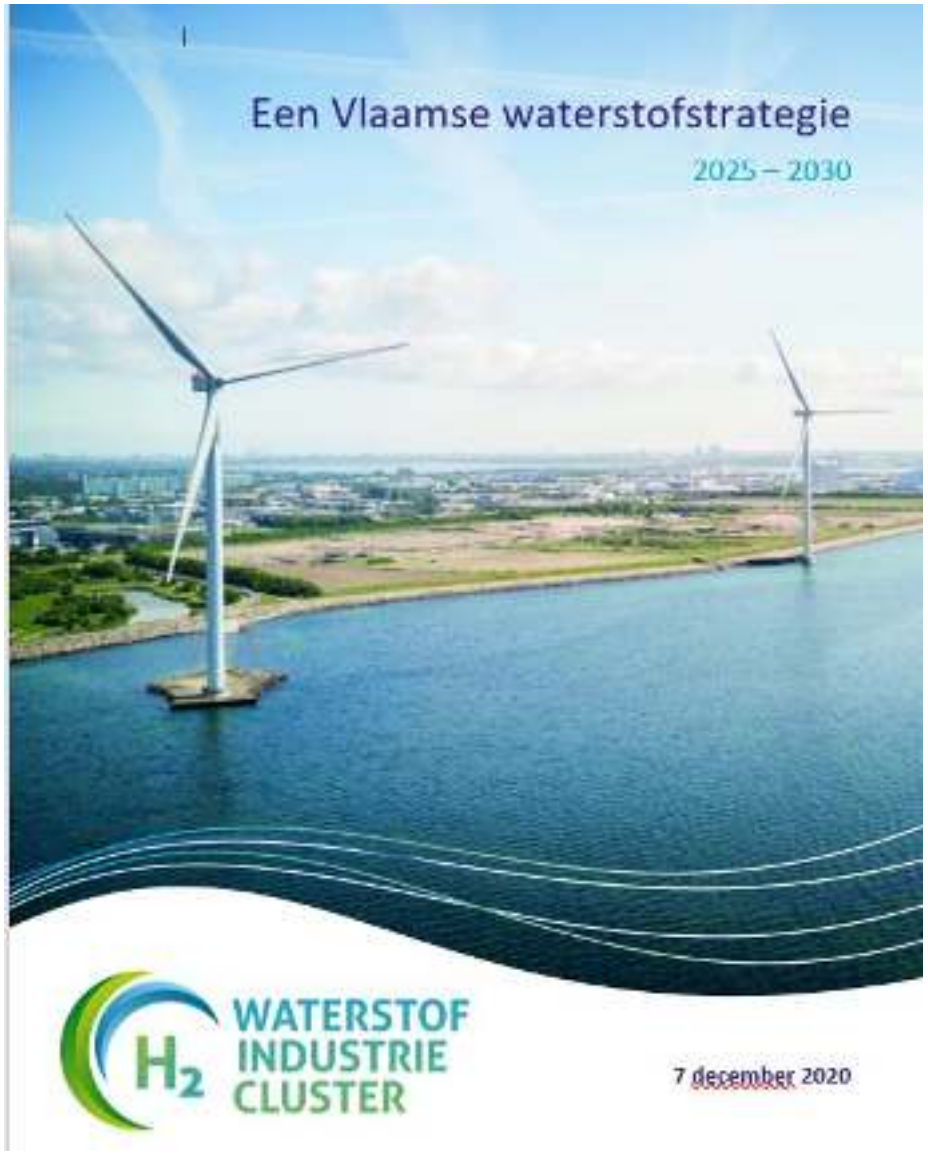






Unieke spelers in een groeiende Waterstof Industrie Cluster

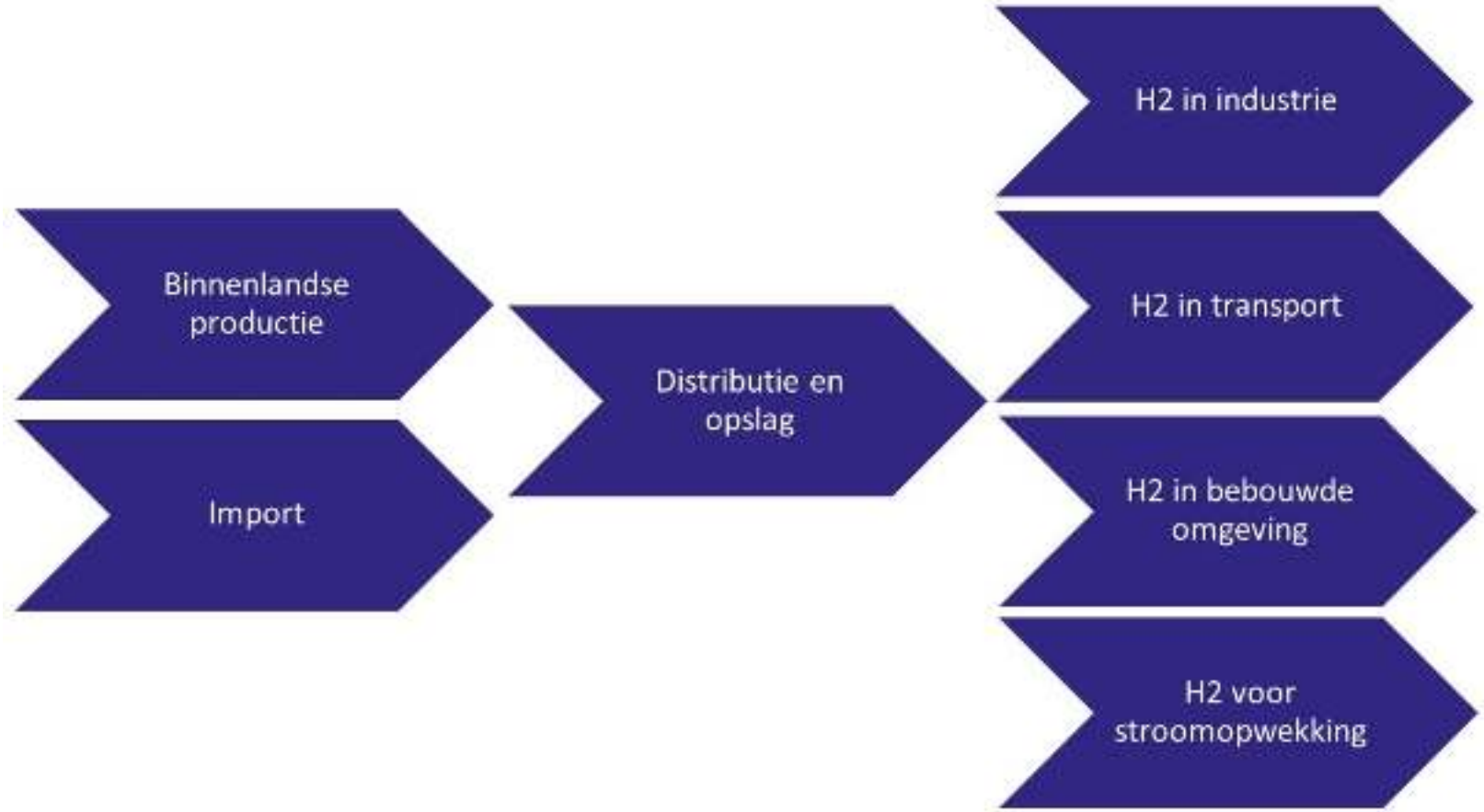
verdeeld over de waterstof waardeketen


Een Vlaamse waterstofstrategie
2025 – 2030
WATERSTOF
INDUSTRIE
CLUSTER
7 december 2020

Uitgangspunten

- 8/7 : Waterstofstrategie Europees beleid
- 10/11 : Naar een koolstofcirculaire en CO_2-arme Vlaamse Industrie
- 13/11 : Waterstofstrategie Vlaams beleid
- Troeven/ambities van de Vlaamse industrie voor 2025 - 2030

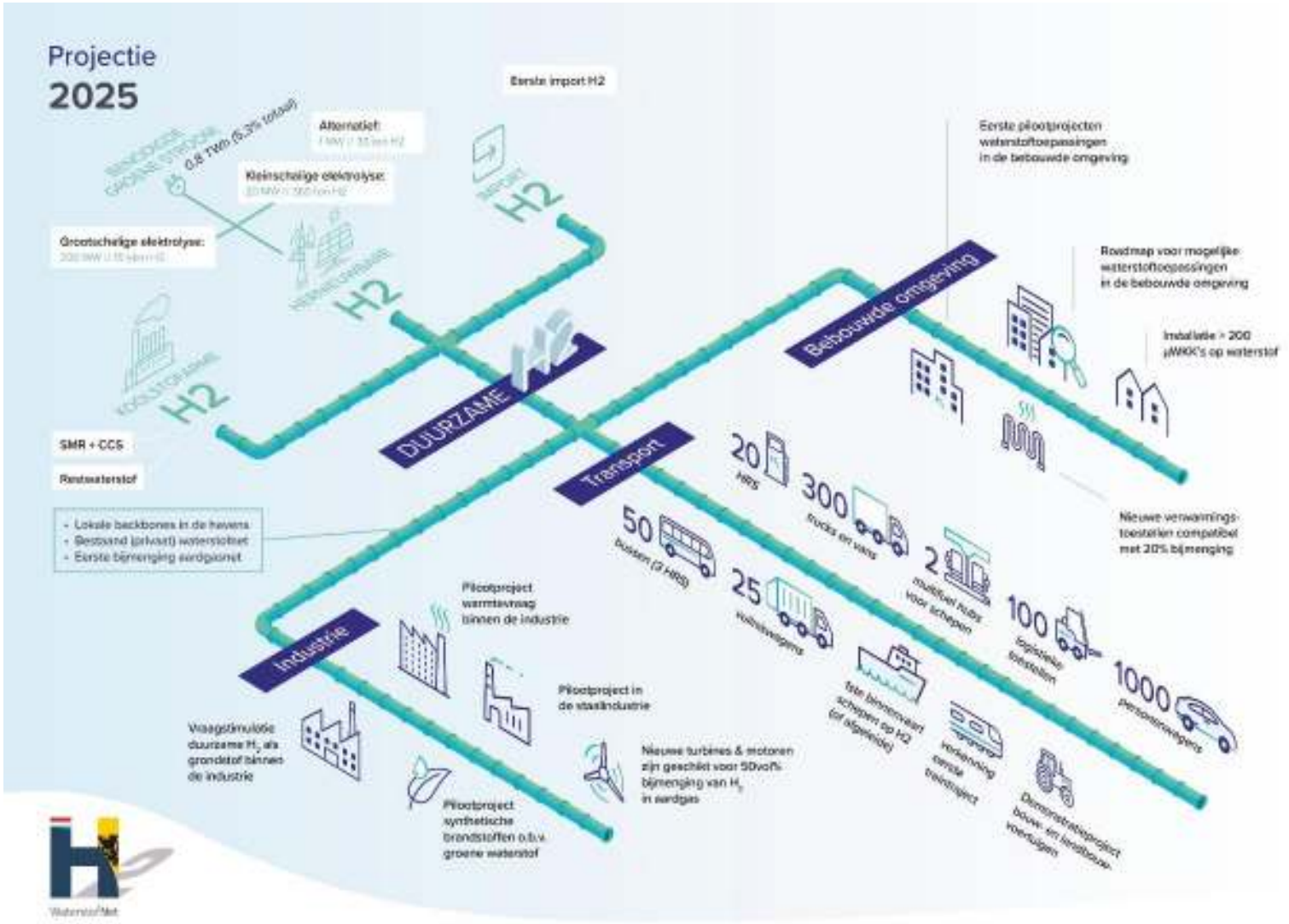
Aanpak over de gehele keten

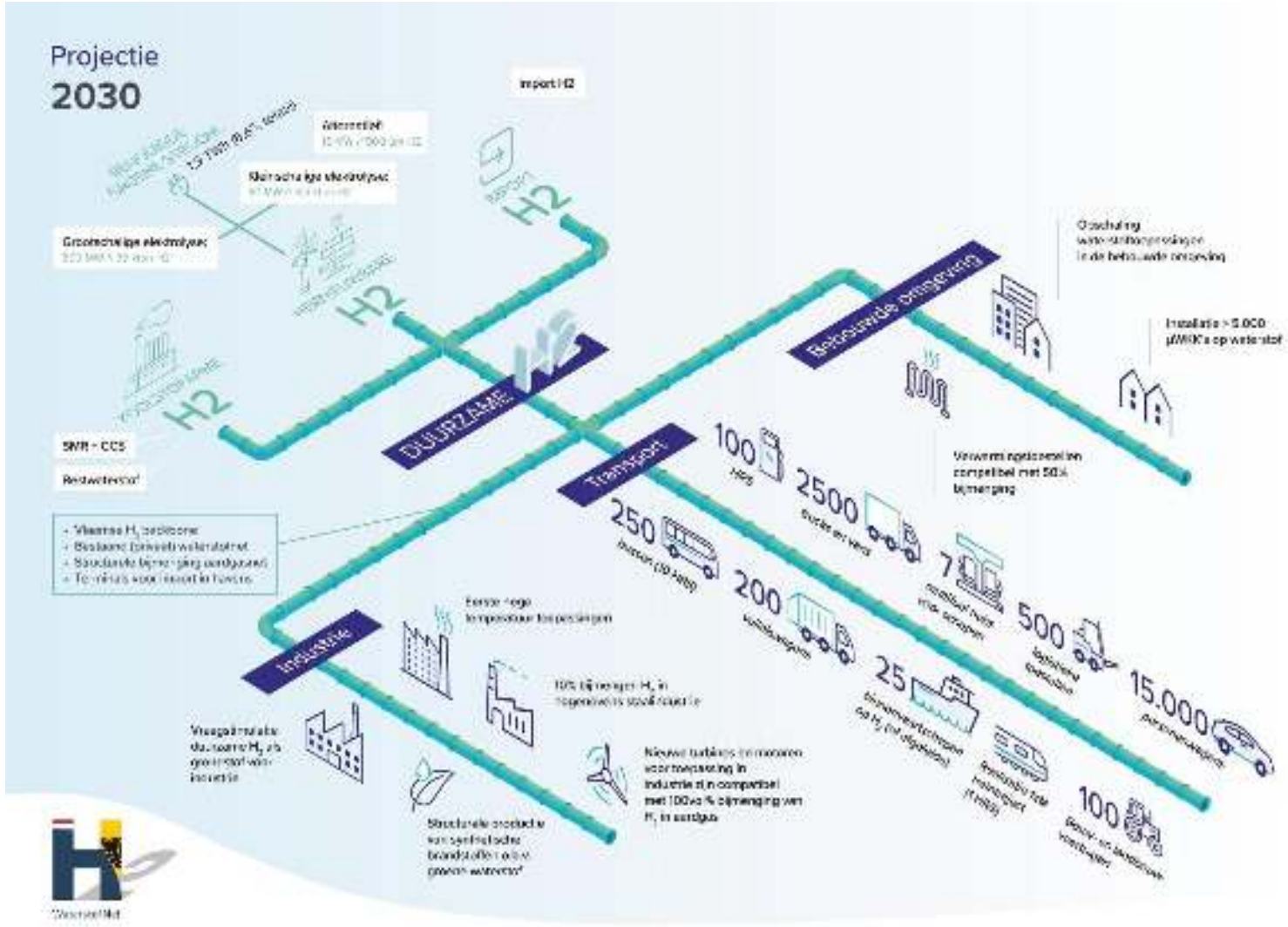


Per schakel

- status en uitdagingen

- Doelstellingen 2025 en 2030


Projectie
2025
Eerste import H2
Alternatief:
Kleinschalige elektrolyse:
Grootschalige elektrolyse:
H2
DUURZAME
SMR + CCS
Restwaterstof
- Lokale backbones in de havens
- Bestaand (privaat) waterstofnet
- Eerste bijmenging aardgasnet
Industrie
Transport
Gebouwde omgeving
Vraagstimulatie duurzame H2 als grondstof binnen de industrie
Pilootproject warmtevraag binnen de industrie
Pilootproject in de staalindustrie
Pilootproject synthetische brandstoffen o.b.v. groene waterstof
Nieuwe turbines & motoren zijn geschikt voor 50vol% bijmenging van H2 in aardgas
50
bussen (3 HRS)
20
HRS
300
trucks en vans
25
vuilniswagens
2
multifuel hubs voor schepen
100
logistieke treinstellen
1000
personenwagens
Eerste pilootprojecten waterstoftoepassingen in de bebouwde omgeving
Roadmap voor mogelijke waterstoftoepassingen in de bebouwde omgeving
Installatie > 200 µWKK's op waterstof
Nieuwe verwarmingstoestellen compatibel met 20% bijmenging


Projectie
2030
import H2
H2
H2
H2
SMR + CCS
Restwarmte
DUURZAME
Industrie
Transport
Gebouwde omgeving
100
2500
250
200
25
7
500
15.000
100

Concretisering van ambitie naar projecten

Wat is nodig om dit te realiseren ?

- Onderzoek en innovatie
- Regelgevend kader : proactief Vlaams en federaal beleid
- Implementatie Europese richtlijnen en gebruik maken van Europese middelen
- Ontwikkeling van een thuismarkt voor waterstoftoepassingen in Vlaanderen
- Evenwichtige inzet financiële middelen door industrie/Vlaanderen/België/Europa
- Internationale samenwerking: nu al met Nederland en Duitsland

Uitnodiging tot dialoog, maar vooral tot samen resultaten boeken

WaterstofNet

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2300 Turnhout
België

T +32 (0)14 40 12 19

Kantoor Nederland

Automotive Campus
Automotive Campus 30
5708 JZ Helmond
Nederland

WaterstofNet
WaterstofNet

WaterstofNet.eu

Adwin Martens
adwin.martens@waterstofnet.eu

Bedankt voor uw aandacht!

Thank you for your attention!

WaterstofNet

16.25 – 16.45u:

De Vlaamse waterstofvisie

Hilde Crevits

Viceminister-president van de Vlaamse regering &
Vlaams minister voor Werk, Economie, Sociale Economie,
Innovatie en Landbouw