



H2

WEBINAR

The French hydrogen ecosystem
in the Pays de la Loire Region

WELCOME!

April 28th, 2022
From 10 to 11 am

SHOWCASING THE FRENCH HYDROGEN ECOSYSTEM IN THE PAYS DE LA LOIRE REGION



Moderator: Maxime Krummenacker, Business France

10.05 - 10.15

The French Hydrogen Strategy

- Camille Campadelli, Head of Public Policies, Business France
- Arlo Rafidison, Public Policies Expert, Business France

10.15 - 10.40

The Pays de la Loire Regional Hydrogen Ecosystems

- Erwann Rio, Hydrogen Project Director, Pays de la Loire Region
- Nathalie Garry, International Project Advisor, Business Solutions Atlantic France

10.40 - 10.50

Company testimony - Lhyfe

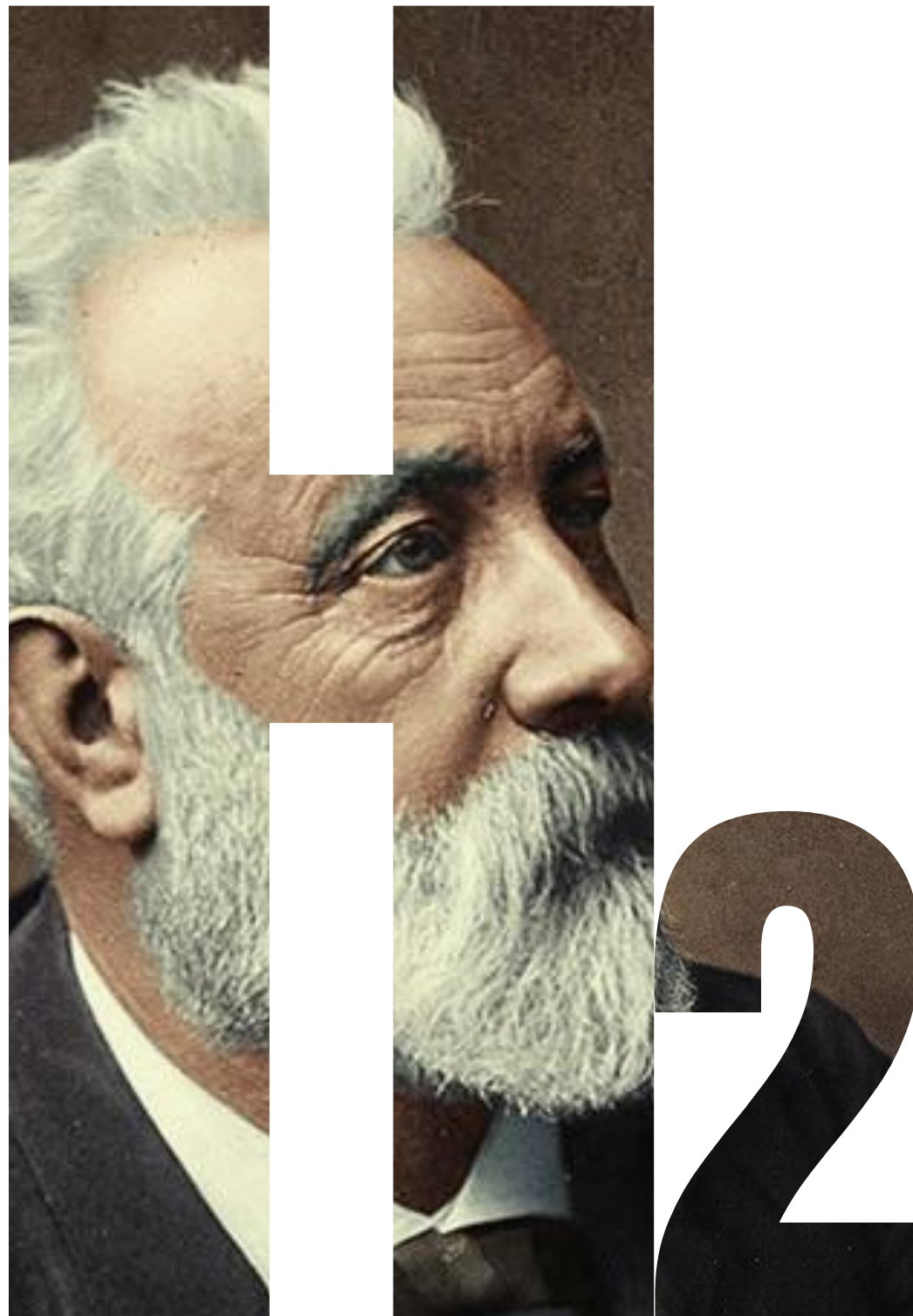
- Björn Arvidsson, Area Manager Nordics & UK, Lhyfe

10.50 - 11.00

Q&A Session

- All speakers

SHOWCASING THE FRENCH HYDROGEN ECOSYSTEM IN THE PAYS DE LA LOIRE REGION



— I believe that hydrogen will one day be used as a fuel. It will furnish a source of heat and light inexhaustible. Water is the coal of the future.

— I would like to see that.

— You got up too early!

Jules Verne

The Mysterious Island, 1874.

**SHOWCASING THE FRENCH HYDROGEN ECOSYSTEM
IN THE PAYS DE LA LOIRE REGION**



THE FRENCH HYDROGEN STRATEGY

Camille Campadelli
Head of Public Policies
Business France

Arlo Rafidison
Public Policies Expert
Business France

A TOP PRIORITY IN THE PUBLIC AGENDA

DECARBONIZED HYDROGEN HAS BEEN CONSIDERED STRATEGIC AND WILL REMAIN SO IN THE UPCOMING YEARS



France has long invested on decarbonized hydrogen as a crucial element of its carbon neutrality strategy :

2018

Launching Plan Hydrogène

- Support to basic and applied research
- Financing demonstrators
- Equity funding to high potential companies and start-ups
- Support to hydrogen mobility
- Support to local authorities' plans to deploy hydrogen (fuelling stations, hydrogen production...)

2020-2021

Shaping the long-term strategic vision

- Hydrogen identified as a key strategic sector (Conseil de l'Innovation)
- Creation of the National Council of Hydrogen to ensure the development of a competitive French sector in decarbonized hydrogen
- Large consultation of industry key players and stakeholders to identify H2-related innovative projects and potential technical regulatory or financial locks

2021-2030

Investing in breakthrough innovations

- Presentation of France 2030, France's strategic investment plan of €30Bn to foster breakthrough innovations and their industrialization
- France 2030 features massive support to decarbonized hydrogen spanning from production to use cases (mobility and transportation, industry, decarbonization...)



Overall, €9 billion will be allocated until 2030 to supporting decarbonized hydrogen.

IMPLEMENTING A REGULATORY FRAMEWORK

THE HYDROGEN ORDER LAYS OUT THE FOUNDATIONS
OF THE REGULATION OF THE SECTOR



THE HYDROGEN ORDER (FEBRUARY 17, 2021)

THREE CATEGORIES OF HYDROGEN DEFINED

INJECTION OF HYDROGEN IN NATURAL GAS NETWORKS

IMPLEMENTATION OF A TRACING SYSTEM

CREATION OF THE NATIONAL HYDROGEN COUNCIL

- Ensuring the development of a competitive low-carbon French hydrogen sector
- Promotion the emergence of collaborative projects

HYDROGEN IN THE FRANCE 2030

BECOMING A LEADER IN GREEN HYDROGEN



“France 2030” supports the whole lifecycle of innovation, from breakthrough innovation to manufacture.

A total investment of
€54 billion

including €34 billion of new credits

- › 50% for the decarbonization of industry
- › 50% pour emerging players

€9 billion
to develop the French
hydrogen industry

From Relaunch France
and the National Investment Program
(PIA4)

SUPPORTING R&D AT ALL PHASES

FRENCH H2 STRATEGY AIMS AT SUPPORTING INNOVATION FROM THE BENCH TO FACTORIES AND END-USERS



“France 2030” supports the whole lifecycle of innovation, from breakthrough innovation to manufacture.

Basic research programs

- › Specific support to basic research projects of universities and public labs in the field of decarbonized hydrogen (✓)
- › Massive investment in training and skills (✓)

Applied research

- › Specific support to applied research projects of universities and public labs in the field of decarbonized hydrogen (✓)
- › Support to use cases in the field of transportation and mobility (e.g., Hydrogen-powered aircraft...) (✓)

Demonstrators

- › Open calls to support local authorities' policies for hydrogen-powered trains (X)
- › Important Projects of Common European Interest (IPCEI) (X)
- › “Critical technology blocks” open call (✓)

Industrialization

- › Equity funding through bpifrance’s Ecotech fund (✓)
- › Equity funding through bpifrance’s Industrial SPV fund (✓)
- › Equity funding through ADEME Investissement (✓)

Deployment

- › Open call “Ecosystèmes territoriaux hydrogène” aimed at local authorities (X)
- › Specific funding through Banque des Territoires (✓)
- › Financial support to decarbonized hydrogen producers either through a grant for CAPEX or through an additional remuneration mechanism (~)

“CRITICAL TECHNOLOGY BLOCKS” OPEN CALL

(✓) OPEN UNTIL DECEMBER 31ST, 2022

Support innovation to develop critical technology blocks:

- Production and transportation of decarbonized hydrogen
- Innovative use cases (e.g., H2-powered heavy vehicles)
- Large scale demonstrators

Minimum cost of projects:

€2M for production, transportation, and use cases
€5M for capacity electrolyzers demonstrators (>20 MW)

(✓) ON-GOING

(~) PLANNED

(X) CLOSED



THE REGIONAL HYDROGEN ECOSYSTEMS STRATEGY

Erwann Rio

Hydrogen Project Director

Hydrogen Planet - Pays de la Loire Region

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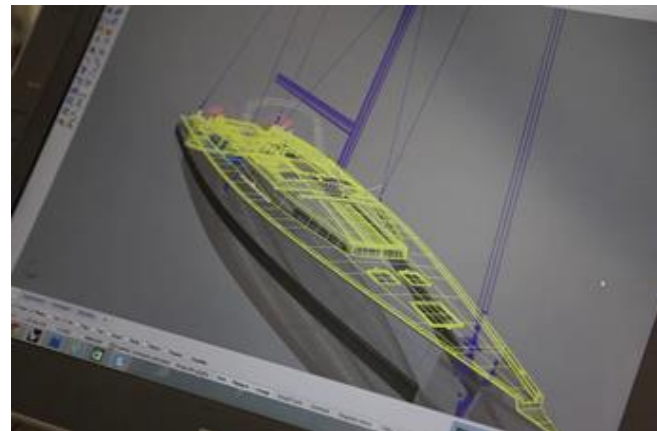
(+33) 684 582 273

RÉGION DES PAYS DE LA LOIRE OVERVIEW

- 2 hours from Paris (by train) and international airports
- 2nd region for population growth (3,8M inhabitants)
- 1st port on France's Atlantic coast
- 1st region for manufacturing jobs
- 1st region for shipbuilding
- 2nd largest industrial hub for AIRBUS
- Top agrifood region



BUSINESS OPPORTUNITIES IN ATLANTIC FRANCE



ASSETS

8 technocampus
10 innovation clusters
4 universities
10+ engineering campuses
150 labs

EXPERTISE

Automation
Composites
Ind. Electronics & IoT
Digital (AR/VR,IA)

MARKETS

Aeronautics
Shipbuilding
Automotive
Agrifood
Agritech

HYDROGEN IN ATLANTIC FRANCE



80+
firms

200+
jobs

14
research labs



Networks & clusters



Research



REGIONAL CONNECTION TO FUTURE HYDROGEN NETWORKS

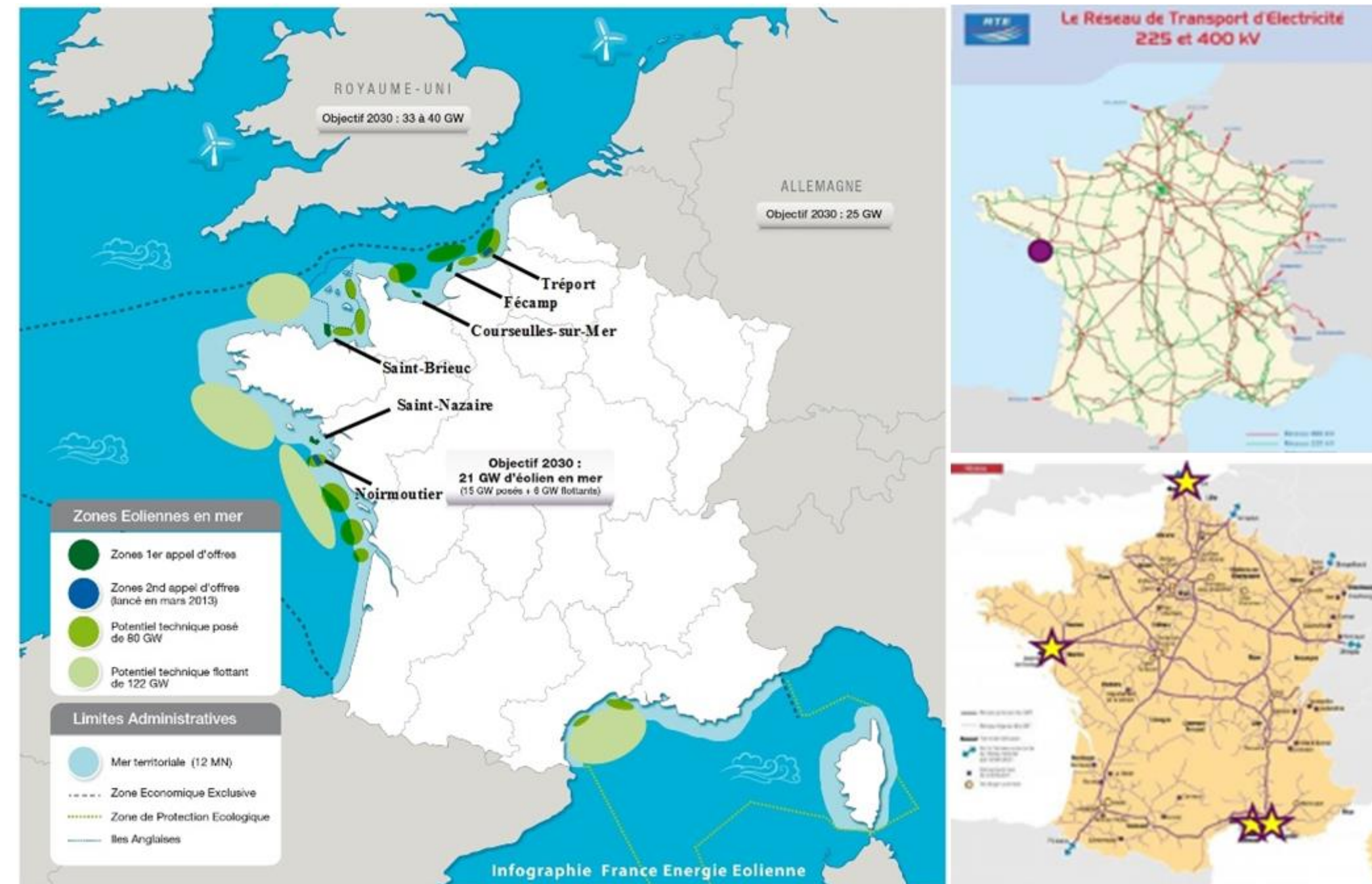
Major gaz, road, and electricity distribution network run through Pays de la Loire.

These offer significant opportunities for change to the hydrogen network.

- Production
- Transportation
- Distribution

Pays de la Loire is one of the major regions where offshore wind turbines are installed.

The first wind turbines, 500MW, were installed in 2021, and a significant Offshore floating wind project will be developed (XGW).



PAYS DE LA LOIRE AND MRE OVERVIEW

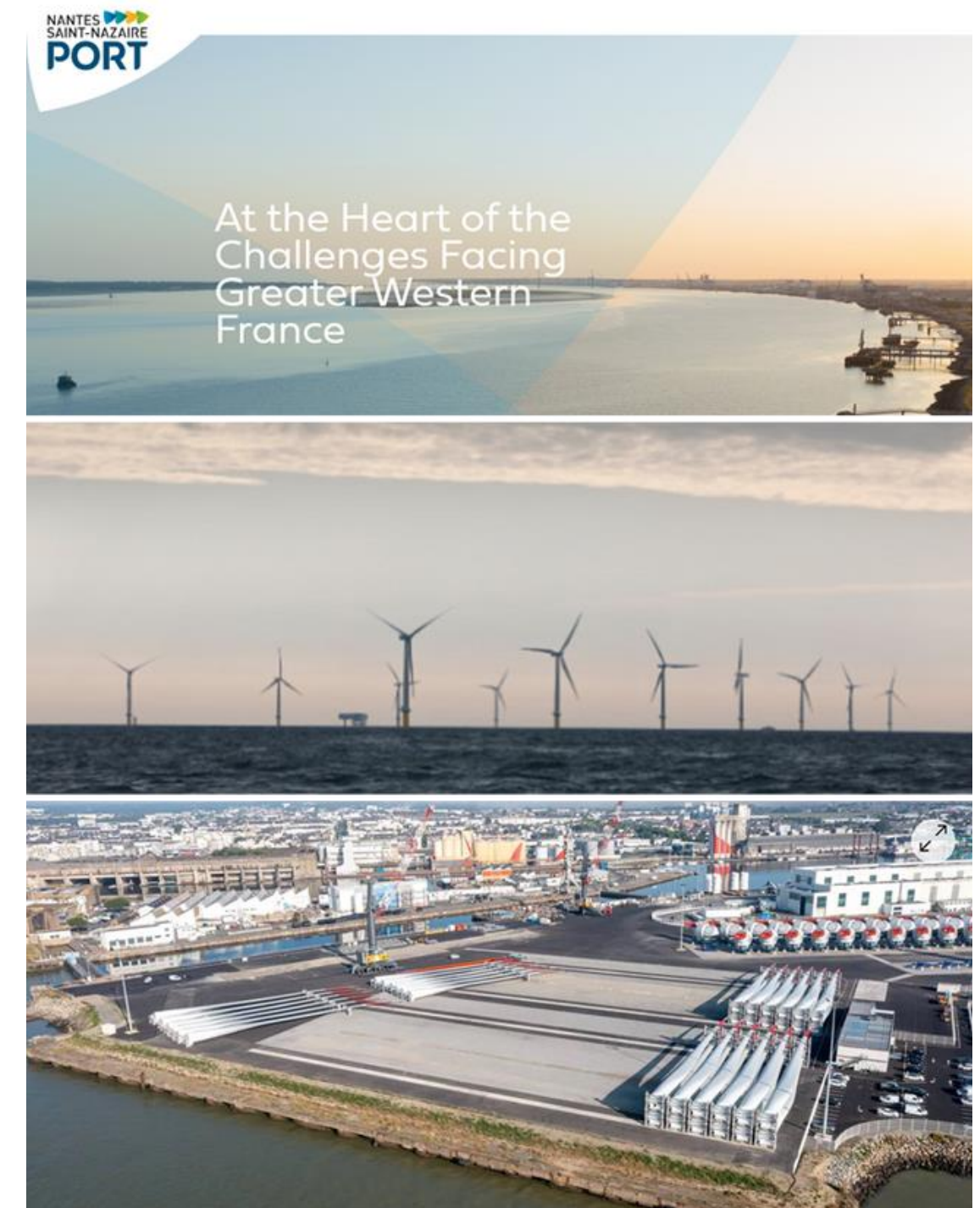
With direct access to the Atlantic Ocean, Pays de la Loire through Nantes-Saint-Nazaire Port, is the largest Atlantic port in France.

As an industrial facility, Nantes – Saint Nazaire Port provides the interface between land and sea, serving an entire Region and its economy.

An international industrial and logistical platform, the Port is connected to several modes of transport, including sea, inland waterway, rail, road, and air.

For importing and exporting actors of Greater Western France, Nantes – Saint Nazaire Port makes available doorstep services that serve to optimize supply and distribution chains.

It is one of the major MRE Logistic hubs with a dedicated platform of about 100 000m² and many heavy lifting capacities.



HYDROGEN NETWORK STRONG HISTORY AND ENVIRONMENT TO IMPACT THE ENVIRONMENT AND GROW OUR LEADERSHIP!

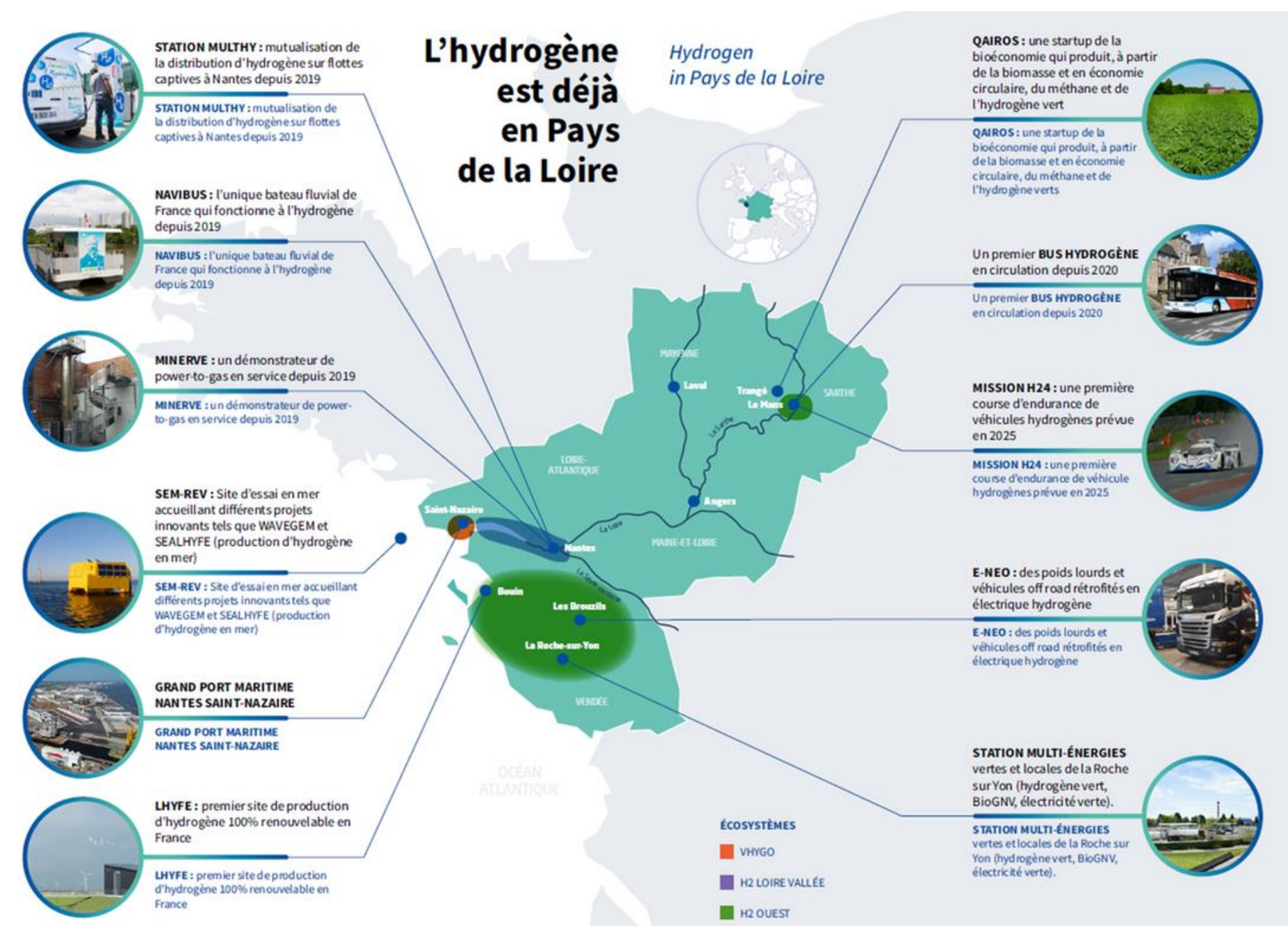


Innovation in Pays de la Loire is in the DNA of research and industrial stakeholders:

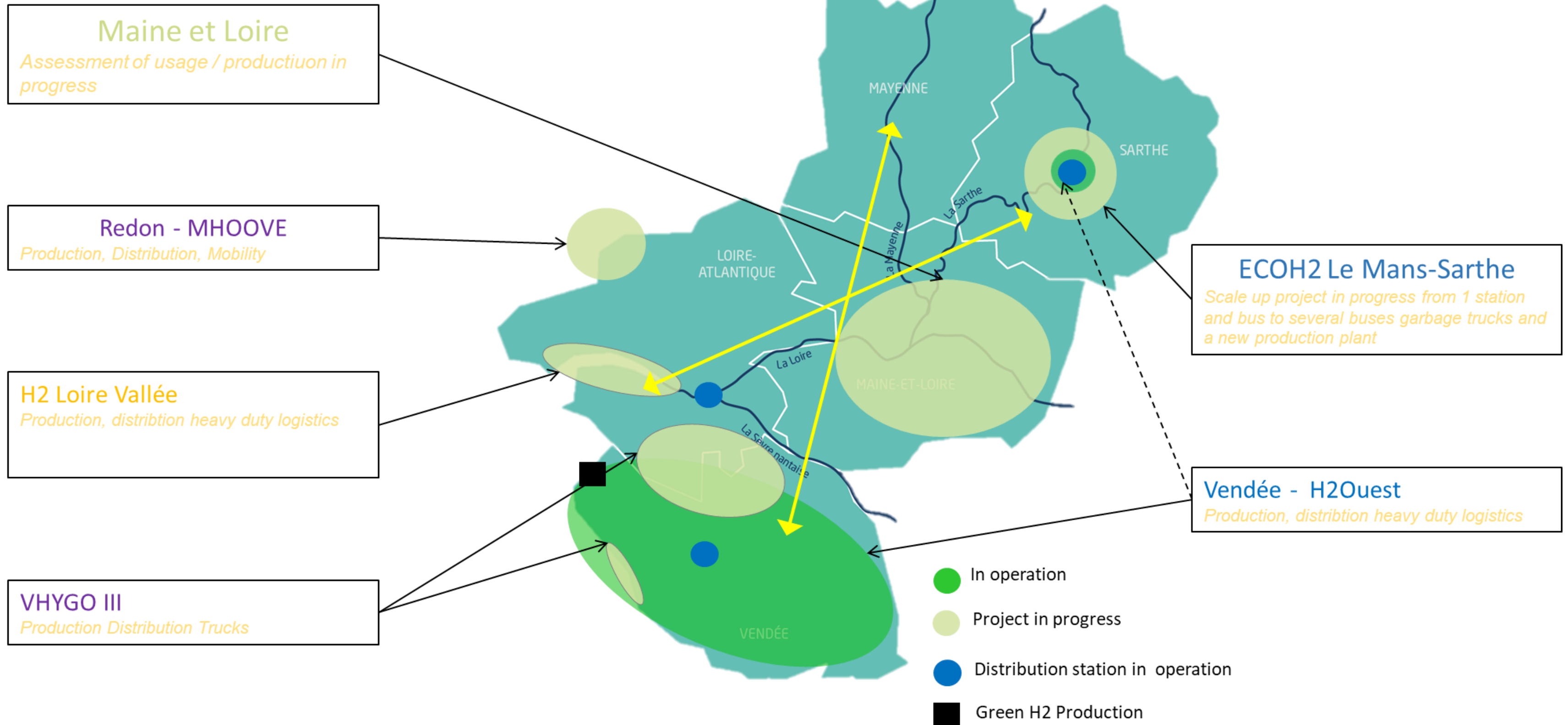
- From the early 2000s, Hydrogen projects tracking
- Navibus 2012-18 – First river vessel for public transportation
- Stationary usage – Deltagreen building in Loire Atlantique
- Several projects of bus, garbage truck, and service light vehicles - in relation to the distribution

More than 10M€ regional support was allocated to Hydrogen development in 2020/21 on a global budget of 100M€ for the RDPL Hydrogen Roadmap.

Ecosystem development – 3 ecosystems in progress +3 in development



LOCAL ECOSYSTEMS GROWTH DYNAMIC IN PAYS DE LA LOIRE



HYDROGEN VALUE CHAIN FROM RESEARCH AND INNOVATION TO ECONOMIC DEVELOPMENT

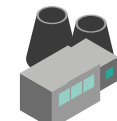
Some spots of the value chain to be further developed –
opportunities for collaboration



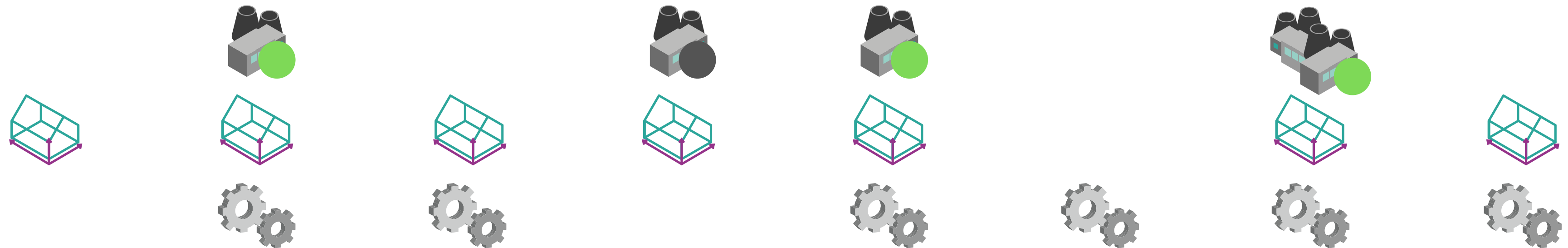
R&D



Project in
development



Ready for industrial
deployment



Potential sources
H2

Production
H2

Stockage
H2

Transport
H2

Station
Distribution
H2

Conversion H2
Electricity

Applications

Services
Maintenance
Recycling

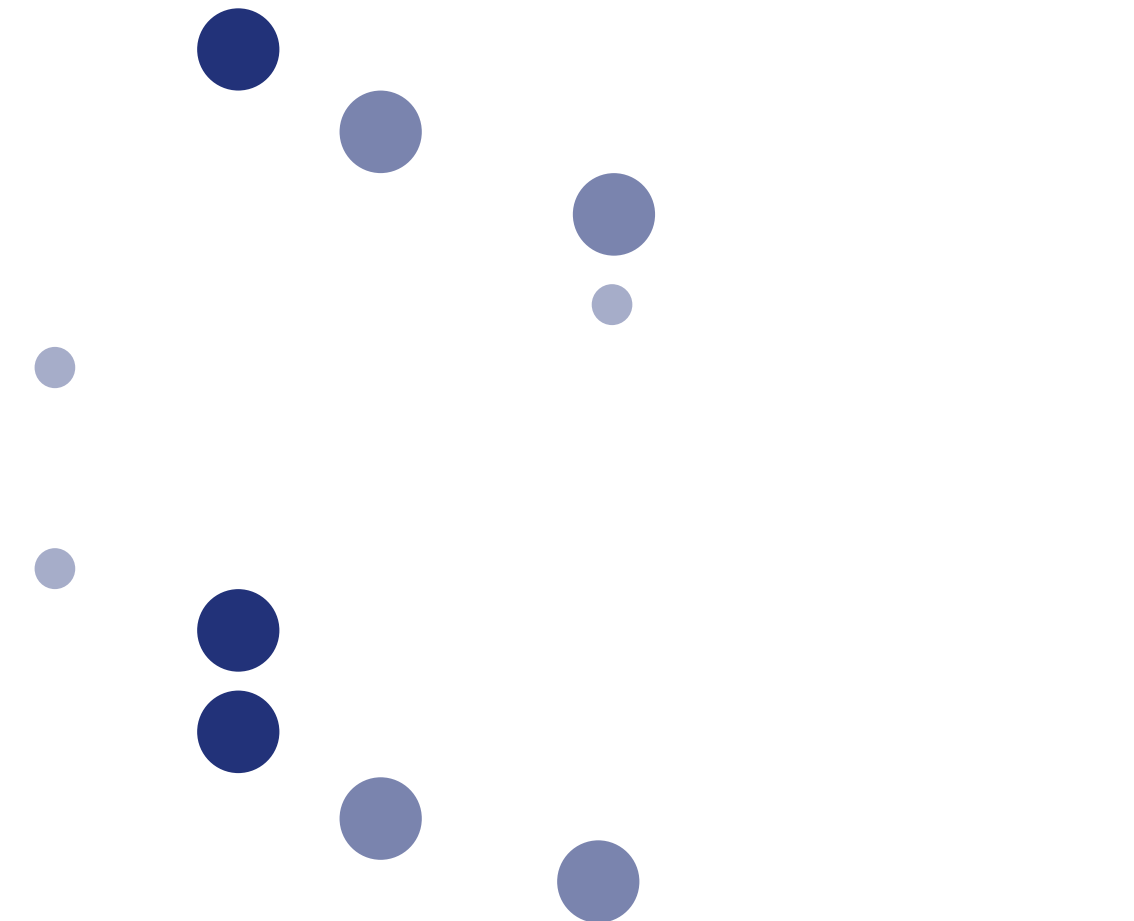
HYDROGEN

A VISION OF MARKET DEVELOPMENT



NEW MARKETS

- System integration
 - Electrolysis
 - Pyrolysis and gasification
 - Bio technologies
 - E-fuels
 - SMR
- OEM
 - Gaz filtration
 - Electrolysis cells
 - Chemical reactors
 - Biotech reactors
 - Sea interfaces



Potential sources
H2

Production
H2

Storage
H2

Transport
H2

Station
Distribution
H2

Conversion H2
Electricity

Applications

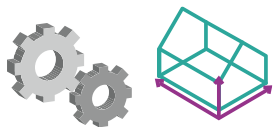
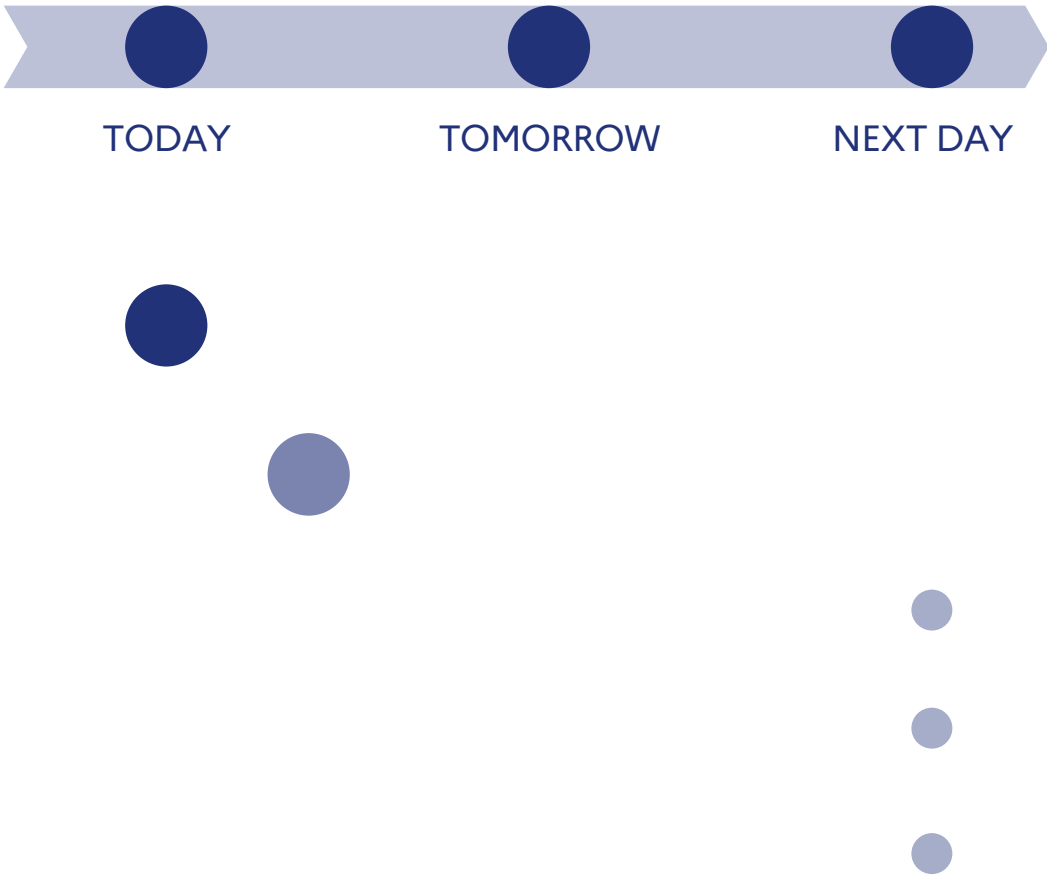
Services
Maintenance
Recycling

HYDROGEN

A VISION OF MARKET DEVELOPMENT

NEW MARKETS

- Gaz storage
- Liquid storage
- Hybride storage
- Underground storage
- Pipe network Storage



Potential sources
H2

Production
H2

Storage
H2

Transport
H2

Station
Distribution
H2

Conversion H2
Electricity

Applications

Services
Maintenance
Recycling

HYDROGEN

A VISION OF MARKET DEVELOPMENT



NEW MARKETS

- High-pressure vessels - Road & Train
- Cryogenic vessels
 - Road or rail
 - Sea
- Pipeline
 - Massification, necessary as a first step



Potential sources
H2

Production
H2

Storage
H2

Transport
H2

Station
Distribution
H2

Conversion H2
Electricity

Applications

Services
Maintenance
Recycling

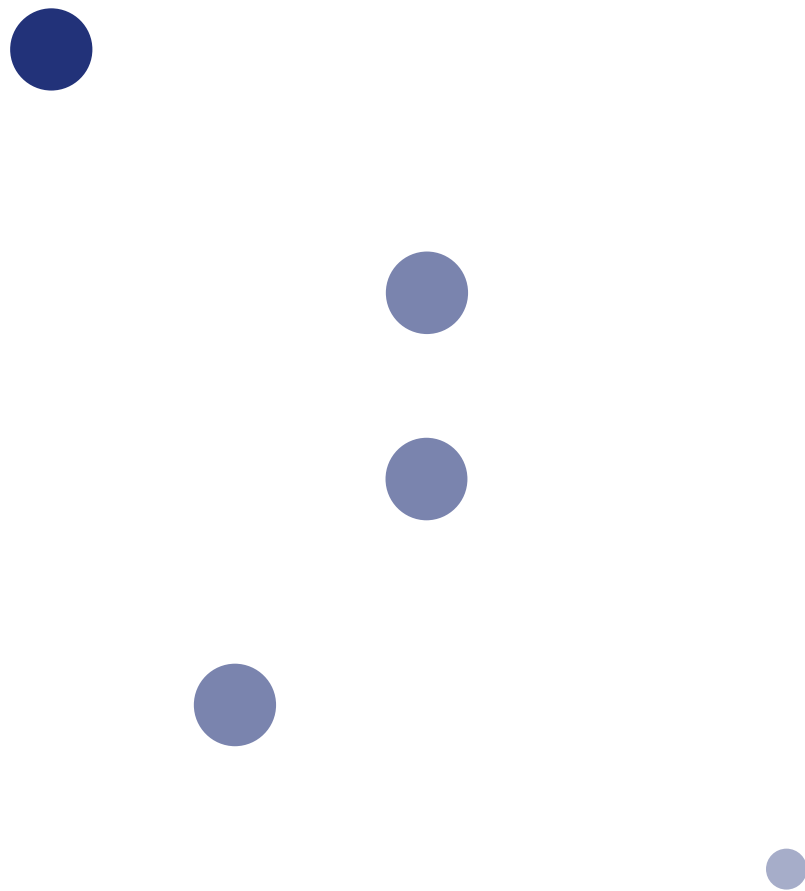
HYDROGEN

A VISION OF MARKET DEVELOPMENT



NEW MARKETS

- Electrical Fuel Cell
- Internal combustion
 - Hydrogen
 - E-fuel
- Heat generation
 - Mixed with CH4
 - Direct use

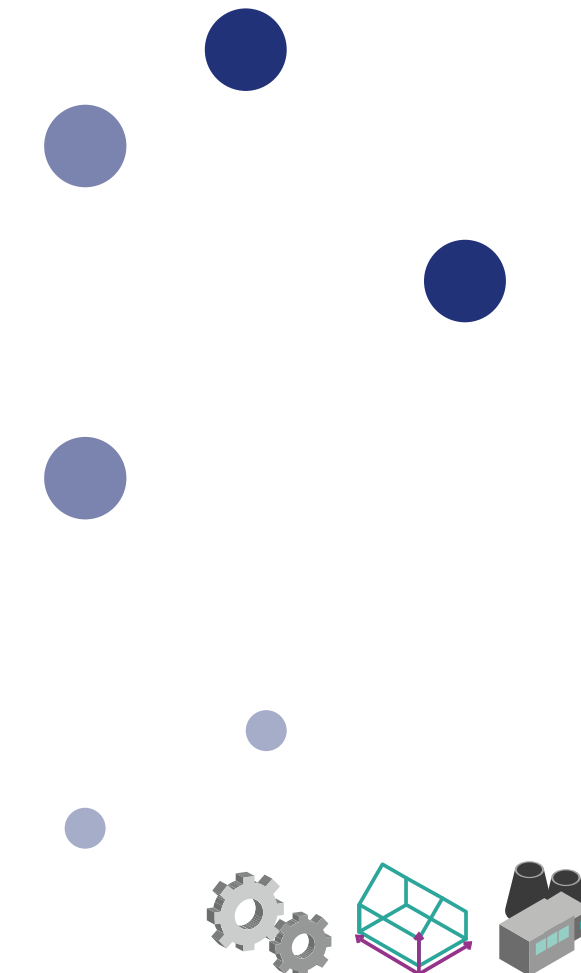


HYDROGEN

A VISION OF MARKET DEVELOPMENT

NEW MARKETS

- Heavy transportation
 - New vehicles
 - Retrofit
- Light vehicles
- Specific types of equipment
 - Integration
- Complementary Applications to Mobility
 - Autonomy extension - LV/Leisure
 - Energy trailers (refrigerated/special)



Potential sources
H2

Production
H2

Storage
H2

Transport
H2

Station
Distribution
H2

Conversion H2
Electricity

Applications

Services
Maintenance
Recycling

HYDROGEN

A VISION OF MARKET DEVELOPMENT

NEW MARKETS

- Shipbuilding and integration
 - H2 Carriers
 - International vessels
 - National vessels
 - Service vessels
 - Fuel cell in leisure boats
- Specific equipment
 - H2 fueled motors
 - Cryogenic tanks
- Operations
 - Refueiling
 - Cols ironing
- Services O&M



Potential sources
H2

Production
H2

Storage
H2

Transport
H2

Station
Distribution
H2

Conversion H2
Electricity


Applications

Services
Maintenance
Recycling

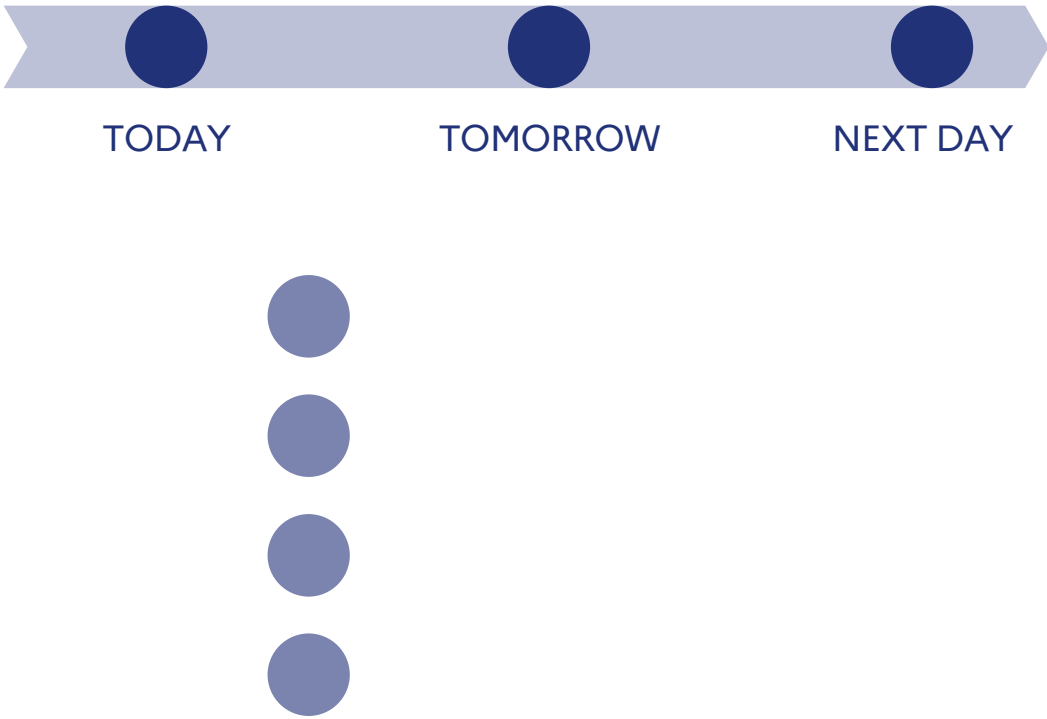
HYDROGEN

A VISION OF MARKET DEVELOPMENT

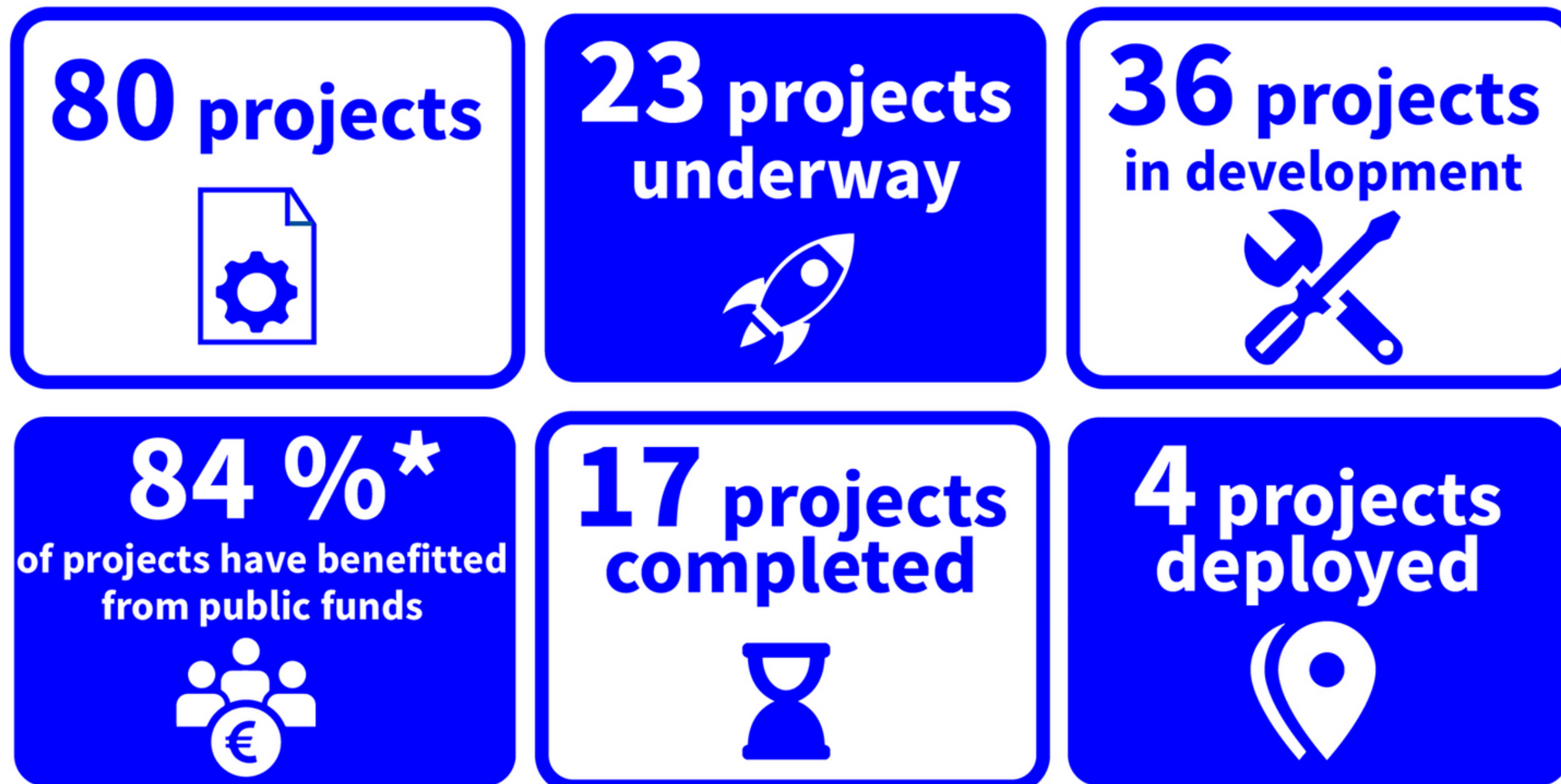


NEW MARKETS

- Gaz
- Energy conversion
- Fuel cell
- Control and monitoring



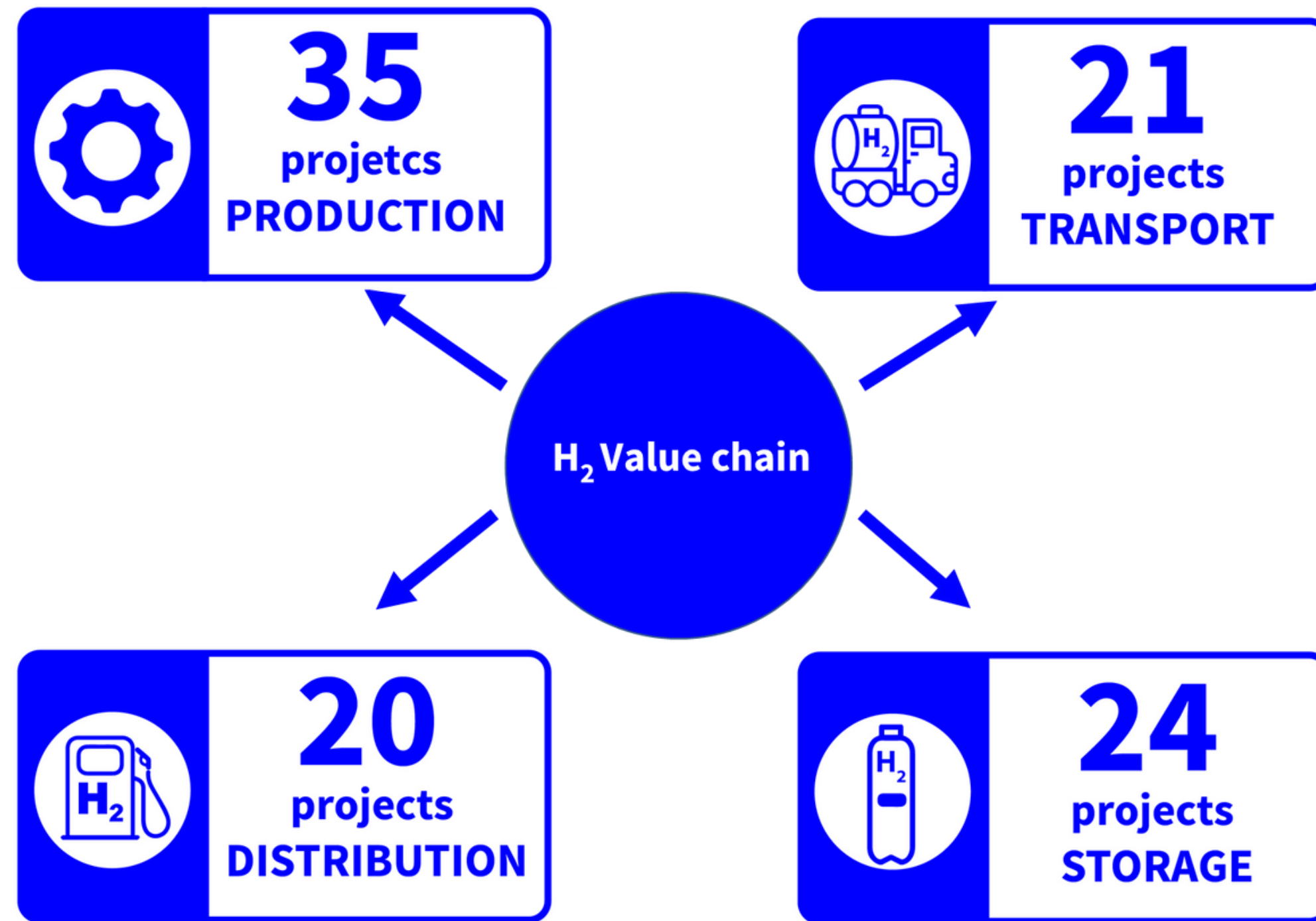
PAYS DE LA LOIRE PROJECTS OVERVIEW



* excluding projects underway,
non projects did not qualify



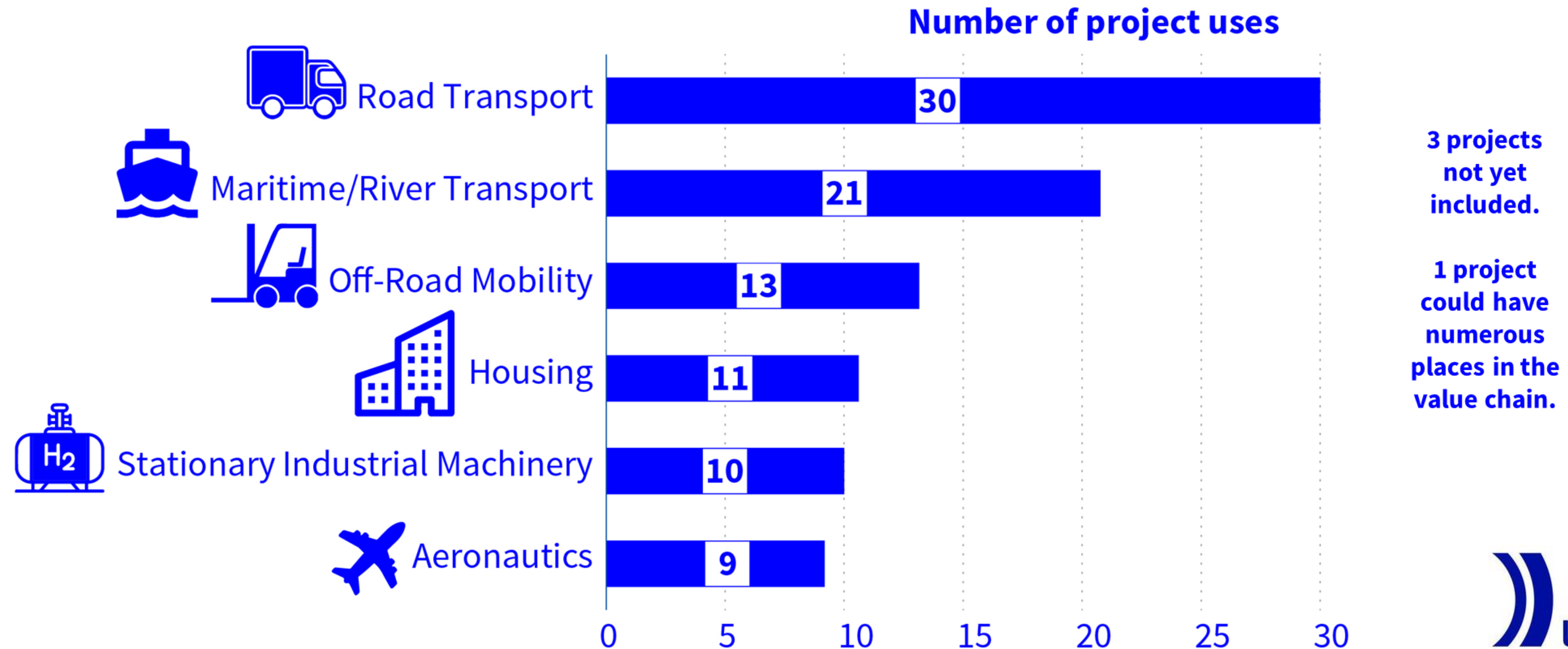
PAYS DE LA LOIRE PROJECTS OVERVIEW



3 projects
not yet
included.

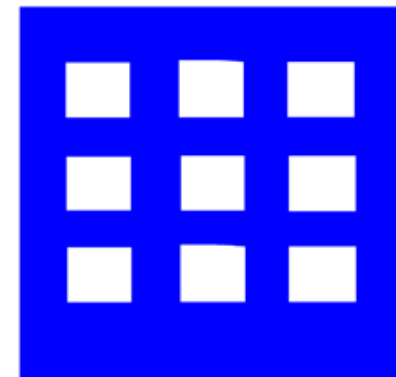
1 project
could have
numerous
places in the
value chain.

PAYS DE LA LOIRE PROJECTS OVERVIEW



PAYS DE LA LOIRE PROJECTS OVERVIEW

94
companies
identified

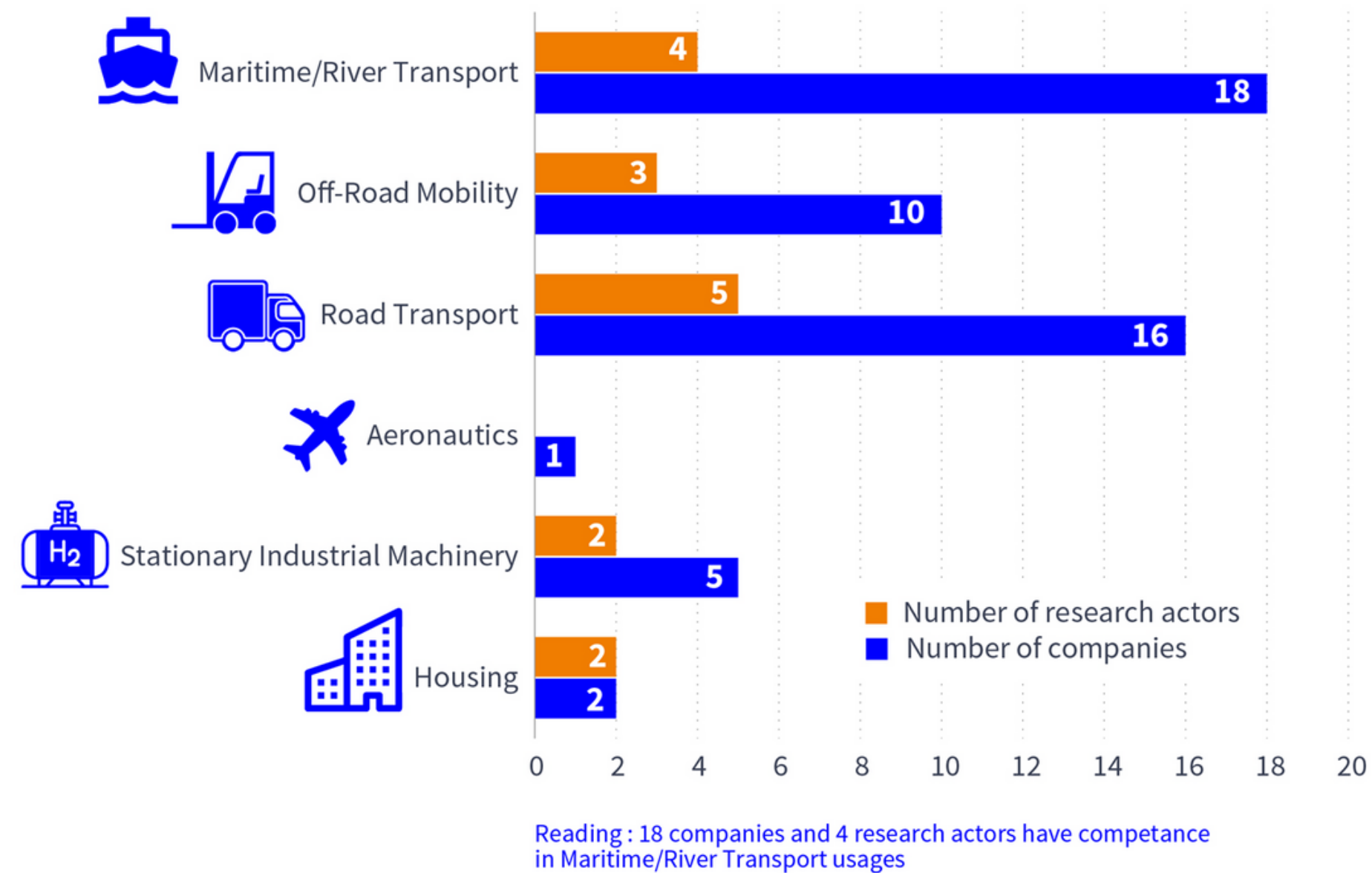


14
research actors
identified



PAYS DE LA LOIRE PROJECTS OVERVIEW

The breakdown of companies and research actors by type of hydrogen usage



1 company or 1 research actor could have competence in various usages.

PAYS DE LA LOIRE REGIONAL LEADER FOR HYDROGEN DEVELOPMENT



In July 2020, the local government of Region Pays de La Loire allocated a budget of 100M€ and a roadmap to support the development of hydrogen.

THE 4 MAIN STRATEGIC STREAMS

- Develop hydrogen production and distribution network
 - Available power (MRE, RE, Combinate)
 - Local Ecosystems (Energy/H2 production/distribution/usage)
 - Balanced network over the region
- Encourage and support the use of Hydrogen
 - Local: airport, mobility, building
 - Region an example in H2 usage : Sea, train, buses, public vehicles
- Develop Hydrogen skills and research programs focusing on maritime and river usage
 - Support R&D projects and expedite the technological transfer
 - Develop R&D on maritime and river application
 - Nantes-Saint-Nazaire port to become the first large Hydrogen Port in the Atlantic
- Offer opportunities for international business development
 - To external stakeholders in Region pays de la Loire
 - Promotion of industrial good and service offer



SUPPORT AND ADVICE EVERY STEP OF THE WAY



Nathalie Garry

International Project Advisor
Business Solutions Atlantic France
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**Do you plan to set up a business in Atlantic France
in the coming months/years?**

We support you every step of the way!

- We introduce you to our H2 ecosystem players
- We put you in touch with potential partners
- We help you find premises
- We help you with your recruitment process
- We guide you through the administrative process

Services are free of charge and fully confidential.

**Seize this opportunity
to meet our regional H2
stakeholders and experts!**



HyVolution

THE HYDROGEN EXHIBITION FOR
ENERGY, INDUSTRY AND MOBILITY

MAY 11 & 12, PARIS

**SHOWCASING THE FRENCH HYDROGEN ECOSYSTEM
IN THE PAYS DE LA LOIRE REGION**

Lhyfe



THE REGIONAL HYDROGEN ECOSYSTEMS STRATEGY

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OUR IDENTITY

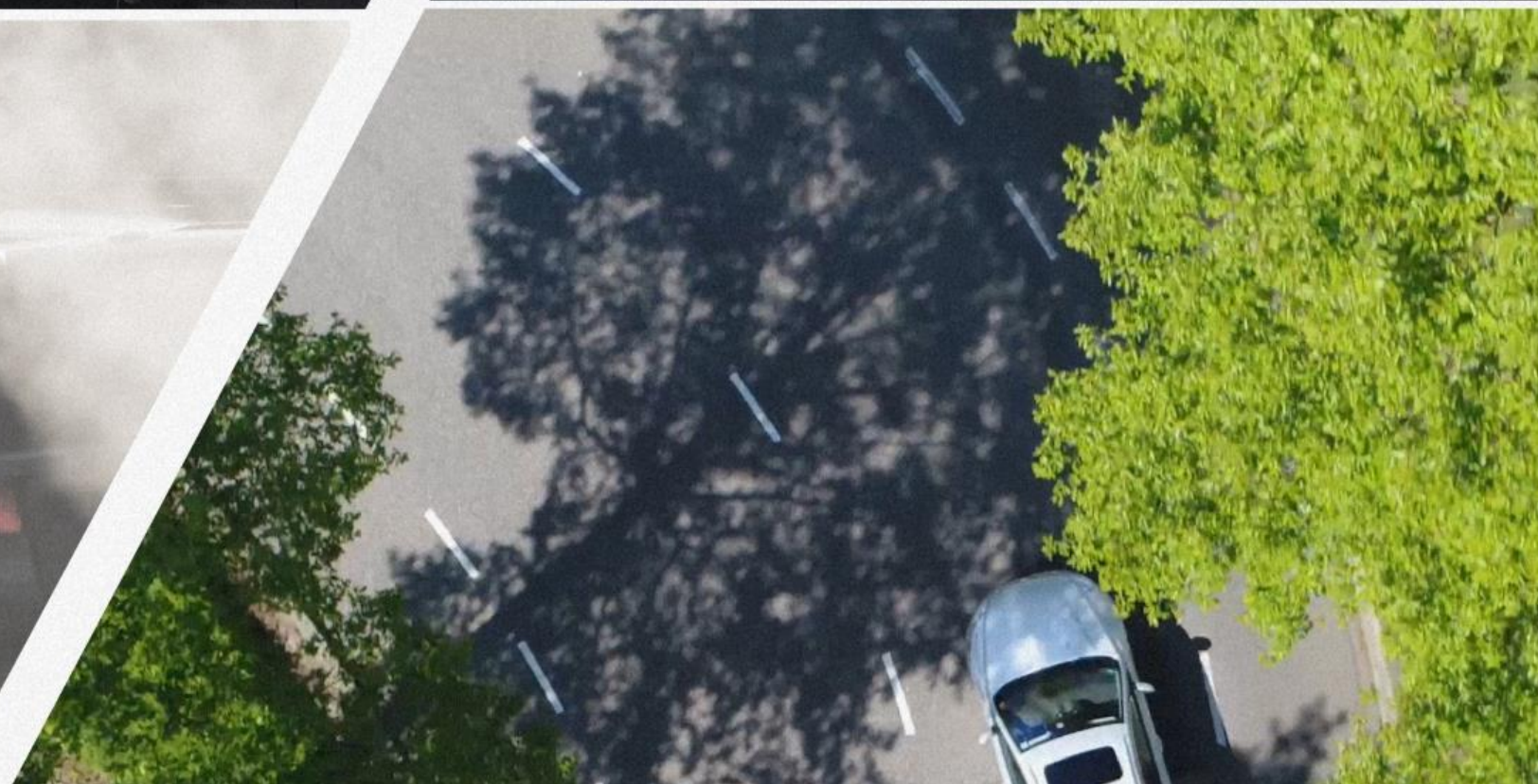
Independent green
hydrogen producer

OUR MISSION

Decarbonise mobility
and industry

OUR PURPOSE

Avoid 1 billion tonnes of
CO₂ emissions



LHYFE HYDROGEN,
FROM RENEWABLE ELECTRICITY:
WHY PAYS DE LA LOIRE?

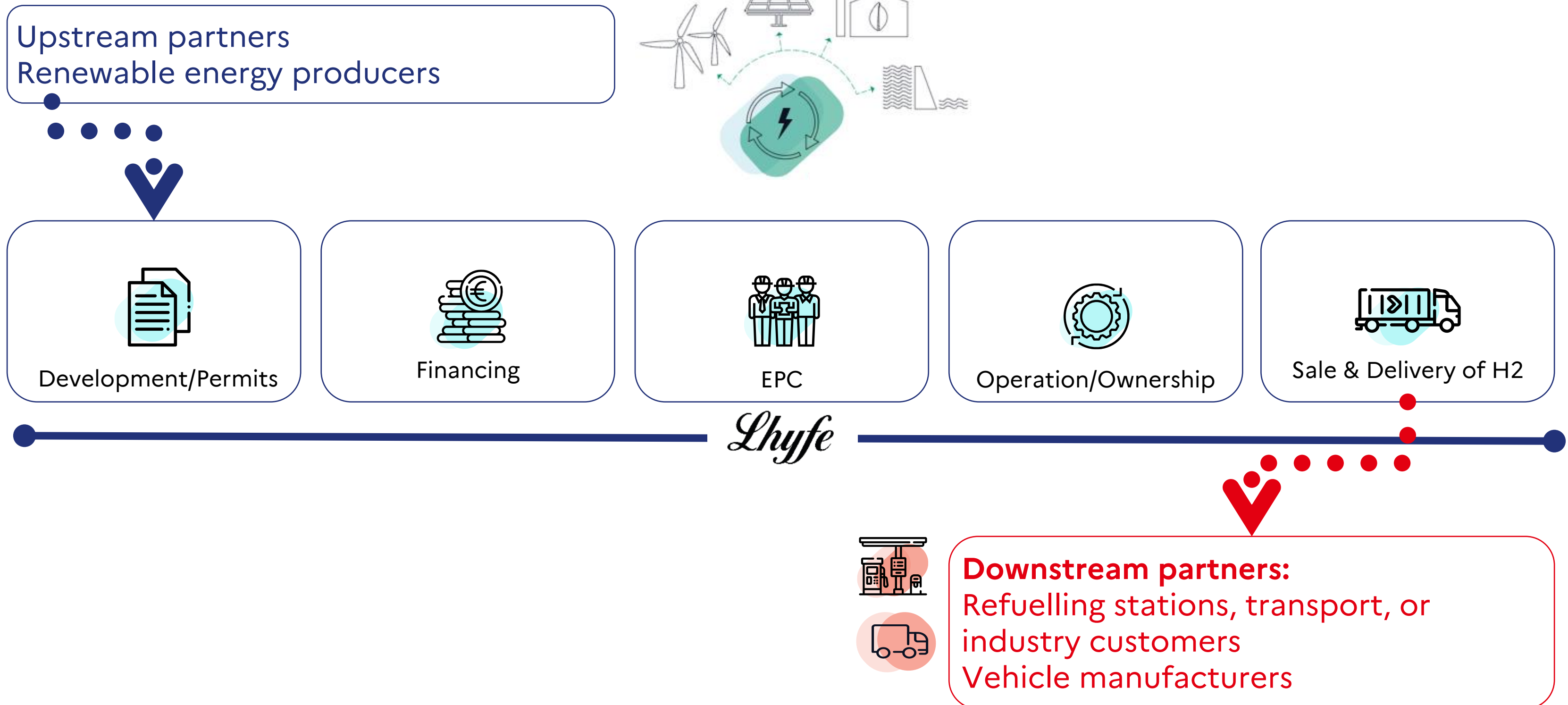
Lhyfe



<https://youtu.be/0yXC6Laa9k>

LHYFE RENEWABLE H2

OUR PARTNERS IN THE VALUE CHAIN



OUR PRODUCTION SITES

THREE HYDROGEN PRODUCTION SYSTEMS

Lhyfe



LHYFE BOX

Mobile production solution

- Maximum of 200 kilos a day
- Easy-to-connect mobile electrolyser
- Powered by grid energy



ONSHORE

Fixed land-based solution

- 1000 to 40,000 kilos a day
- Production plant
- Supplied directly with power and water



OFFSHORE

Fixed offshore solution

- 50,000 kilos a day
- Production at sea
- Supplied directly with power and water

FIRST SITE IN OPERATION BOUIN (VENDÉE)

Lhyfe



OPENED
September 2021

CAPACITY
300 kg to 1000 kg
of H2 a day

ENERGY SOURCE
Wind farm

WATER SOURCE
Sea

USES



FIRST OFFSHORE PILOT SITE LE CROISIC (LOIRE ATLANTIQUE)

Lhyfe

OPENING
2022

CAPACITY
400 kg of H2 a day

ENERGY SOURCE
Offshore wind
turbine

WATER SOURCE
Sea



FIRST INDUSTRIAL SITE SKIVE (DENMARK)

Lhyfe



OPENED
2022

CAPACITY
5,500 kg to 12,000 kg
of H₂ a day

ENERGY SOURCE
Solar power/wind
farm

WATER SOURCE
Network

USES



DB: FIRST RENEWABLE HYDROGEN HIGH-SPEED TRAIN

Lhyfe

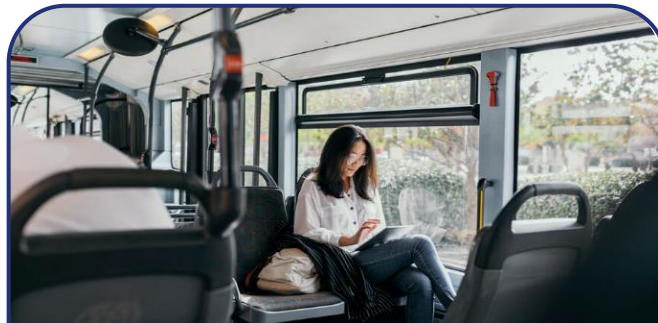


LHYFE BOX

Located in a
test zone in
Germany

QUANTITY OF
HYDROGEN PRODUCED
190 kilos a day

LHYFE WORKS WITH CLIENTS WITH WIDE-RANGING NEEDS



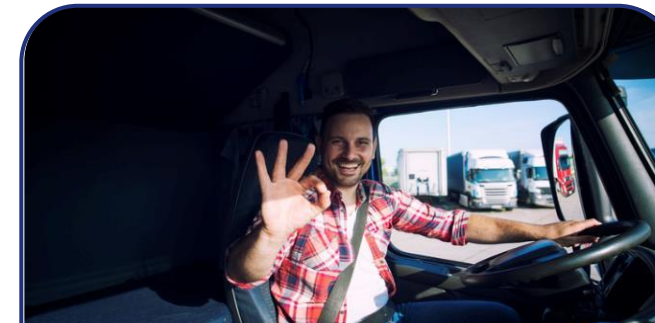
LOCAL AUTHORITIES

who have made the choice to offer environmentally friendly public transport to citizens



INDUSTRY

whose process requires the use of hydrogen and/or who are opting for a clean alternative to existing fuels (gas, petcoke etc.)



TRANSPORT & LOGISTICS PROVIDERS

who want a real solution to improve their environmental impact



FUEL DISTRIBUTORS

who are diversifying their offering at the pump (electric, hydrogen, etc.)

VENDÉE: THE EMERGENCE OF A RENEWABLE HYDROGEN REGION

Lhyfe



FILLING STATION

60 km

Bouin Plant <> Roche-sur-Yon

QUANTITY OF HYDROGEN
THAT THE STATION CAN SUPPLY
200 kilos a day

LIDL: HYDROGEN FORKLIFTS TO SAVE TIME AND SPACE

Lhyfe



One minute charge time for each forklift, for an autonomy of at least one day

50 forklifts in 2021

130 in 2022

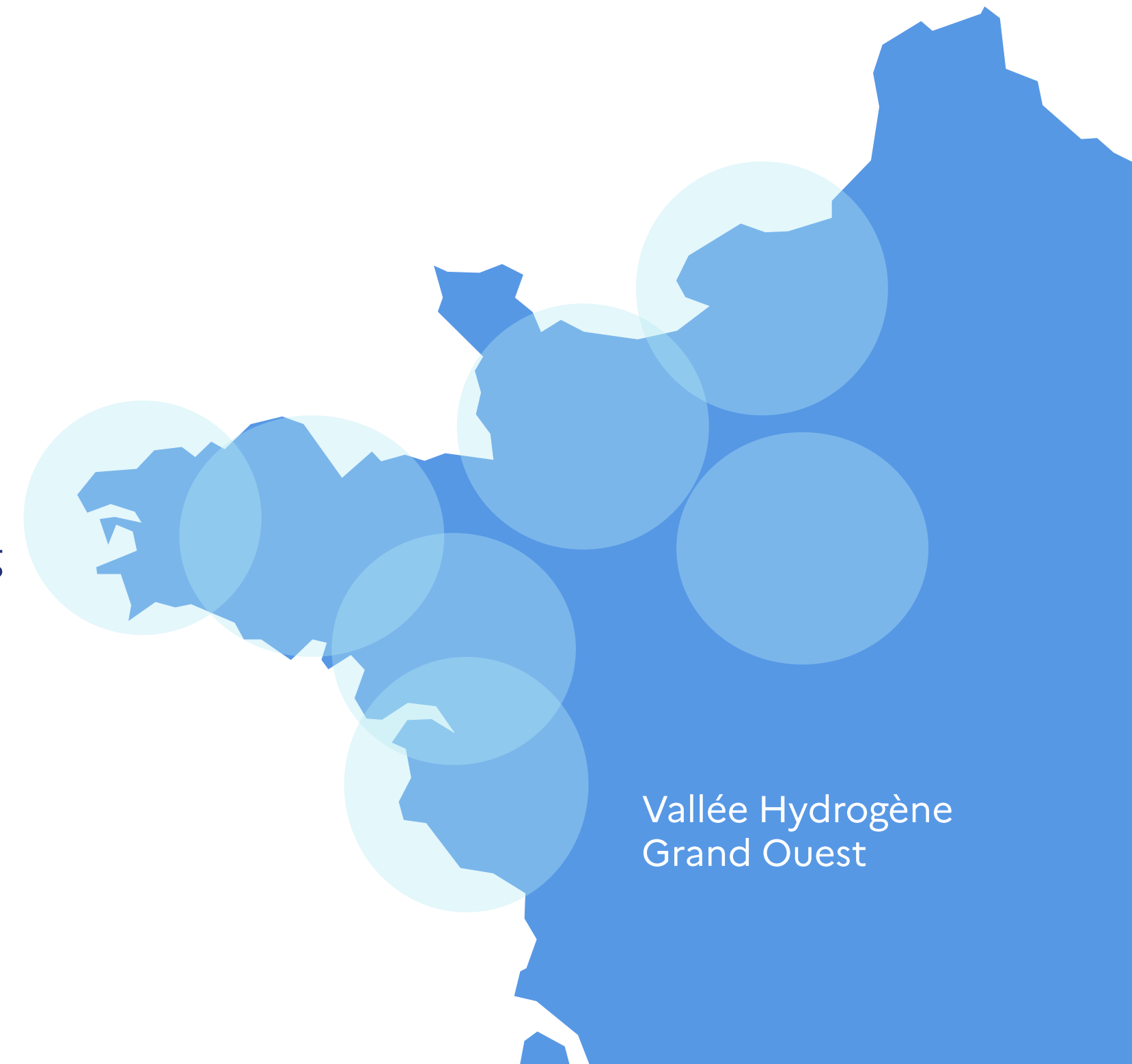
VHYGO EXAMPLE OF THE DEVELOPMENT OF A HYDROGEN ECOSYSTEM

Lhyfe

First transregional
hydrogen distribution
network including
10 green hydrogen
production sites



- 20+ hydrogen refuelling stations across three regions
- 500 hydrogen vehicles powered on a daily basis
- Green hydrogen at under €8/kg available at the pump by 2030
- Carbon footprint reduced by 50,000 tonnes of CO2 by 2024



Vallée Hydrogène
Grand Ouest



A COMMITTED INTERNATIONAL TEAM

Lhyfe

- Making this change that we all know is necessary happen NOW requires energy and courage – and the good news is, our team has plenty.



80+

- Every member of our team is fully engaged in our mission and convinced of the positive impact of our everyday battle.



contact@lhyfe.com



www.lhyfe.com



Lhyfe



[@Lhyfe_hydrogen](https://twitter.com/Lhyfe_hydrogen)

NORDICS & UK

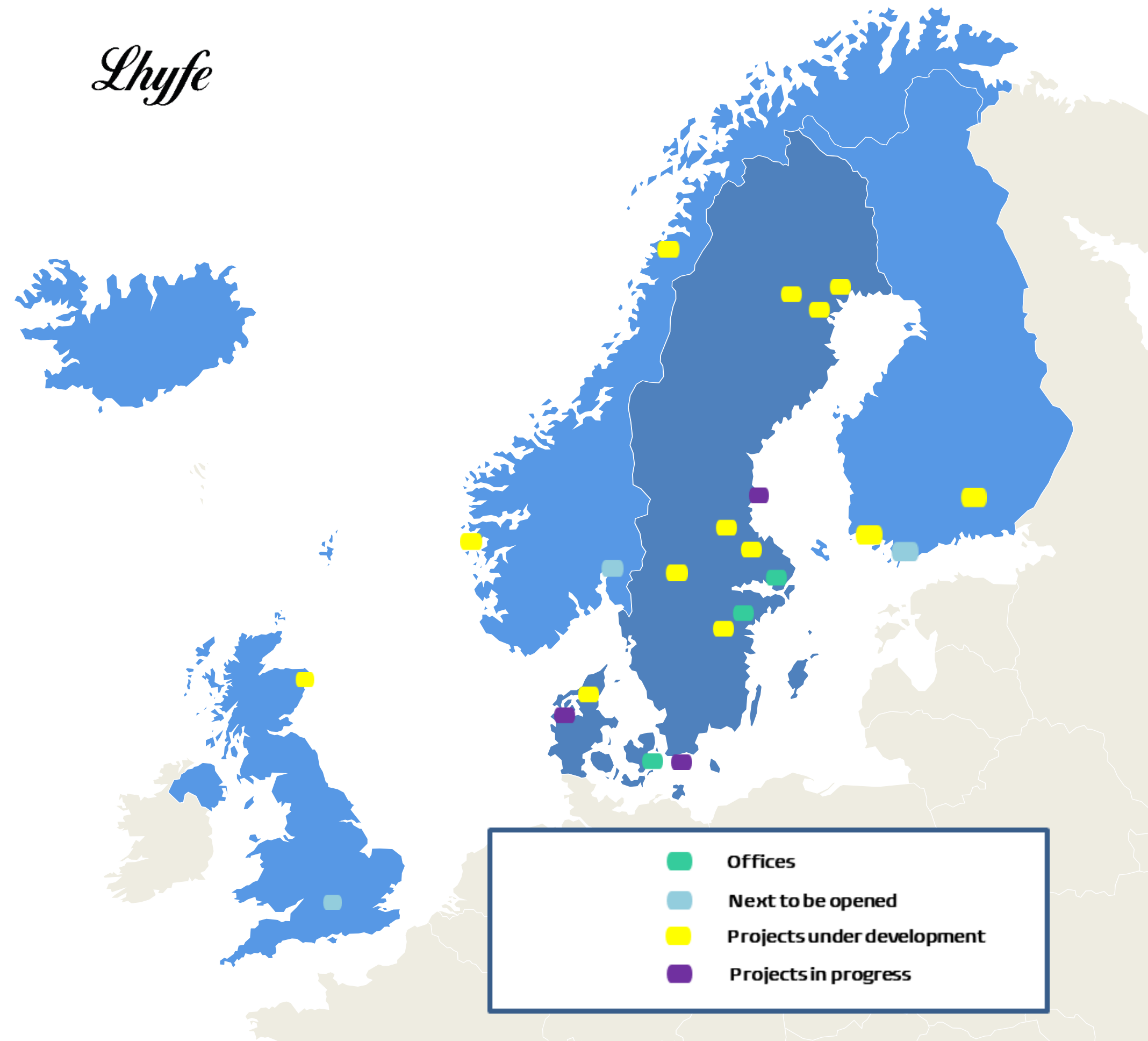
The current team is three people.
At year end 2022 it will be 13 people.

Offices will open in UK, Norway and Finland.

Two MoU's have been signed.
Three more in progress.

Two M&A activities in progress.

Project Pipeline of 2,1+ GW.



SHOWCASING THE FRENCH HYDROGEN ECOSYSTEM IN THE PAYS DE LA LOIRE REGION



Q&A SESSION





CONNECT - ACCELERATE - SUCCEED

www.world.businessfrance.fr/nordic