Air Liquide

Decarbonization in Industry

From single site to Bassin Level Collaboration

Group presentation

March 2024

THIS DOCUMENT IS PUBLIC

A world leader in gases, technologies, and services for…

INDUSTRY

Sustainable solutions for a wide range of industrial processes for our customers (energy, metals, food, chemicals, automotive, pharmaceuticals, etc.) **and for transports**

HEALTH

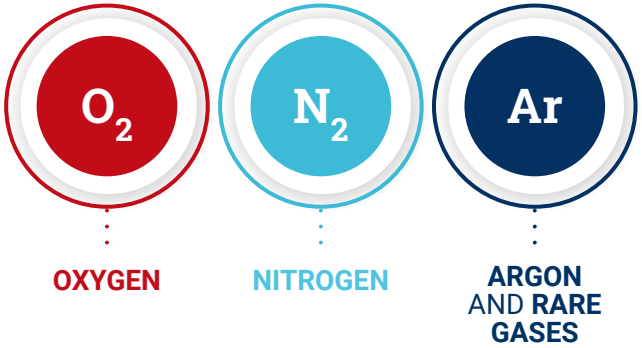
Patients at home
Hospitals
Specialty ingredients

©Adrien Daste

Our scientific territory: Essential small molecules

**Oxygen, nitrogen and hydrogen are essential small molecules for life, matter and energy.
They embody Air Liquide's scientific territory and have been at the core of the company's activities.**

Separating the components of **air** to take advantage of their properties



Producing molecules from the **natural resources** of the planet

2023 Key Figures

~67,800
EMPLOYEES

PRESENT IN
72 COUNTRIES

MORE THAN
4 MILLION
CUSTOMERS &
PATIENTS

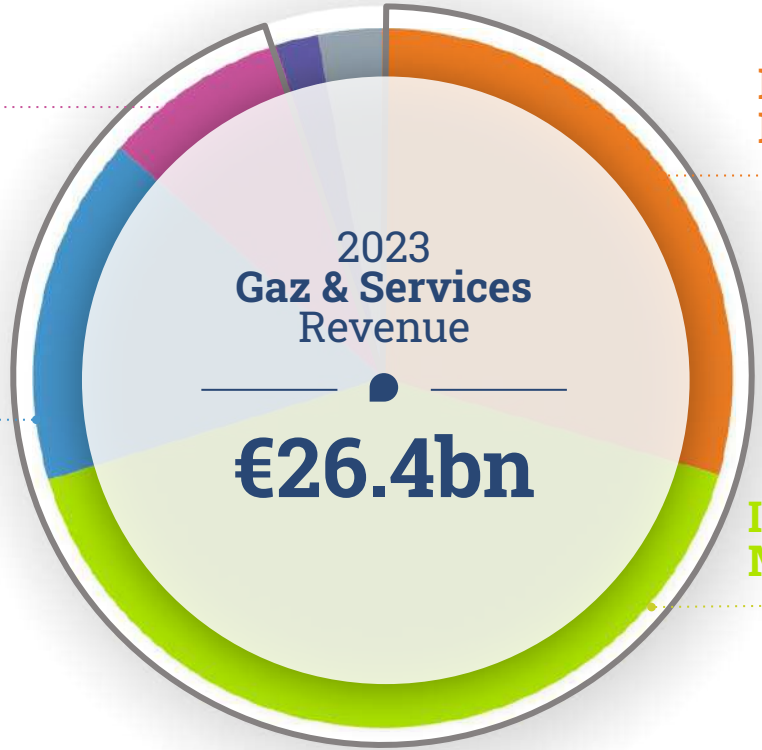
REVENUE
€27.6bn

NET PROFIT
(GROUP SHARE)
€3.1bn

INVESTMENT
DECISIONS
~€4.3bn

Gas & Services revenue

2023 figures



9% ELECTRONICS

Carrier Gases
Advanced Materials
Equipment & Installations
Services

15% HEALTHCARE

Home Healthcare
Hospitals
Specialty Ingredients

LARGE INDUSTRIES 28%

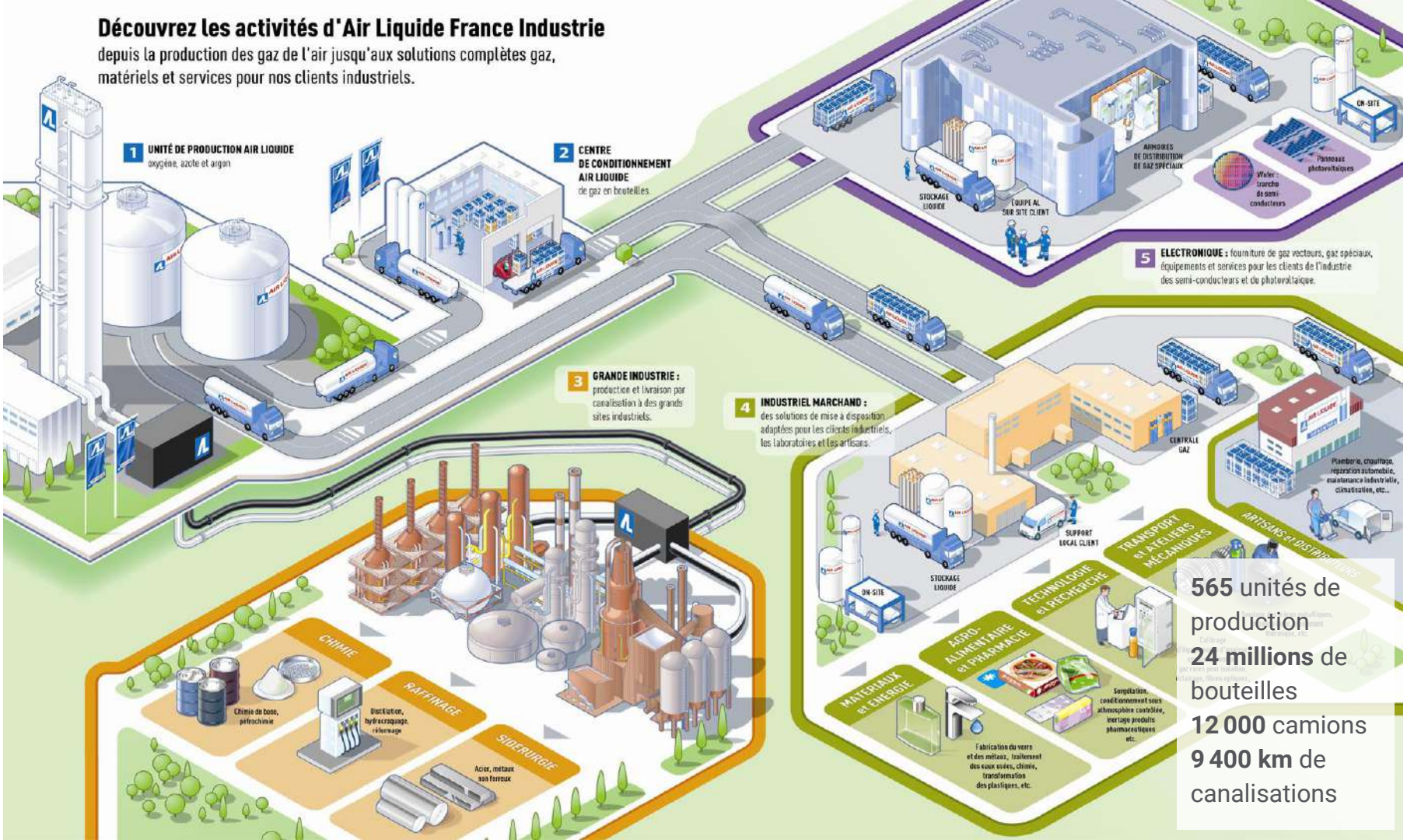
Air gases, hydrogen and CO
15-year or more contracts
Pipeline networks
Industrial basins

INDUSTRIAL MERCHANT 43%

Bulk and cylinder gases
Hardgoods
for a wide variety of sectors
and customer sizes

Découvrez les activités d'Air Liquide France Industrie

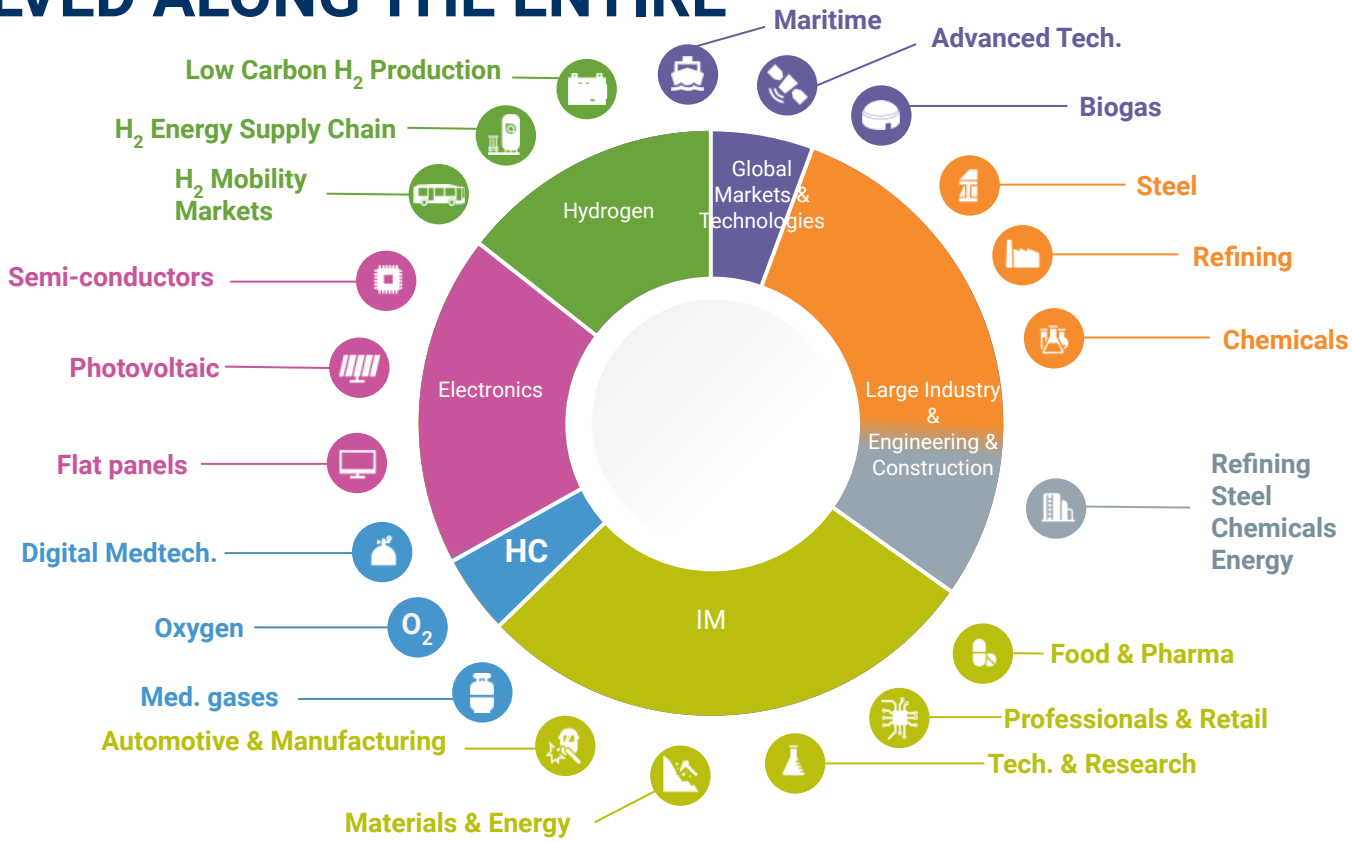
depuis la production des gaz de l'air jusqu'aux solutions complètes gaz, matériels et services pour nos clients industriels.



565 unités de production
24 millions de bouteilles
12 000 camions
9 400 km de canalisations

WE ARE INVOLVED ALONG THE ENTIRE VALUE CHAIN

FROM
PRODUCTION
TO
APPLICATION



01

Our Sustainability Strategy

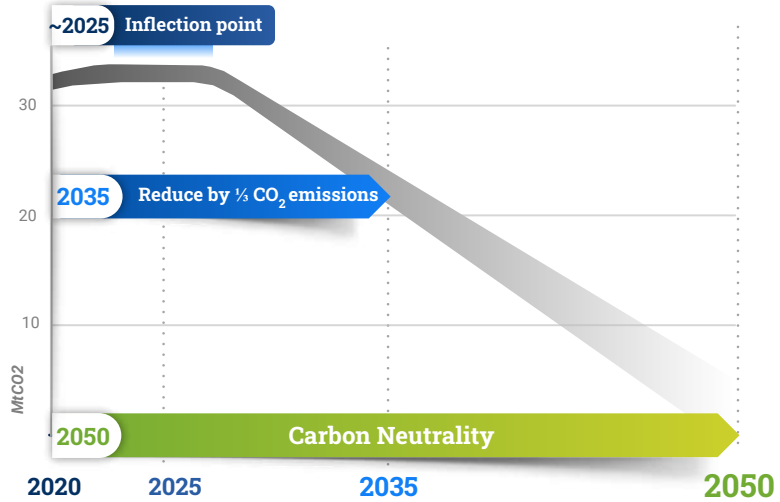
March 2021: First Complete Set of ESG Commitments

	2025	2035	2050
 **A**batement of CO_2 Emissions	• Inflection in absolute emissions • <30%> reduction in carbon intensity vs. 2015	• <33%> reduction in absolute emissions vs. 2020	• Carbon Neutrality
 **C**are for patients	• In Mature economies - increase personalized care for patients • In Low & Middle Income Countries : Facilitate access to O_2		
 **T**rust as the base to engage with employees & to build best-in-class governance	• 35% Women among M&P • 100% of employees to have common basis of care coverage • All employees to have access to local volunteering initiatives		

…With CO2 Emissions Reduction Becoming One of the 3 Strategic Objectives

Absolute Scope 1+2 emissions

Reminder



ADVANCE
Performance Objectives

Sales growth
+5-6% CAGR(1)

ROCE
>10%
by 2023(2)
and forward

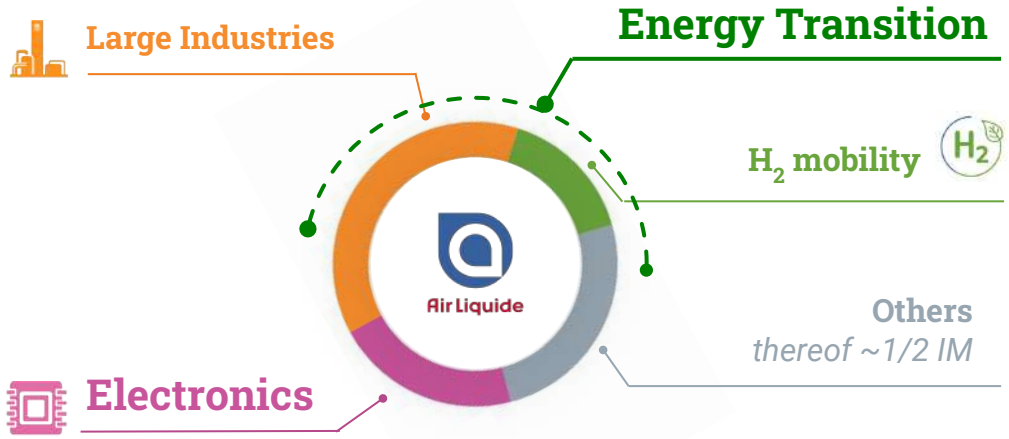
Air Liquide

CO_2 emissions inflection
around 2025

Subject to favorable long-term policy and regulatory frameworks, and availability of new low-carbon energy infrastructure
(1) Group comparable growth 2021-2025 CAGR (2) Recurring ROCE based on Recurring Net Profit

… And investments being selective

Industrial Investment Decisions above €5m



Total investment decisions **€16bn**(1) **2022-2025**

>50%

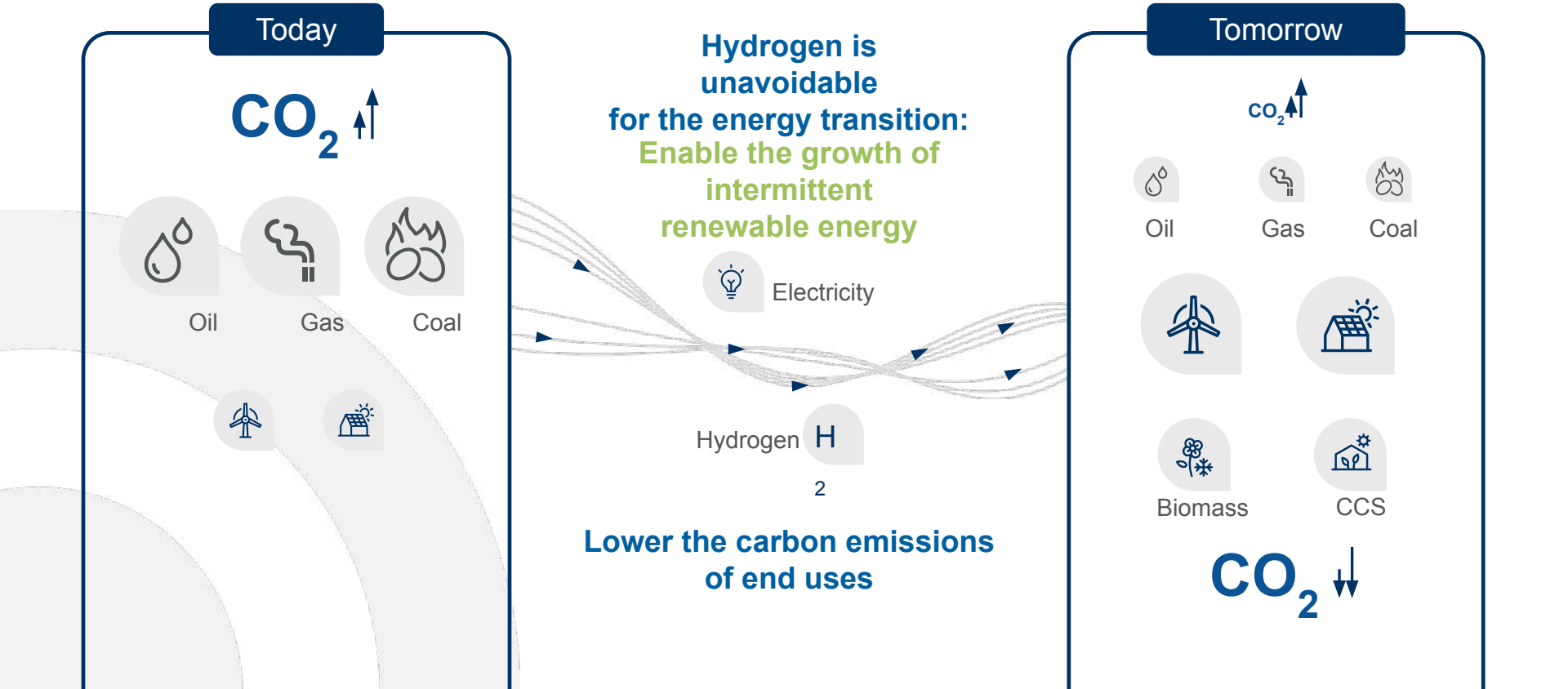
In Energy Transition

(1) Cumulated industrial and financial investments decisions over 4 years 2022-2025

02

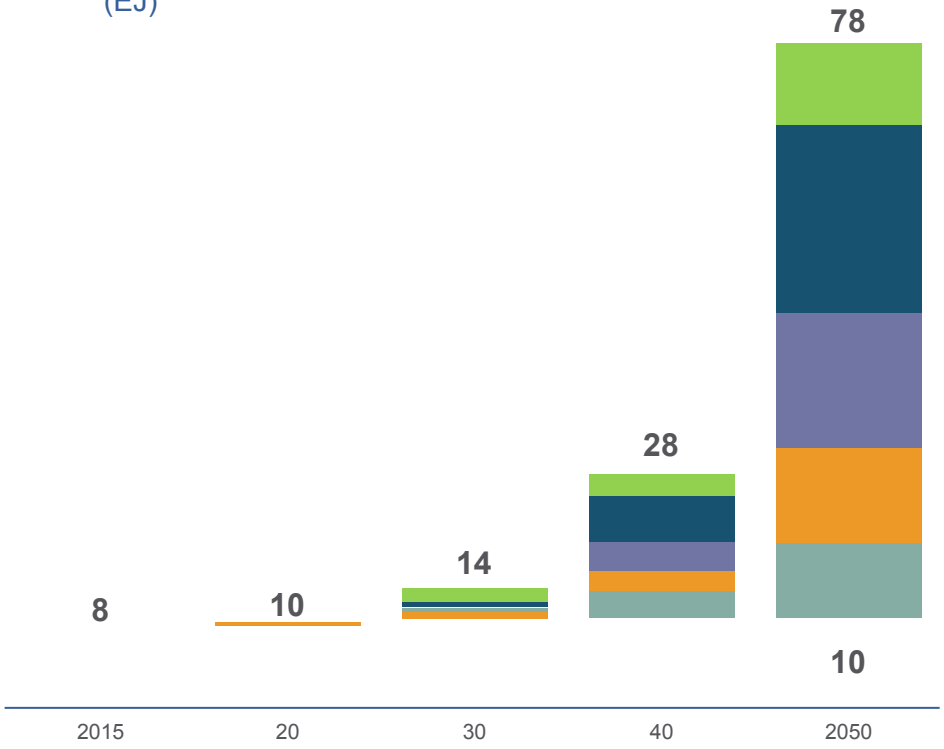
Focus on Clean Hydrogen Production

Transformations in the global energy system



In a 2-degree-world, hydrogen could contribute ~18% of demand

Potential global energy demand supplied with hydrogen, Exajoule (EJ)

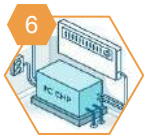


SOURCE: Hydrogen Council

Power generation, buffering

Transportation

Industrial energy

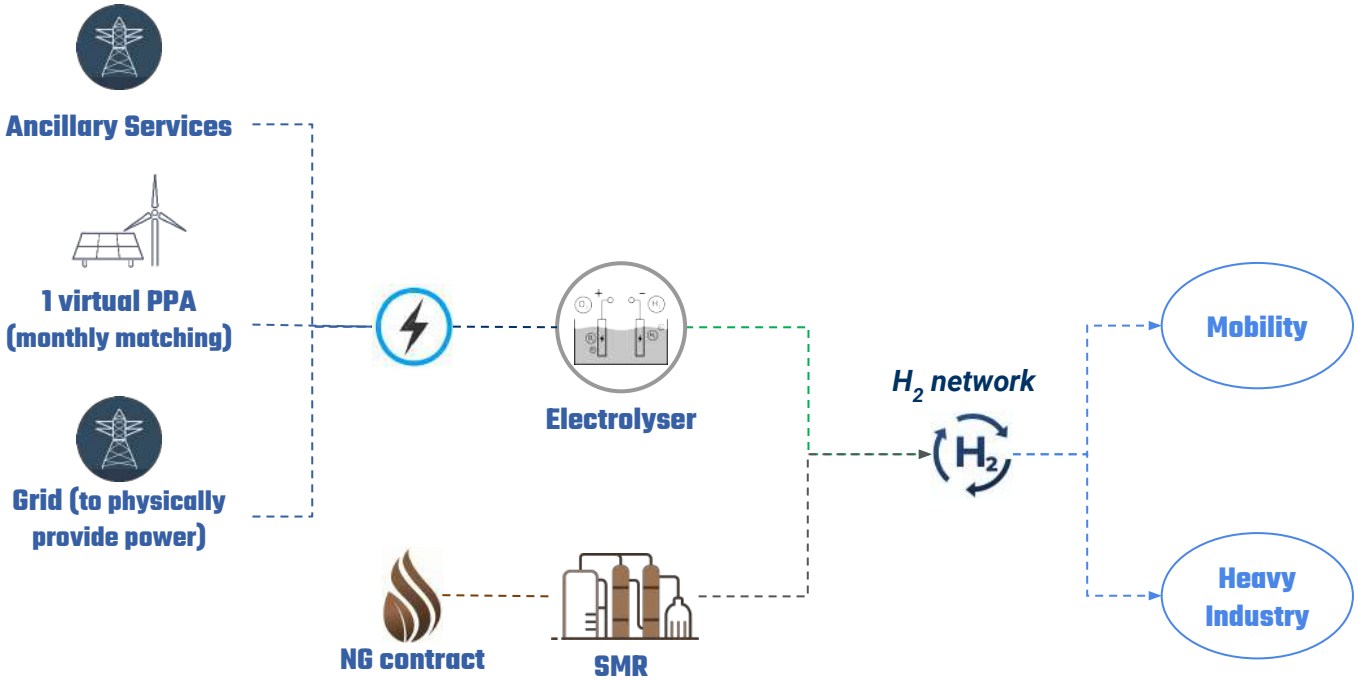


Building heat and power

New feedstock (CCU, DRI)
Existing feedstock uses

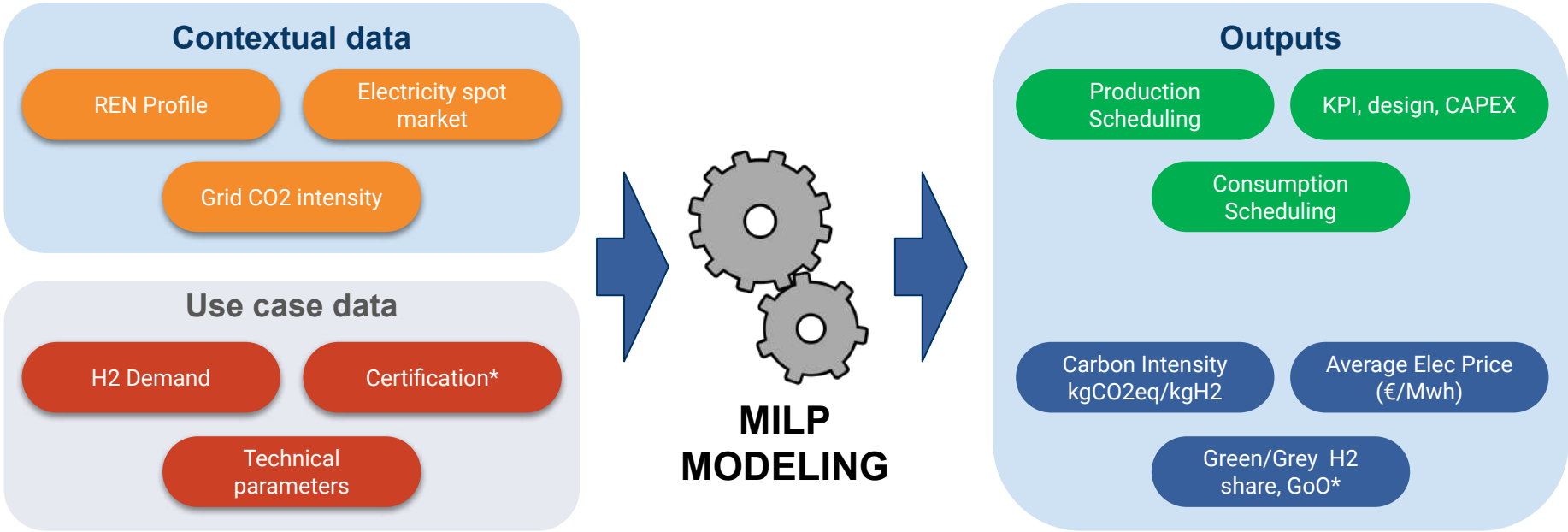
18%
of final energy demand

Low Carbon H2 Production and Supply Modeling



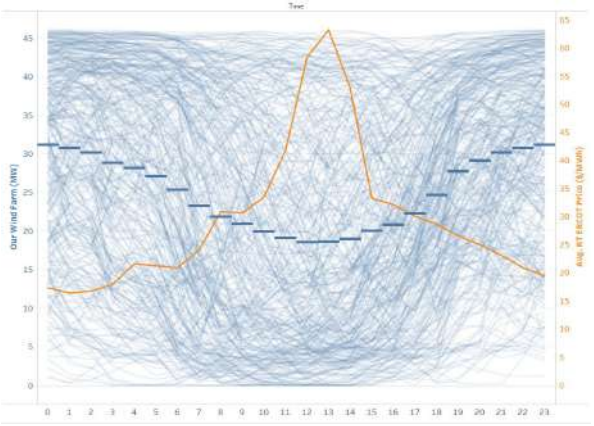
PlaneTerr Use Case

General Modeling Overview



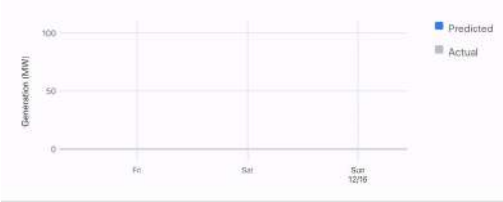
A Large Panel of Technologies & Optimization Levers

- **Using Operations Research | ML | AI**
- **Different Types of Assets & Contexts:**
  - Electrolysers, ASU, Cogeneration, Gas Networks
  - Energy Sourcing, CO2 Management
  - Contrat Risks & Flexibilities



- **Strategic Decisions:**
  - Optimal sizing of assets / storages
  - Best combination of renewable sources
  - Optimal asset degradation management

- **Operational Decisions:**
  - Day to day storage management
  - Accommodation of renewables intermittency
  - Synergies with our customer's operations



03

Scaling from Site to industrial Bassin

Air Liquide - Role in Industrial Basins

Customers

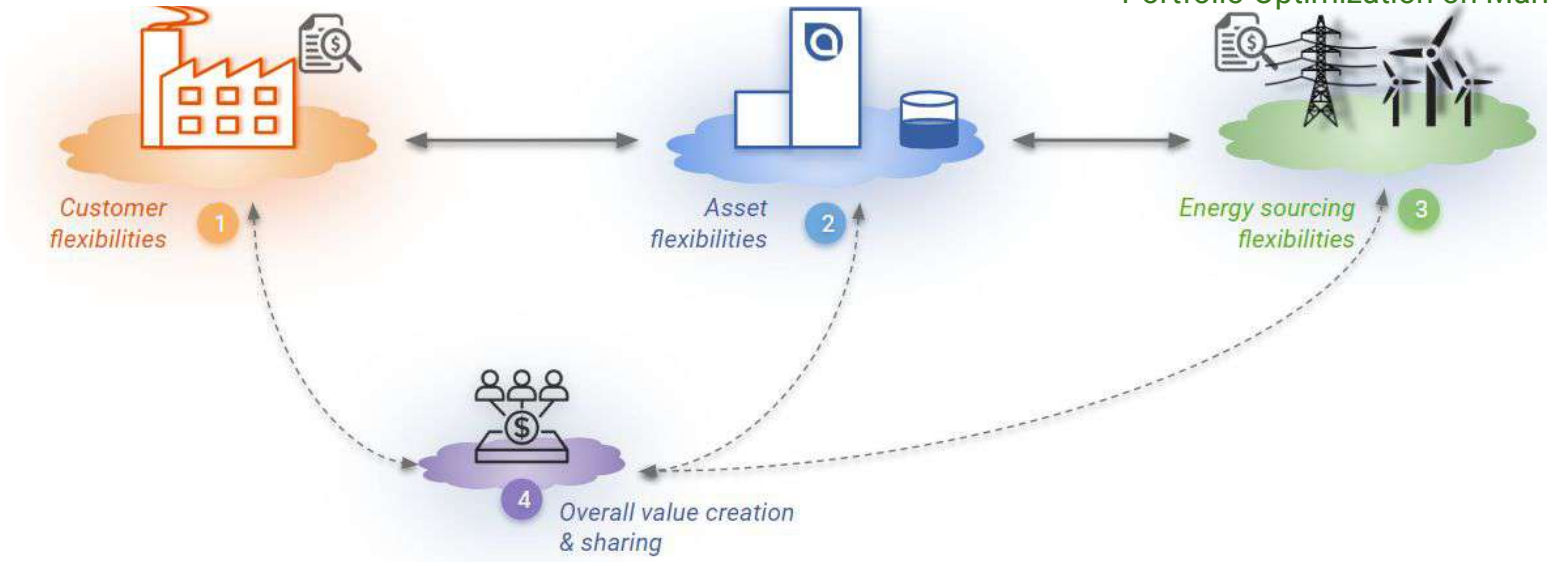
Optionality | Green Offers
Benefits from AL Network & Scale

AL Operations

Assets & Networks Optimization
Production Flexibility Valorization

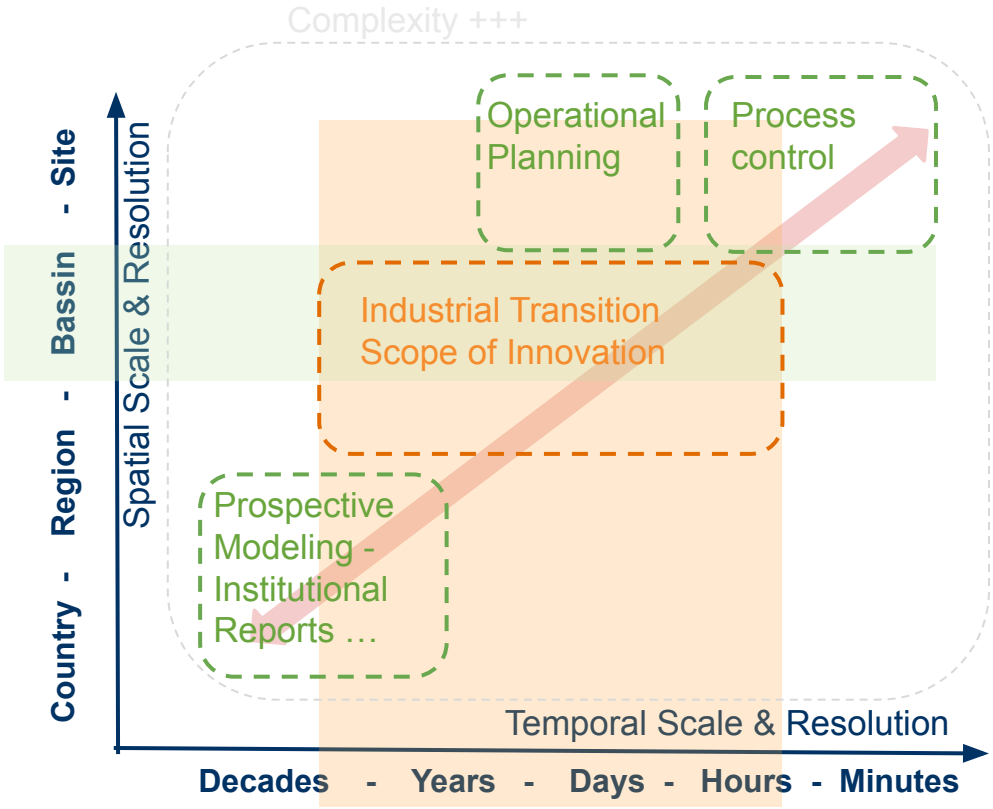
Clean Energy Sourcing

Renewables Integration
Portfolio Optimization on Markets



Synergies
Value Sharing

Industrial Bassin as a Modeling Scale:



Multi-Actor Decisions: Beyond Confidentiality

Market Design

Method to solve Multi-Agent Decision Problem

Peer to Peer

Distributed Optimization
Automated Trading

Supply Chain Wide Optimization

Multiple Objectives: Cost - Env. Impact

Cascading Decision Impacts

Strategic / Contractual Relations

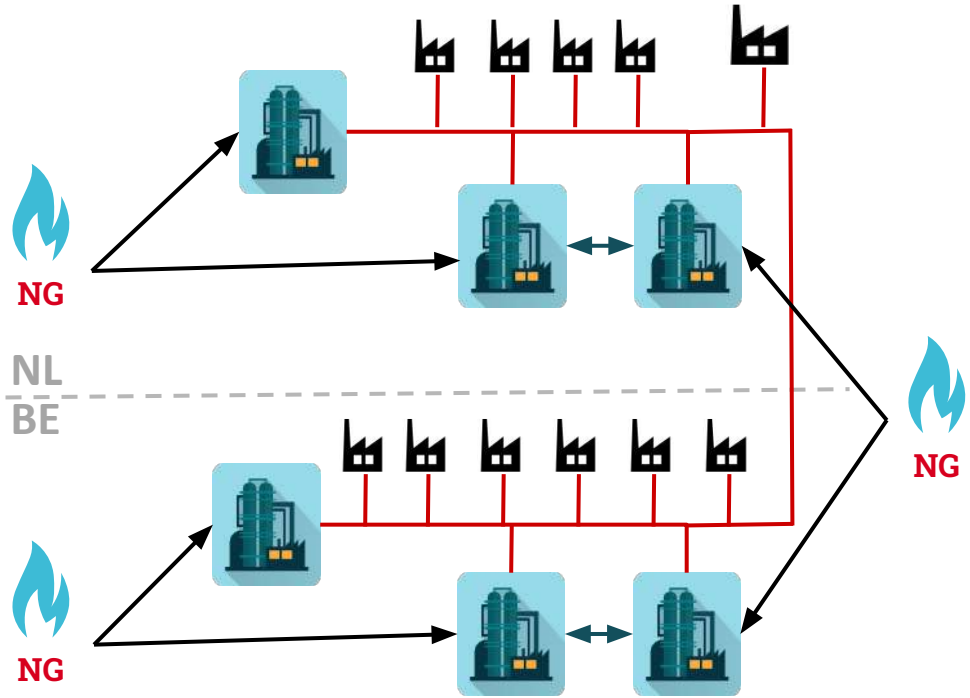
Centralized Solve

Monopoly
or
Regulated

Collaborative Solve

Common Solution
No Ops. Data or Model Sharing

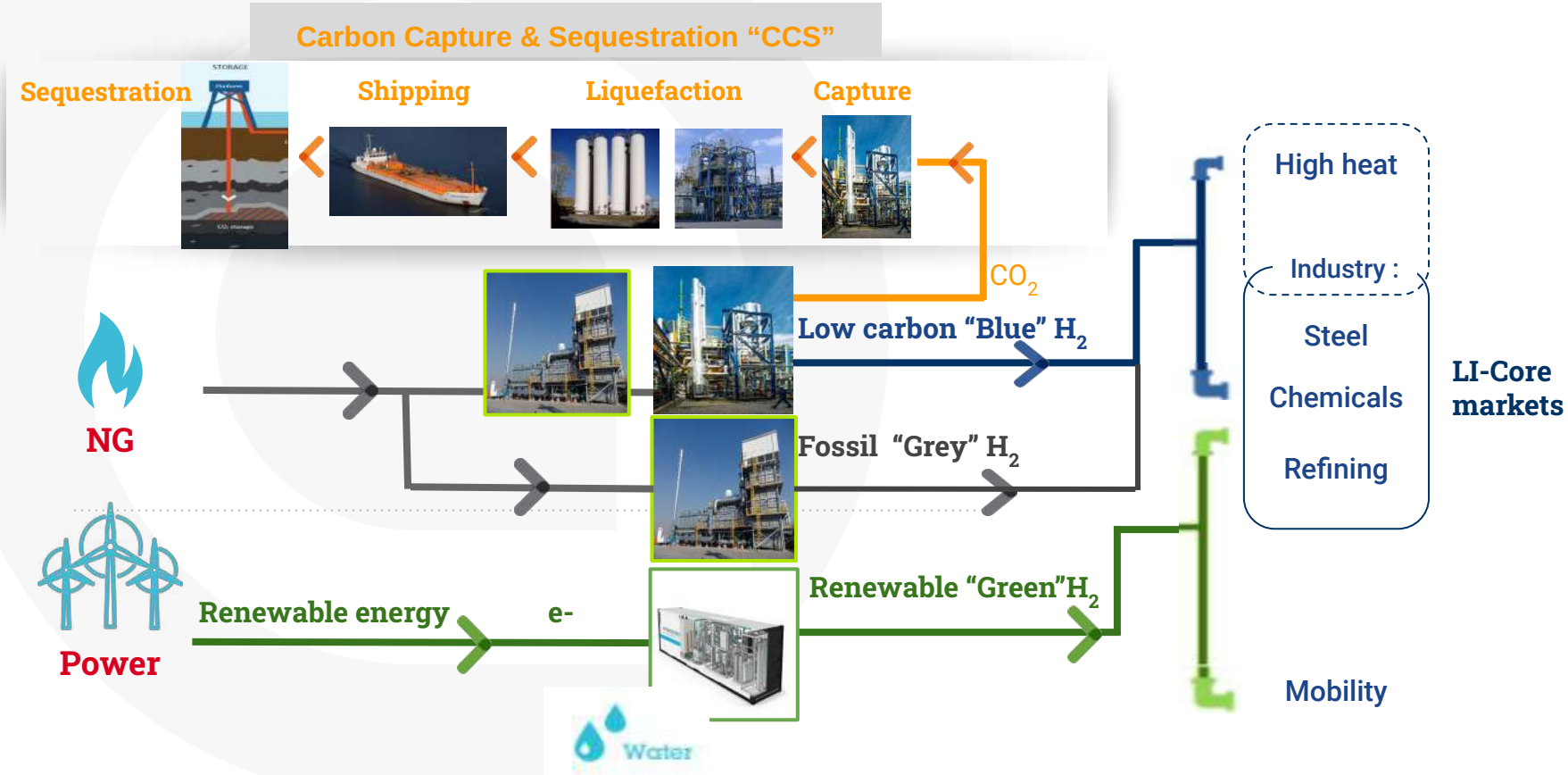
Building Synergies in Key Industrial Basins



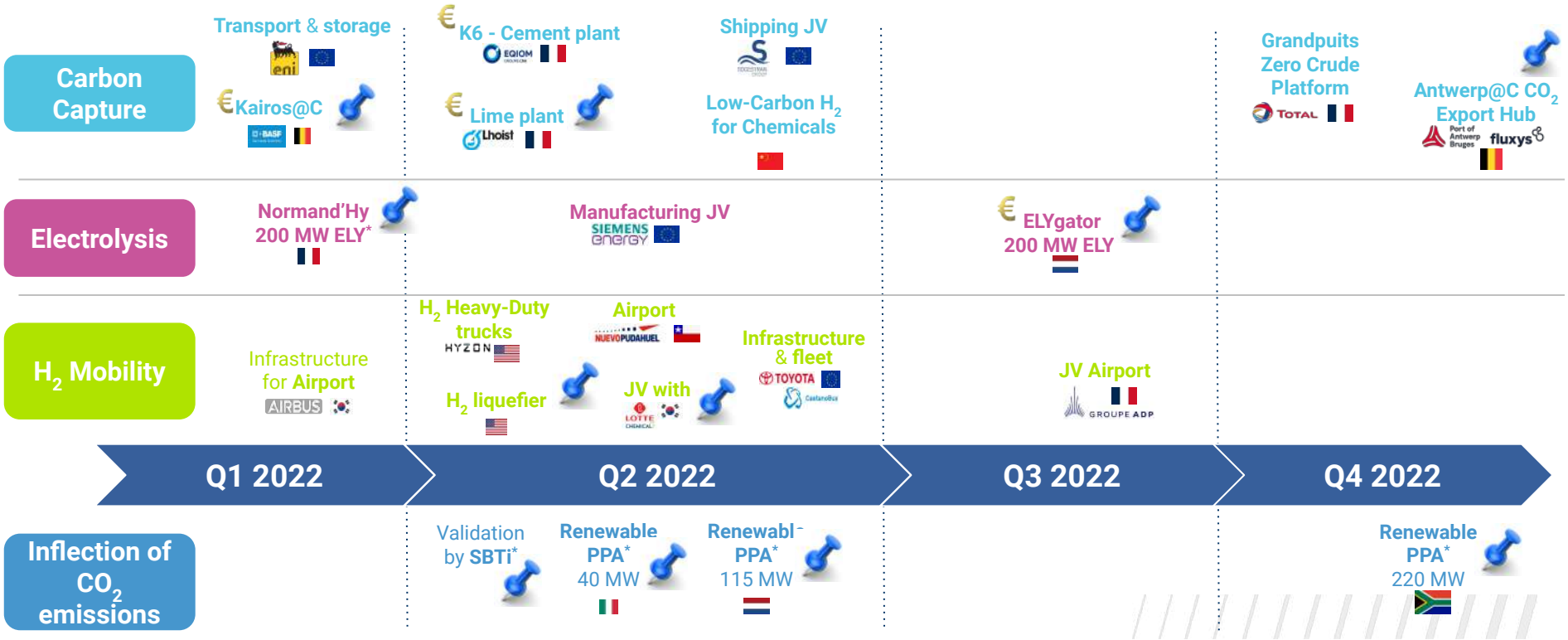
Scaling Optimization Across Industrial Basin Actors

- **Common Objectives:**
  - Global Supply Chain Efficiency
  - Environmental Footprint
  - ⇒ **Decarbonization** ⇐
- **Mutualization Services**
  - Interface with Multiple Sectors & Processes
  - Dedicated Infrastructure Expertise & Services
- **Digital Opportunities & Limitations**
  - **Larger Optimization Scope**
  - **Managing Confidentiality**

Hydrogen Decarbonization Technology Portfolio



Several Energy Transition Projects Initiated and Developed in 2022 → Ongoing Execution



** PPA=Power Purchase Agreement; ELY=Electrolyzer; SBTi=Science Based Targets initiative*

THANK YOU !

Q & A