



GRTgaz

Welcome
to the Jupiter 1000 project
*First industrial Power-to-Gas
demonstrator in France*

Version 05 2022

Jupiter¹⁰⁰⁰

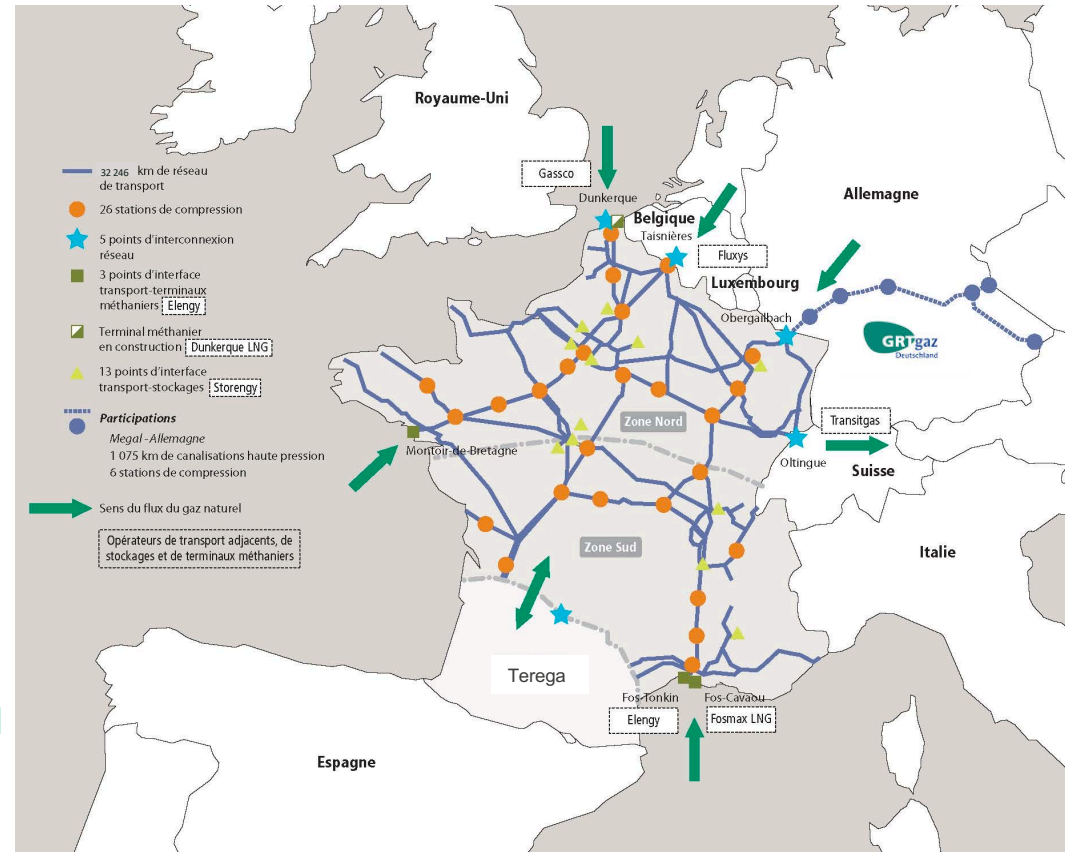
RICE
Research & Innovation
Center for Energy

Project
Support :



GRTgaz : the main transmission system operator in France

- A regulated gas transmission company
- 3 390 employees
- **32 517 km** of high pressure pipelines
- 28 compression stations
- **630 TWh** of gas transported
- about 4500 gas delivery stations
- 716 industrial actors connected to the grid
- 1,85 billions € of turn over



Shareholders:

61 % ENGIE

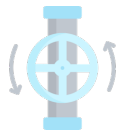
39 % Société d'Infrastructures Gazières



(2021 data – France only - see www.grtgaz.com)

Power-to-Gas : heart of an integrated strategy for Energy Transition

Gas Grid decarbonization



- Replace fossil gas by **renewable ones** (H2 or synthetic methane)
- **Adapt infrastructure and equipment**



- Experiment capture and **recycling of CO₂**

Power Grid support



- **Give a value** to electric surpluses due to intermittent renewable production
- Support **power grid stability**
- **Energy system optimization and Synergy**

Territorial development



- Replace imports with **local production**



- **Reduce the country's energy dependency**



- Develop **technological exports and local employment**

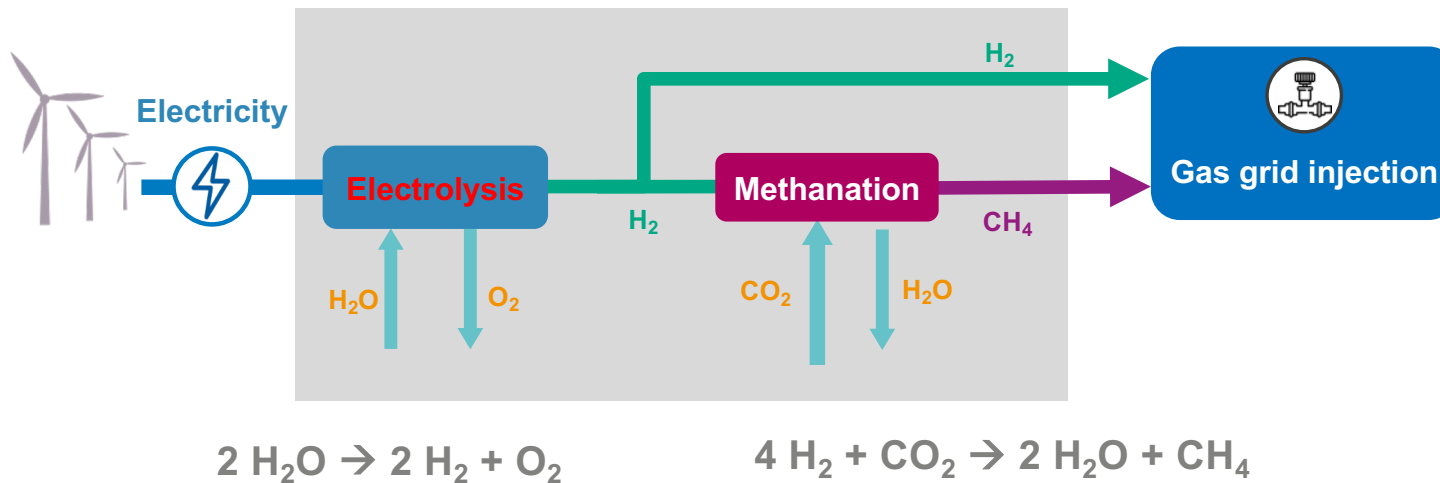
A strategy of grid integration at a country level, and the aim of global efficiency

About 50 projects spotted around Power to Gas technologies, mainly in Europe...

From Power ... to Gas !

When the gas grid offers the capacity to store massive renewable electrical surpluses

Power-to-Gas Jupiter 1000 process



Methanation improves synergies, with the possibility to store bigger volumes

Objectives of the demonstrator Jupiter 1000

The best way to convince is to achieve a proof



**Validate the processes
+ integration of a new gas
into the gas system**

- Validate the technologies :
electrolysers, methanation and CO2 capture
- Experiment hydrogen injection into the gas grid
- Confirm the flexibility offered to support the power grid



**Launch
the Power-To-Gas
sector in France**

- Help to build suitable conditions for the emergence of a new industrial sector
- Feed the debate :
 - o Environmental benefits
 - o Impact of CO2 quality
 - o Guaranties of Origin
 - o ...

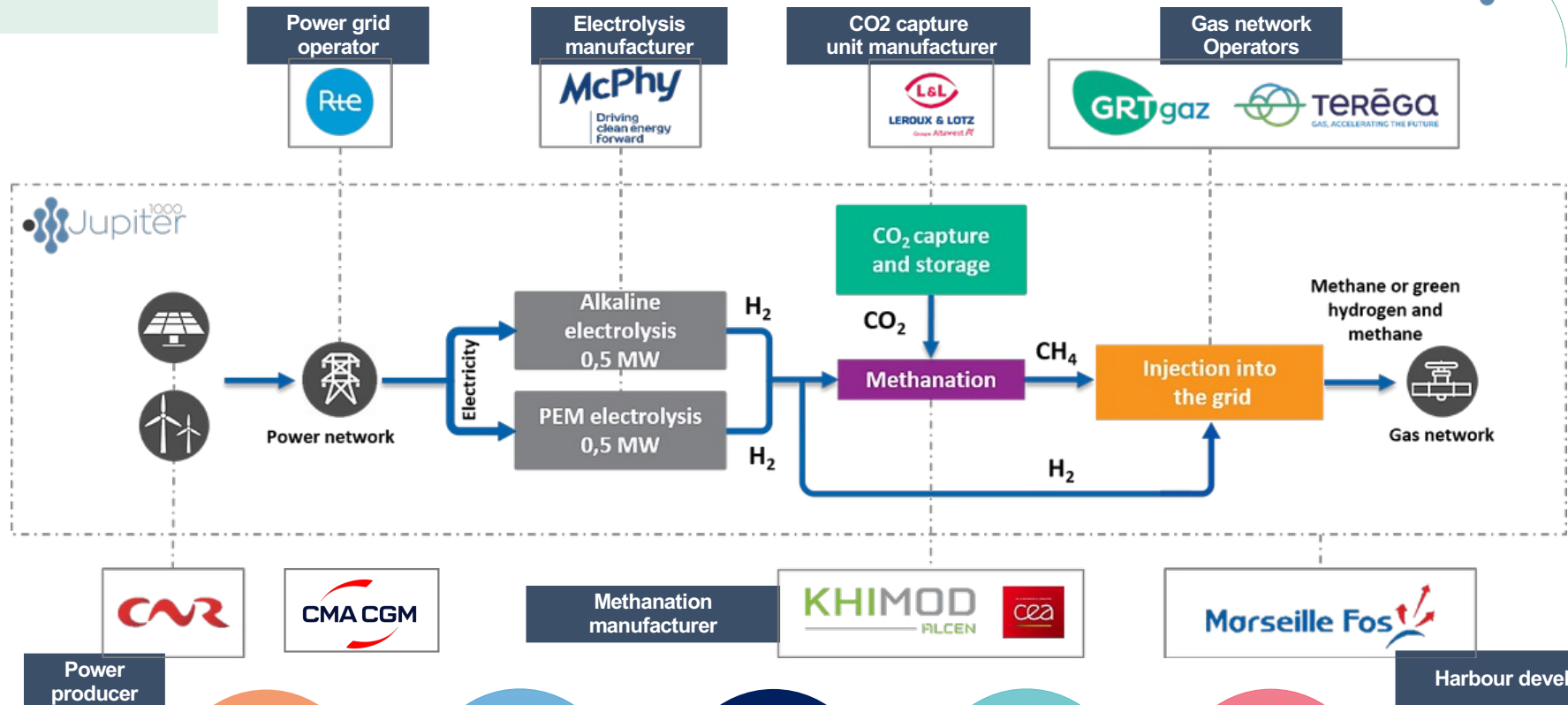


**Explore the
Business Model**



Jupiter 1000 - P2G players working together

The project is the result of the collaboration of 9 French industrial partners



1 MW_e
for 2 electrolyzers

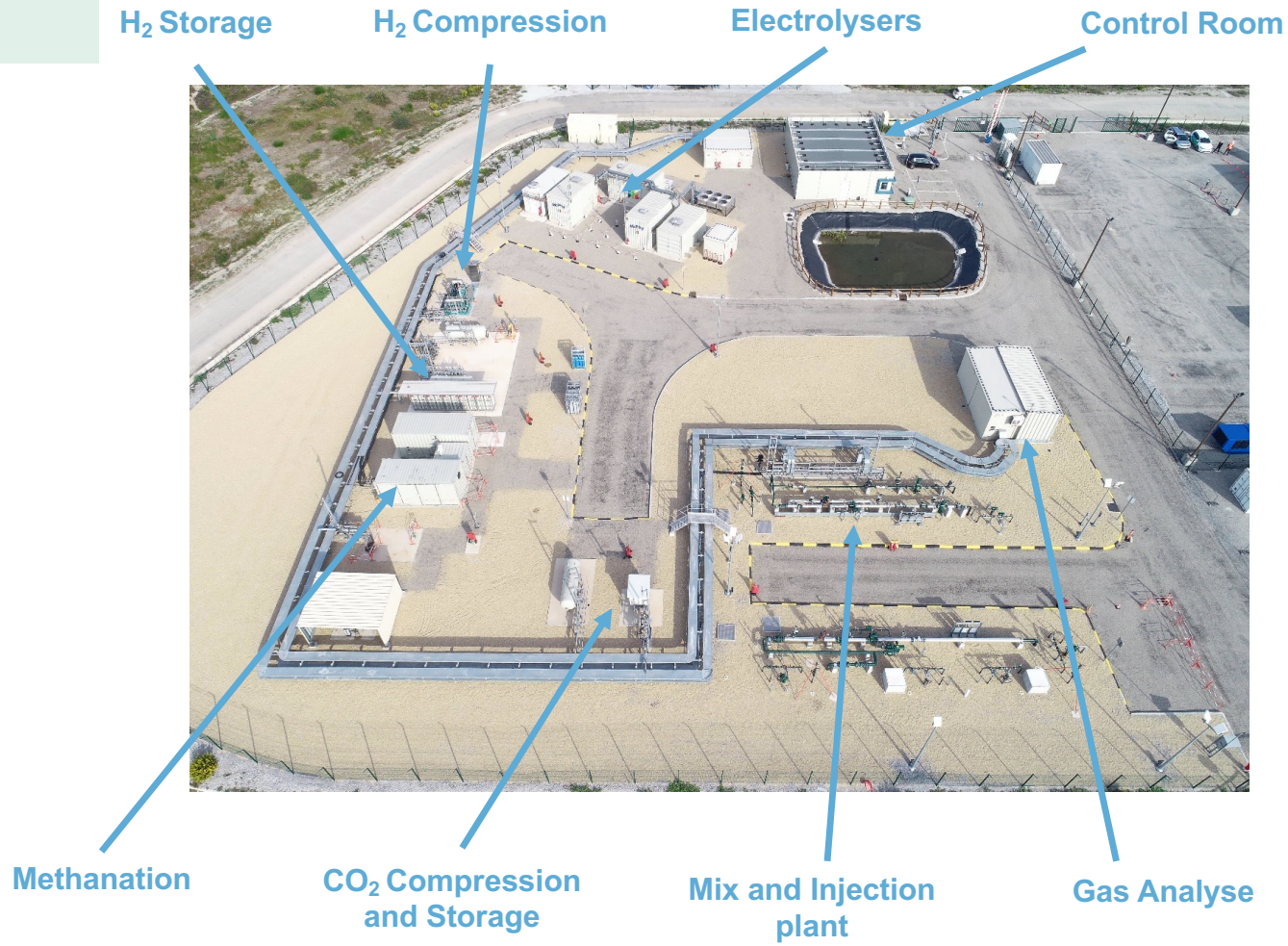
200
Nm³/h of hydrogen

1 to 2 %
Average H₂ rate ...
Max 6 %

25
m³/h
of methane

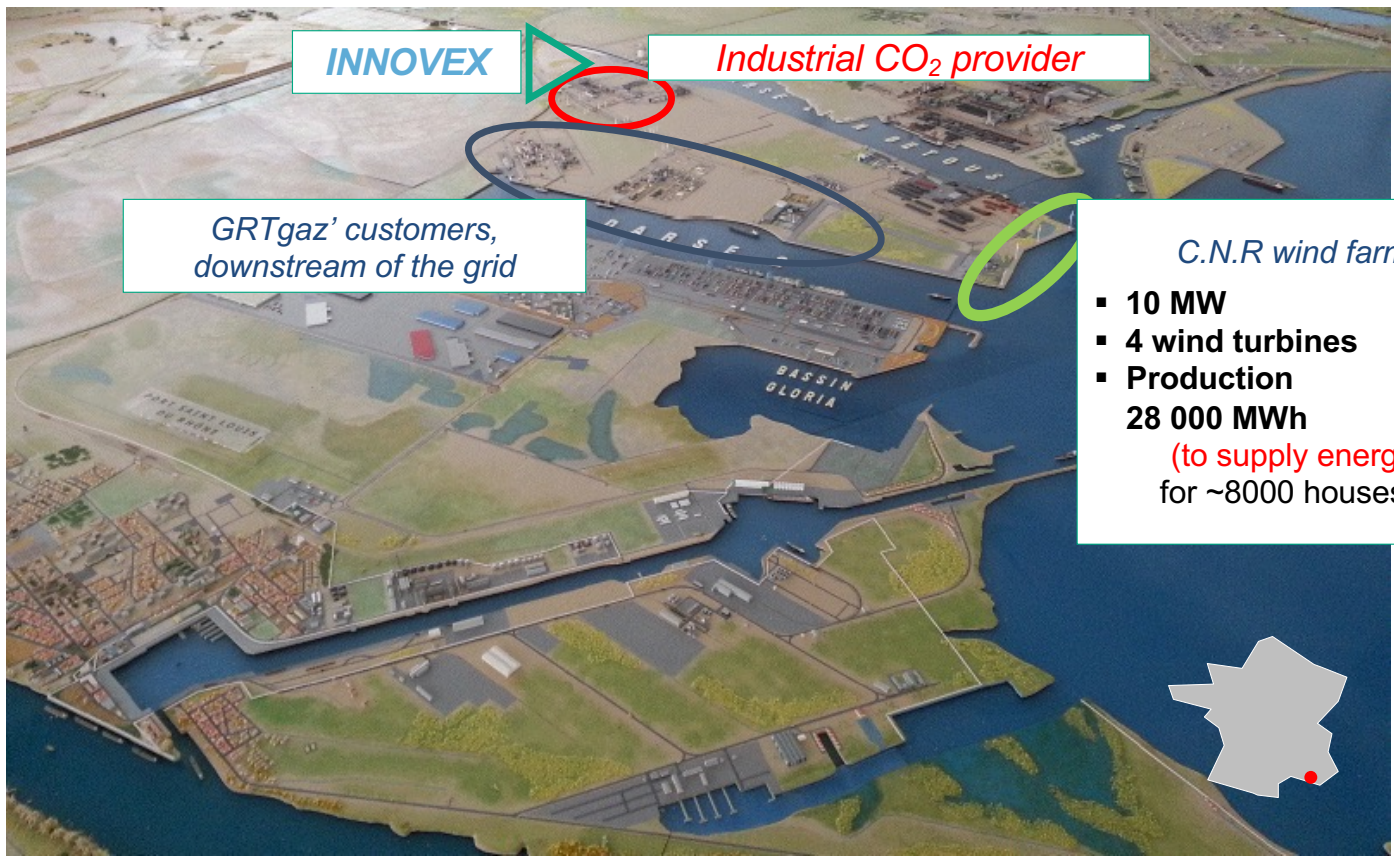
3 years
for tests

*Proton Exchange Membrane



An environment supportive for innovative projects

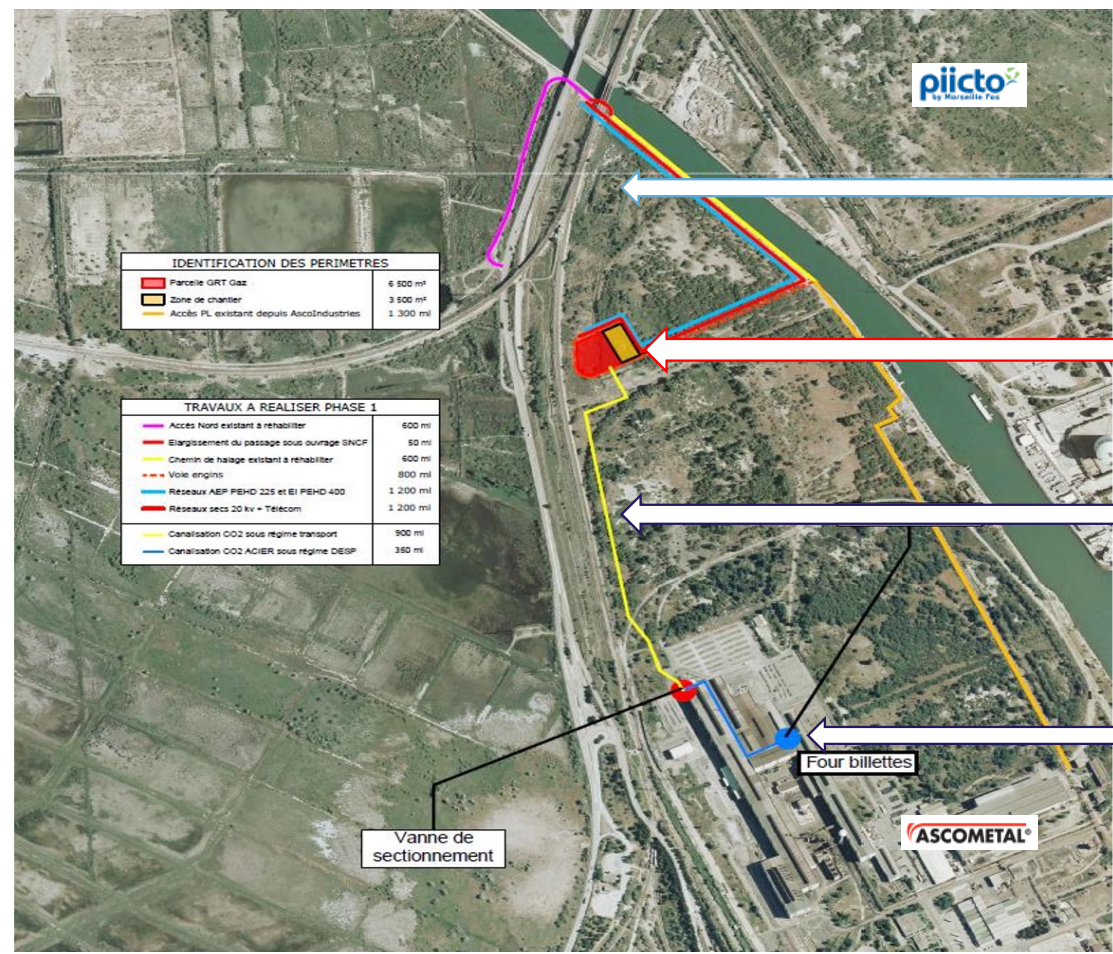
- The project is developed on the INNOVEX platform, up to increase synergies with the industrial neighbourhood
- Jupiter 1000 collaborates with industrial customers



C.N.R wind farm

- **10 MW**
- **4 wind turbines**
- **Production 28 000 MWh**
(to supply energy for ~8000 houses).

CO₂ pipeline



Innovex Platform



CO₂ Pipeline

CO₂ Capture

The situation today ...



The alkaline electrolyser



The PEM electrolyser



The methanation device is settled

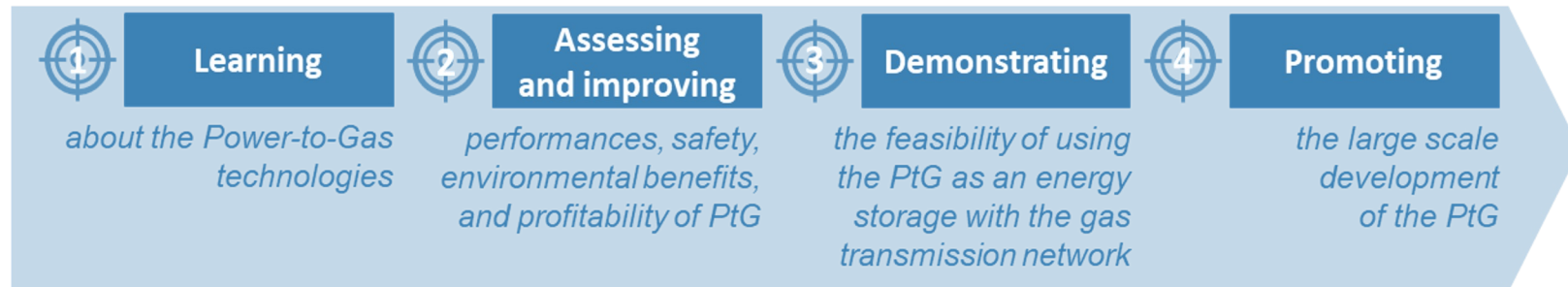


Hydrogen is injected in the grid since 02 2020

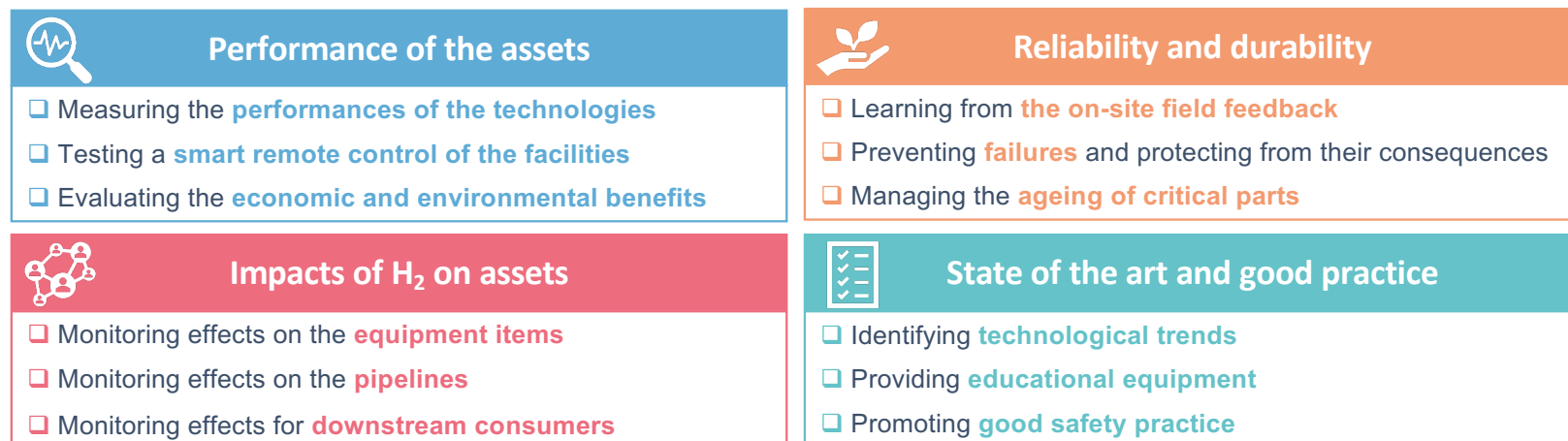
The best way to convince is to achieve a proof of concept.

Research & Development objectives and activities

Our objectives







Our activities



Planning of R&D activities

End of tests & studies : 2023



 First lesson-learned	<h3>Performance of the assets</h3> <ul style="list-style-type: none"> ✓ Alkaline & PEM electrolyser tests ✓ Preliminary technical and economic study ✓ Preliminary life cycle assessment (LCA) 	2022 and 2023	<ul style="list-style-type: none"> ➤ End of alkaline electrolyser testing ➤ Tests on the PEM electrolyser, the methanation plant, the “smart” remote control ➤ Update of preliminary studies/analyses with real data and feedback
 First lesson-learned	<h3>Reliability and durability</h3> <ul style="list-style-type: none"> ✓ Implementation of incident and failure monitoring ✓ First studies on the reliability of equipment ✓ Bibliographical study on degradations 	2022 and 2023	<ul style="list-style-type: none"> ➤ Continued monitoring of incidents and failures ➤ Investigation of the most critical failures ➤ Reliability analysis of technologies
 First lesson-learned	<h3>Impacts of H₂ on assets</h3> <ul style="list-style-type: none"> ✓ First tests (test tubes, sleeves, inspections), and exchanges with downstream users ✓ To date, no noticeable effects of H₂ on pipes and industrial customers.(hydrogen volume <2%) 	2022 and 2023	<ul style="list-style-type: none"> ➤ Continued testing (sampling) ➤ Continued exchanges with downstream users ➤ Specific measurements at the gas network outlet
 First lesson-learned	<h3>State of the art and good practices</h3> <ul style="list-style-type: none"> ✓ First achievements on the state of the art ✓ Organization of work on risk analysis ✓ Development of H₂ safety training 	2022 and 2023	<ul style="list-style-type: none"> ➤ Continuation of the state of the art on Power-to-Gas ➤ Generic “risk study” of Power-to-Gas ➤ Tests and measurements on H₂ leakage control ➤ Recommendations for the design, operation and maintenance of a Power-to-Gas installation

And after 2023 ?

2 main focus areas to be considered

Platform for GRTgaz and other gas transmission system operators

Test center for hydrogen equipment (electrolyser, gas analysers, valves...)



The project is helped by local and institutional players

Financial support



Institutional partners



And with the active participation of industrial neighbours



The project is integrated in an environment supportive for innovative projects



Any questions ?

www.jupiter1000.eu

 [@Jupiter1000PtG](https://twitter.com/Jupiter1000PtG)

www.ResearchbyRice.com