



Connecter les énergies d'avenir



Jupiter 1000 Project :



Jupiter 1000 Project presentation

- First industrial demonstrator of Power-to-Gas in France.
- Based on a **platform dedicated to the energy transition**.
- Located in Fos-sur-Mer
- Coordinated by GRTgaz
- Aims of the Project :
 - **To convert the overproduction of renewable electricity into green gas in order to inject it into the gas network,**
 - **To launch the Power-to-Gas industry in France**
- Jupiter 1000 Project is:
 - Supported by the **French Energy Regulatory Commission (CRE)**
 - Co-financed by the **European Union and the French State**



Wind Energy



Solar Energy

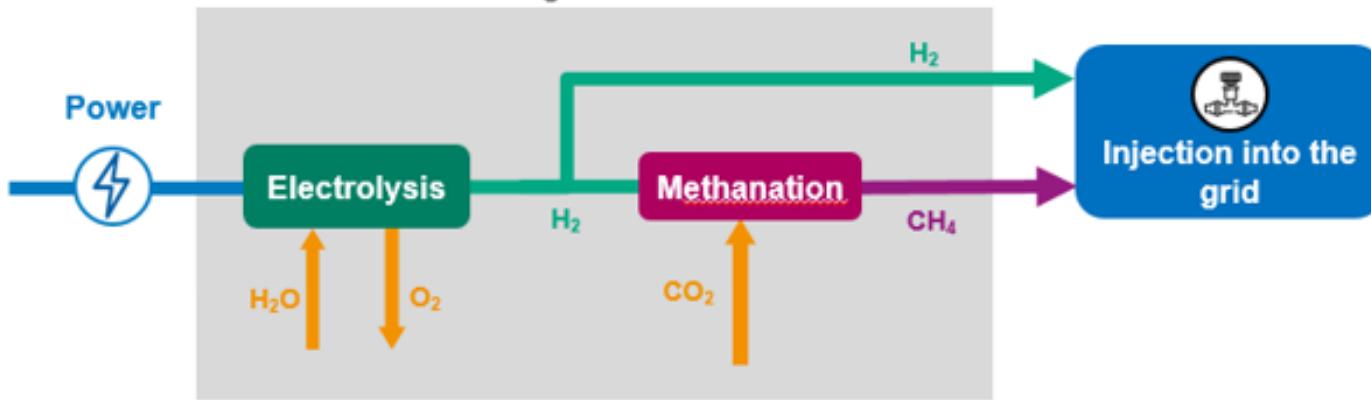


Hydroelectricity

From Power... to Gas! Installation description

When gas networks offer a solution to store massively the excess of renewable electricity.

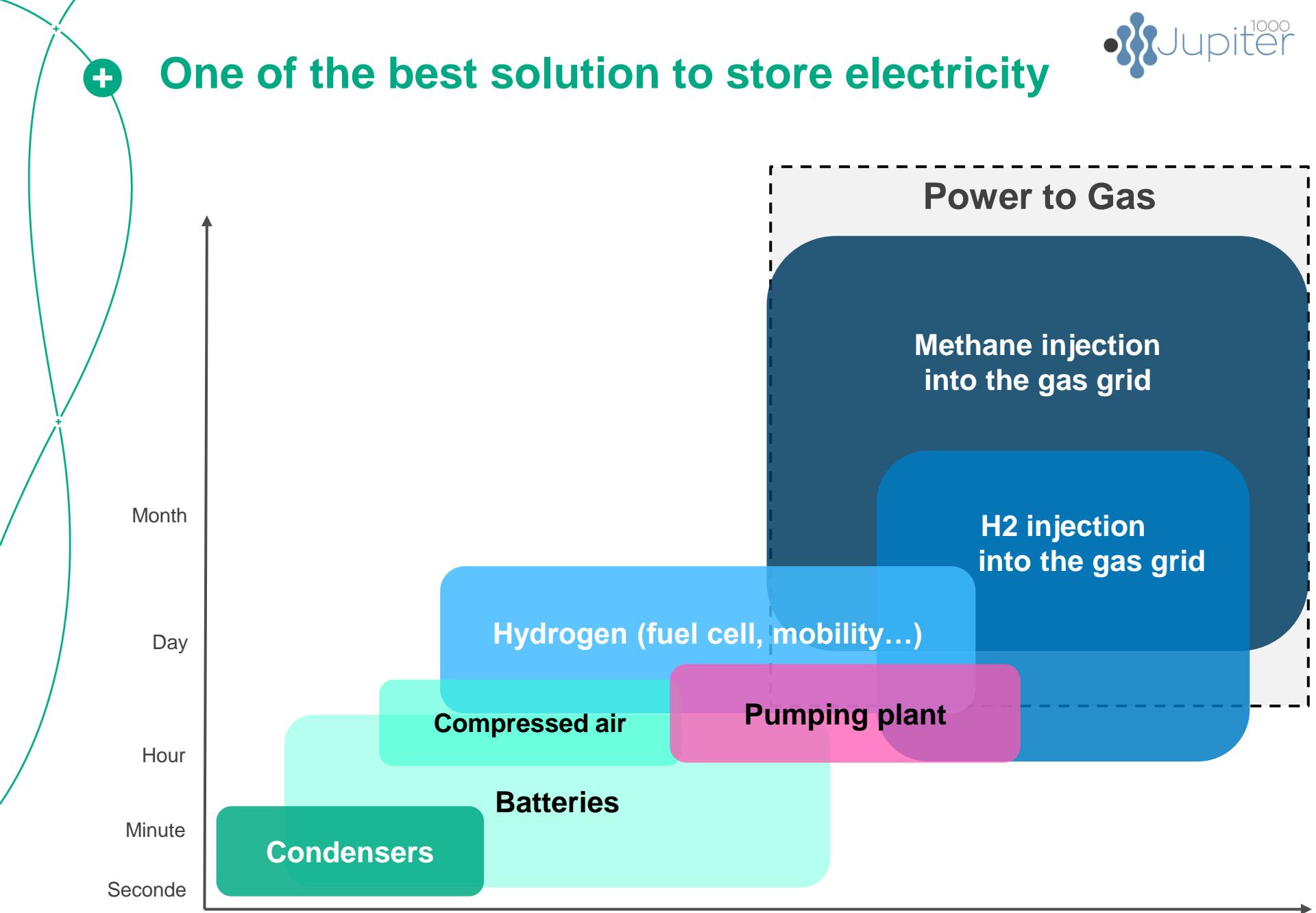
❖ Jupiter 1000 Power-to-Gas installation



With methanation: increasing quantities, increasing synergies



One of the best solution to store electricity



Power-to-Gas, a global system

SUPPORT POWER GRIDS



Value surplus of electricity stemming from the occasional renewable production of our customers



Contribute to the **good performance of electricity** networks and **congestions management**

Optimize the energy system for the whole community

DE-CARBONIZE GAS GRID



Adapt itself to our customers who will produce and will consume some renewable gas



Replace some fossil gas by the renewable gas: **hydrogen or synthetic methane**



Get and recycle CO₂ with methanation

LOCAL PRODUCTION



Replace some gas imported by the gas **produced locally**



Reduce the **energy dependence** of the country



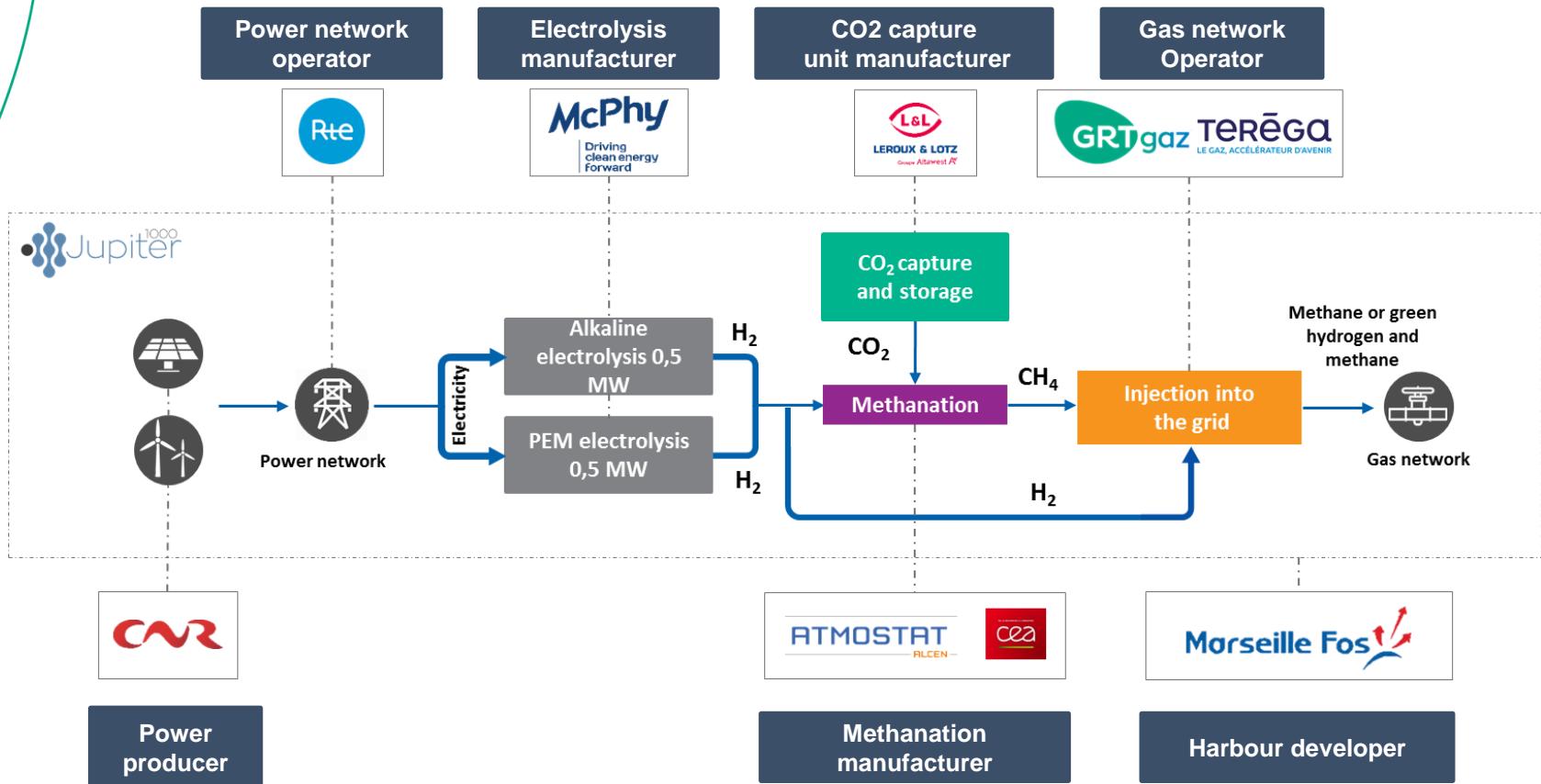
Develop a creative sector of **numerous local jobs** and **export technologies**



Jupiter 1000 – Project's organisation

Jupiter 1000 - French P2G players working together

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



*Proton Exchange Membrane

Jupiter 1000 - Main equipment and technologies' presentation

❖ The Electrolysers - McPHY

Electrolysis system: How does it work?

By passing the surplus of renewable electricity through water : the electrical power will decompose the water molecules (H_2O) separating the oxygen (O_2) from the hydrogen (H_2).

What has been made for Jupiter 1000 Project?

- Fabrication of **2 electrolyzers** (with a cumulated power rating of 1 megawatt)

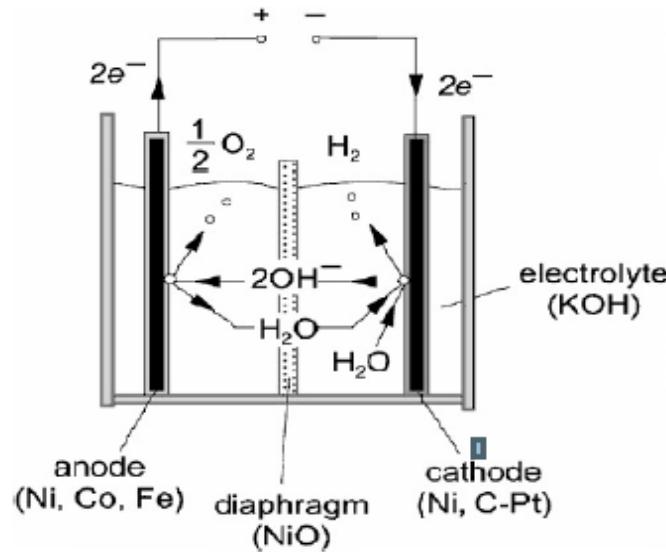
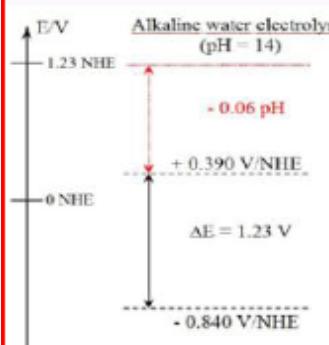
2 different technologies:

- the **ALKALINE**
- the **P.E.M. (Proton Exchange Membrane)**

ALKALINE

Histoire

- 1900 : premier électrolyseur industriel bipolaire
- 1939 : Premier électrolyseur de 10 000 Nm³/h
- 1951 : Lurgi présente le premier électrolyseur haute pression (30 bar)



Sources : Larousse, Eifer, Etogas



Electrolyte : 30% KOH liquide

Température de fonctionnement : 60-80°

Pression de fonctionnement : < 30 bar

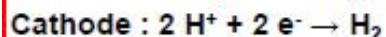
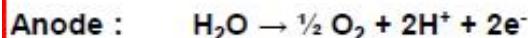
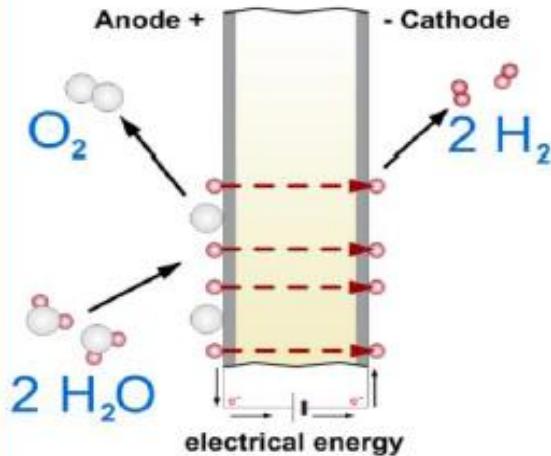
Densité de courant: 0,2 – 0,8 A/cm²

Conso élec: 4,3 – 6,5 kWh/Nm³

Sources : Larousse, Eifer, Etogas

P.E.M. (Proton Exchange Membrane)

La technologie PEM



Aujourd'hui

Le choix technologique développé par Hydrogenics, Proton Onsite, ITM, Siemens, Kobelco, Giner et AREVA H2Gen.

Histoire

- 1962-66 : Programme Gemini-Apollo et première cellule polymère
- 1966 : Premier électrolyseur SPE par GE
- 1987 : Premier électrolyseur 100 kW par BBC (ABB)

Solyd Polymer Electrolyte technologie (SPE)



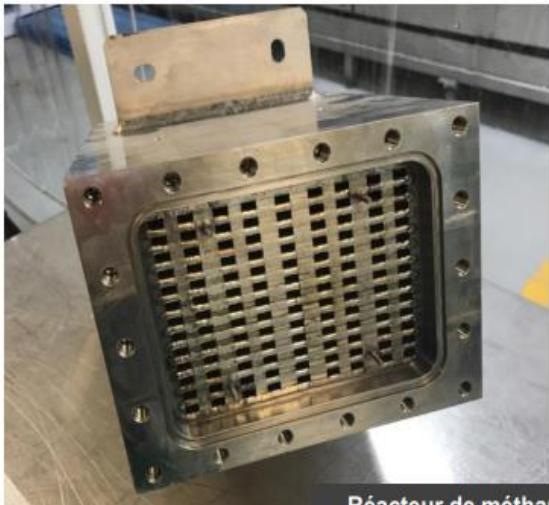
Sources : Larousse, Eifer, Etogas
10

❖ Methanation reactors – ATMOSTAT / CEA

What has been made for Jupiter 1000 Project?

- Fabrication of the **methanation reactors** = the units (**based on a technology developed by the CEA**) combine Hydrogen with CO₂ in order to produce synthetic methane (CH₄).

10 reactors are needed for the project.



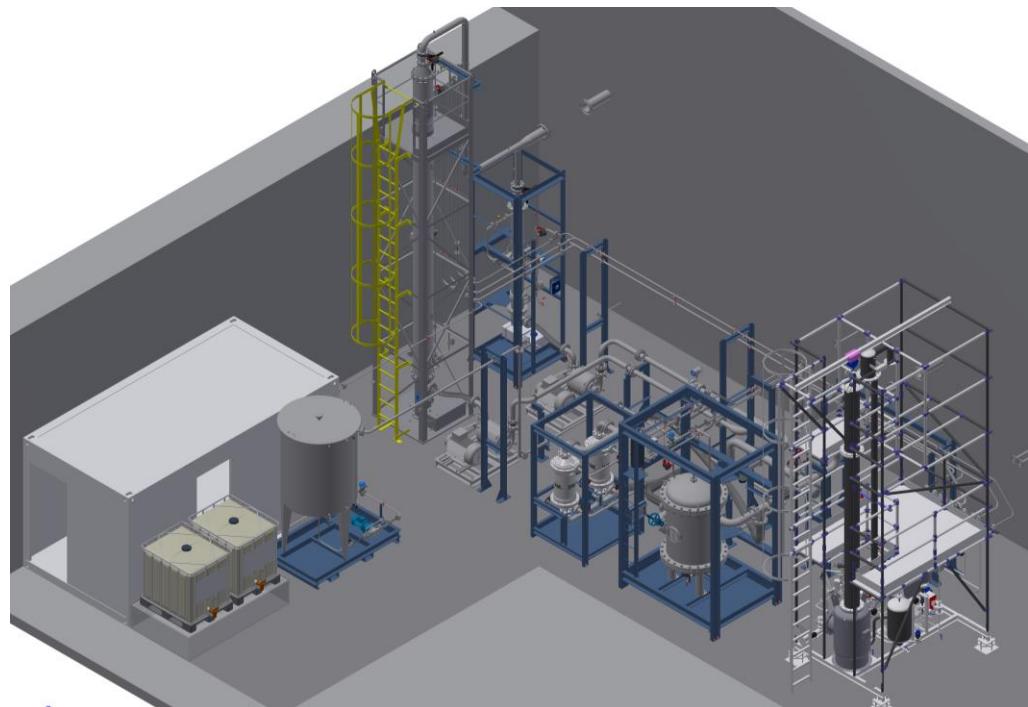
What has been made for Jupiter 1000 Project?

- Development of the **CO2 capture technology** : allows to separate the CO2 from smokes released by **Ascometal steel factory** by means of amine based process. CO2 capture facilities are located close to the chimney

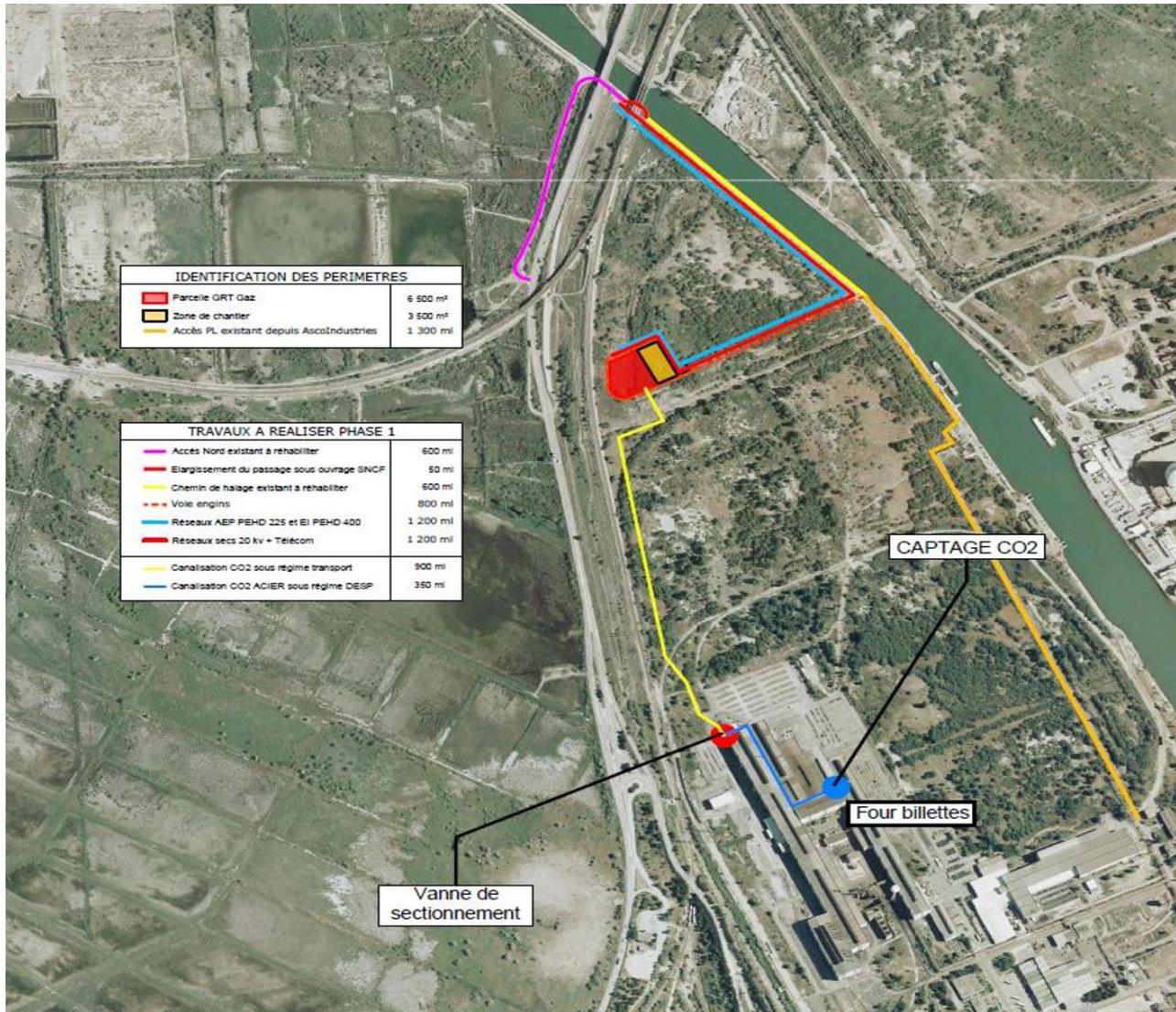
How does it work?:

Once the CO2 is captured, Leroux & Lotz purifies it, dries it and pressures it in order to send it through one pipeline to the methanation reactor.

CO2 capture equipment



CO2 pipeline



Injected gas composition

Injected gas composition

- H₂ (100 % « without methane » mode)
- Syngas : CH₄ & H₂ (30% from 25 m³/h) ; CO₂ (→ 7%); CO (~ 1 %)

Gas flows

- H₂ gas flows: 200 m³/h
- Syngas gas flows: 25 – 30 m³/h
- Pipeline gas flows : min. 4450 Nm³/h

Odorization

- No additional odorization

Dilution factor
>> 10



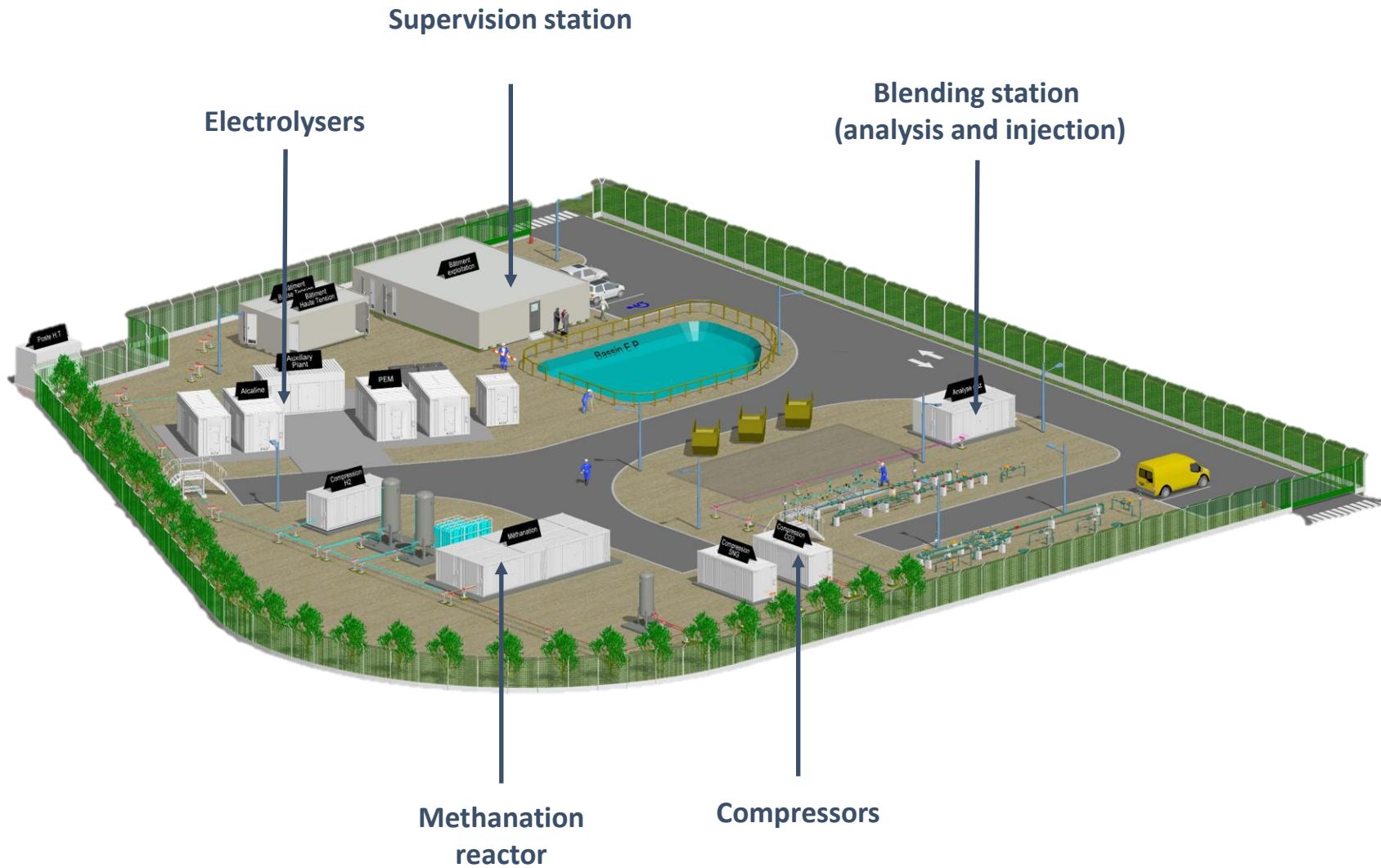
Jupiter 1000 Project implantation

Jupiter 1000 project - Location

- Established on the **innovation platform, INNOVEX** (dedicated to demonstrators developing industrial innovation and energy transition).
- The project is located on this platform in order to **increase the synergy with the industrials already established.**



Demonstrator site



The aims of the Project



Confirm the potential to store green electricity surplus

- Confirm the flexibility offered to support the power grid (ancillary services, excess of green electricity...)
- Validate all the technologies : electrolyzers, methanation and CO₂ capture
- Experiment the feasibility of injecting hydrogen into the gas grid



Build a Business Model

- Work on technical and economic models and determine the conditions for profitability



Launch the Power-To-Gas sector in France

- Help the public authorities to build favourable conditions for the emergence of a new industrial sector in France

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



Planning

Decision to launch Jupiter 1000 Project	March 2016
Engineering file	December 2016
Administrative approvals	July 2017
Start of the construction	September 2017
End of the construction	T1 2019
H2 commissioning with injection	T2 2019
SNG commissioning with injection	T4 2019
Exploitation	2020 - 2021

Budget

Global budget	31,3 M€
GRTgaz participation	57 %
Institutional support	32 %



Fonds Européen de Développement Régional



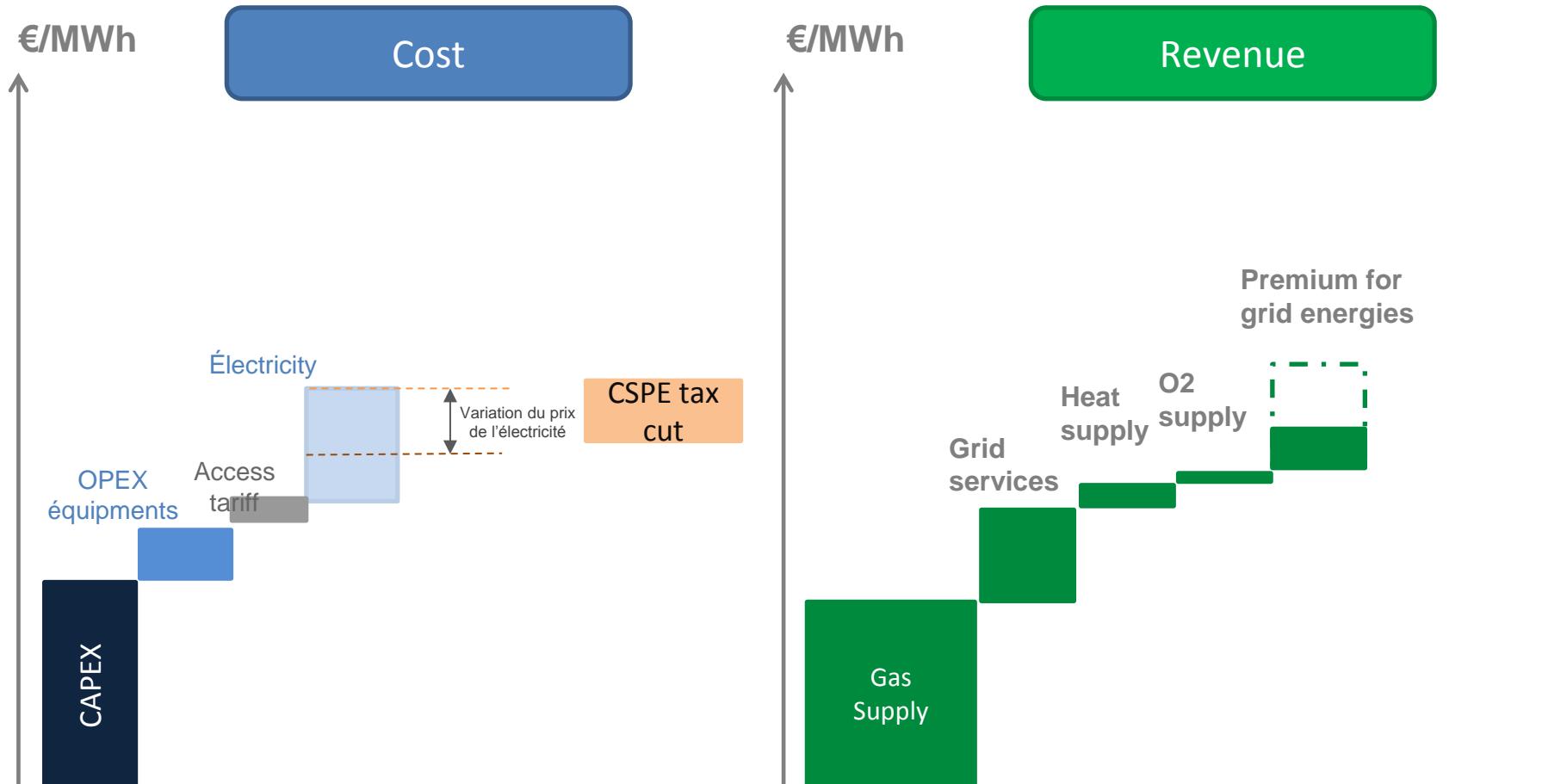
Région
Provence
Alpes
Côte d'Azur

The JUPITER 1000 project is cofinanced by the European Union within the framework of the Fund FEDER, by the French State within the framework of the Investments of Future entrusted by the ADEME and by the Region Sud Provence-Alpes-Côte d'Azur.

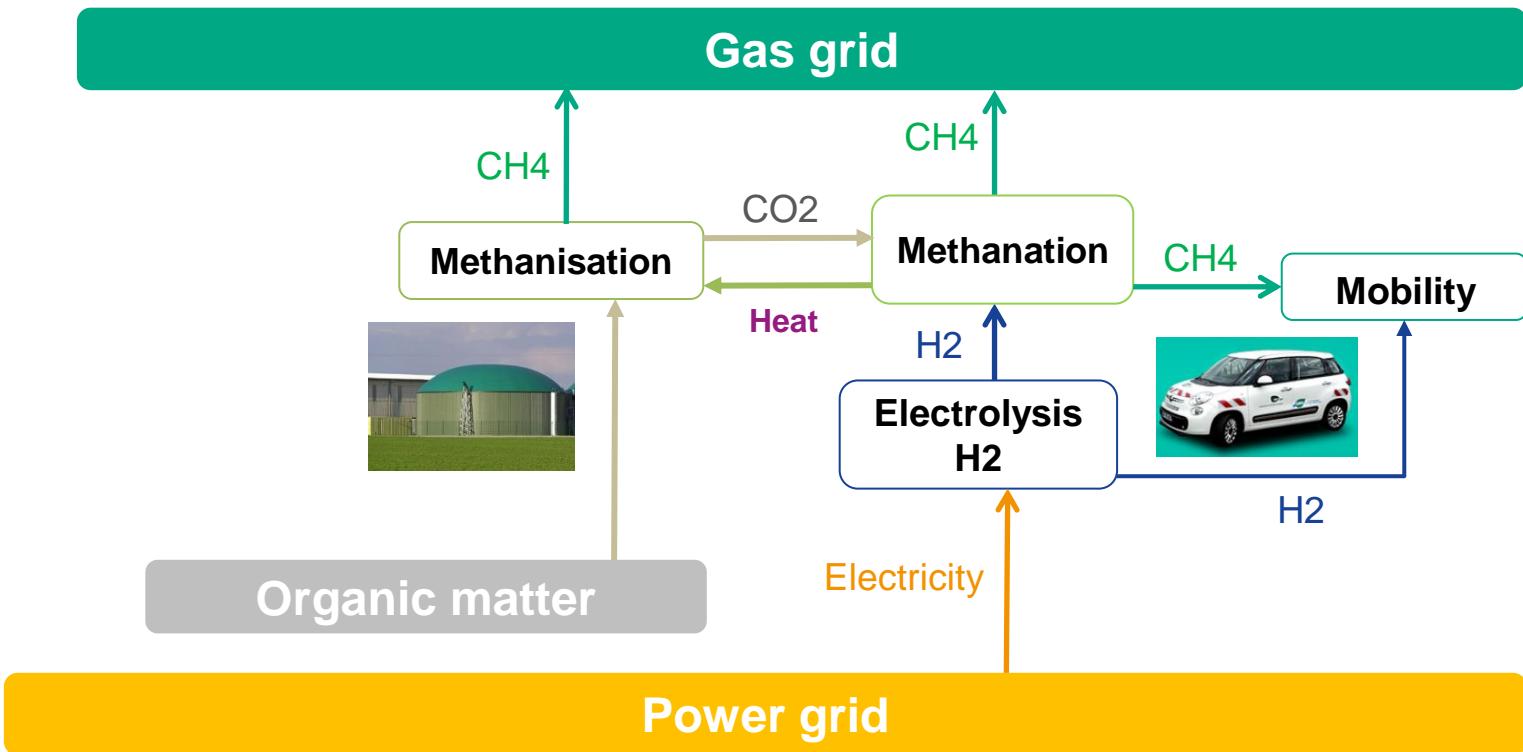


Jupiter 1000 Business model

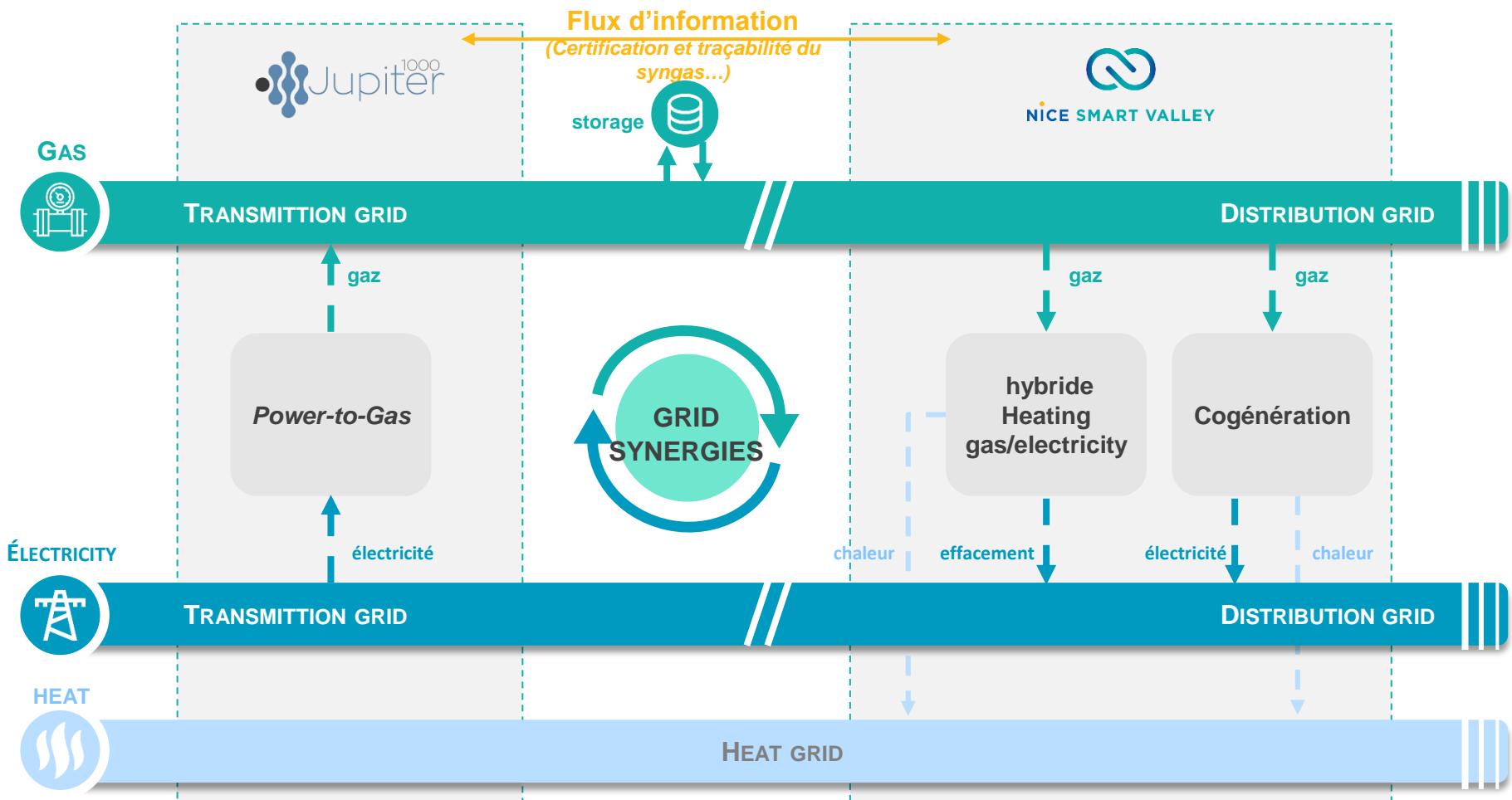
Business model: principles



Decentralized application – smaller installations



ENERGY GRIDS – DE CARBONIZED HEAT, GAS, ELECTRICITY



Jupiter 1000 - A technical and economic analysis project



Jupiter 1000 includes a **technical and economic analysis project**

The analysis allows to:

- Experiment the demonstrator in real conditions
- Evaluate the profitability of the Power to Gas sector in France

Realized in partnership with the CEA of Grenoble, the modelling of the system for the economic analysis bases itself on the data of the set of the project partners:

Forecast
electricity prices



Le réseau
de l'intelligence
électrique

Valuation of
the balances



Forecast gas
prices



Learning curves of
technologies



Analysis method



Each partners bring relevant data to the
whole chain.

The construction of a demonstrator is useful to validate or unvalidate the given hypotheses.



Jupiter 1000 – Operation phase

Jupiter 1000 en phase d'exploitation

- Program tests still ongoing
- Technologic and efficiency tests still ongoing
- Results of operation scenarios compared to business model forecast
- Time of operation = 3 years



Jupiter 1000 – International visibility

International visibility on 2018

- Strong international visibility reflected in the large external invitations received



energir
6 Février 2018
Rencontre avec les équipes d'Energir (ex-Gaz Métro)
Montréal, Canada



14 Mai 2018
Encounter with socalgas team,
Los-Angeles, Etats-Unis



Biogaz Europe
7 février 2018
Biogaz Europe
Nantes, France



26 Septembre 2018
Conférence Gas for Climate
Bruxelles, Belgique



GOOD PRACTICE OF THE YEAR
28 Février 2018
Concours
« Good Practice of the Year »
en lien avec le Forum des Infrastructures Énergétiques de mai 2018



20-21 Novembre 2018
Opening of the international P2X conference set by AIE.
Marseille, France



Visite de Jupiter 1000 par Socalgas et Energir

Strong International visibility for 2019

- February: Site visit of **Slovenian gas grid operator** and **Marrocan chemical plant operator**
- March: Site visit of an **Austrian** delegation (Embassy members, energy industry...),
- April: V.I.P. site visit of representatives of **Californian State** (senators, members of government...),
- June: Site visit of a **Japanese** delegation : the largest public research and development management organizations linked to the energy industry
- Various participation requests to international conferences (**Lisboa...**)



Connecter les énergies d'avenir

grtgaz.com