



## Research and Innovation Center in Gas and New Energies

IGRC 2014

**GDF SUEZ**

BY PEOPLE FOR PEOPLE



# Projet GRHYD : The French Power-to-Gas project for demonstrating H2 injection in Natural Gas grid and Hythane® fuel for buses

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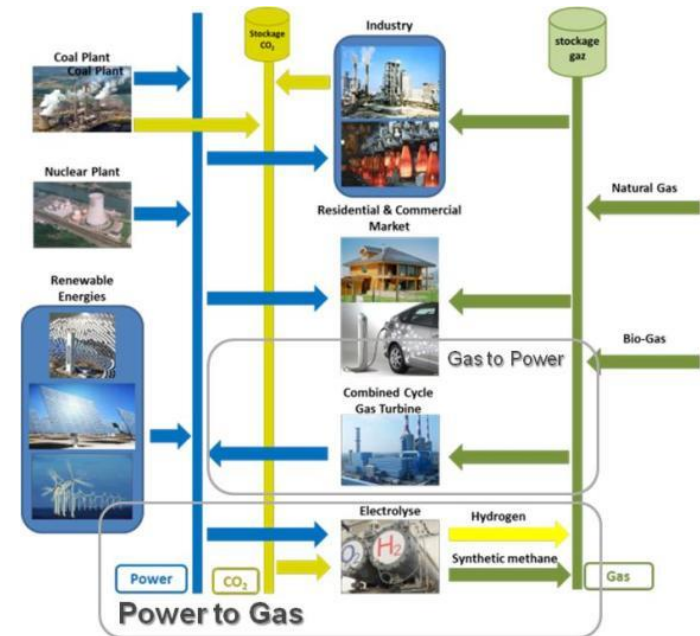


## « Power to Gas » – one flexible solution Value of green electricity as chemicals, H<sub>2</sub> or CH<sub>4</sub>

Take advantage of low price of electricity on the markets, **caused by overproduction of intermittent electricity at low marginal cost**, to produce add value gas fuels (hydrogen or methane synthesis) which can be easily stored and transported in the existing natural gas infrastructures.

### ■ 4 advantages

- Ability to store large quantities of electricity over very long periods (several months)
- Possibility of transporting energy using natural gas grids.
- Possibility of arbitrage between markets of power generation and other uses of gas
  - ➔ “Power to Gas”...”not to power” (option)
- High ability of gas grids to absorb / cushion variable and intermittent productions



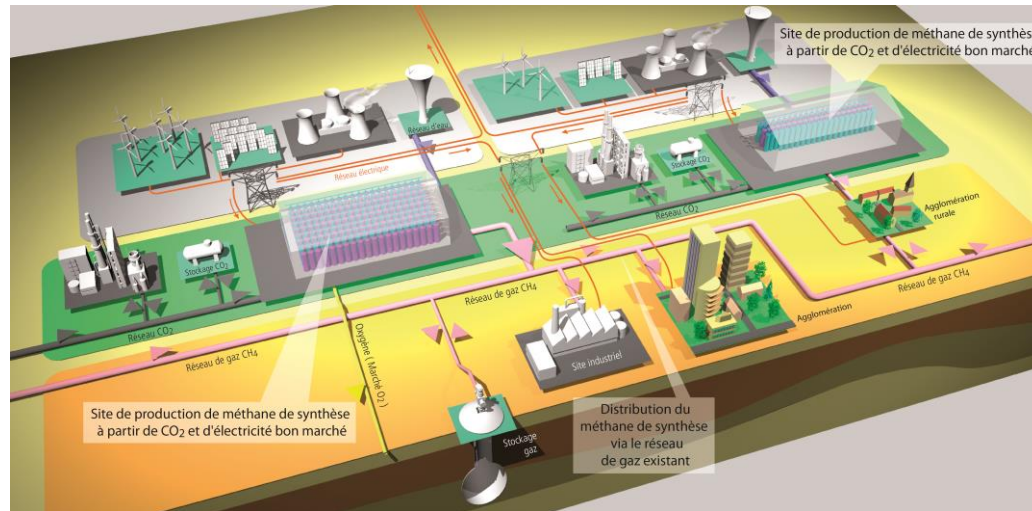
### The "Power to Gas", at the crossroads of the activities of GDF SUEZ

- Electricity production, transport, storage, distribution and marketing of natural gas, arbitrage between gas and electricity markets

## The GRHYD “Power to Gas” project complies with the topic « Hydrogen for Sustainable City »

- **GRHYD project introduces hydrogen as a flexible solution to store, transport and give value to intermittent renewable energies through « green » natural gas,**
- **by demonstrating H2 injection in natural gas grid and Hythane® fuel for buses**
  - Sustainable Hydrogen production from the local electricity distribution grid
  - Injection into the local natural gas grid (below 20%vol. H2)
  - Use of the mixture in final appliances : stationary gas appliances and vehicles
- **GRHYD project, active layer in the energy transition**
  - Value of fluctuating RES
  - Reduction of CO2eq emissions
  - Innovation for a new industrial chain
  - Development of local industrial & commercial activities
  - Promotion of public awareness

# The GRHYD project complies with the topic « Hydrogen for Sustainable City »

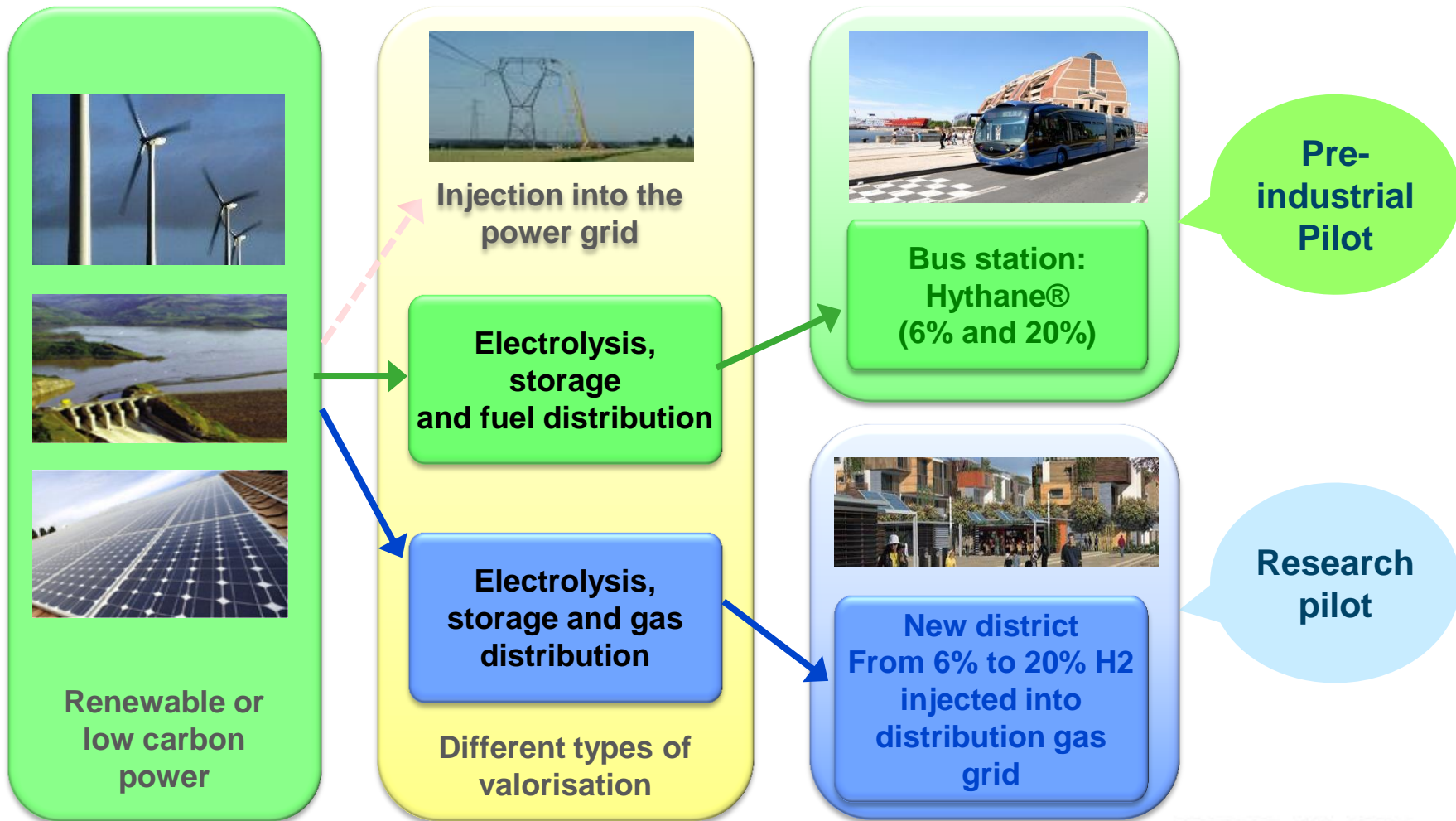


The GRHYD project solves different **challenges** :

- **Environment** : reduction of greenhouse gasses and urban pollution
- **Energy** : consumption decrease of fossile energy
- **Techniques** : development of electrolyzer technologies (PEM) and H2 storage
- **Economics** : cost reduction of the energy chain
- **Social** : development of local and national economic activities and familiarization of public with hydrogen energy

## 2 demonstrations to explore new markets

- ★ Optimisation value RES
- ★ New gas for sustainable cities
- ★ Hythane® fuel for fleets



# 12 Partners Players all along the new energy chain

GDF SUEZ



INEO  
GDF SUEZ

AREVA

McPhy  
energy

Dunkerque  
Grand Littoral  
COMMUNAUTÉ URBAINE



CET H<sub>2</sub>

GNVERT  
GDF SUEZ



INERIS  
maîtriser le risque |  
pour un développement durable |

CETIAT  
ensemble, innover et valider

Supported by ADEME:  
Investment for future



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## Demonstration in a new quarter

New quarter in the Dunkerque urban community

Mix of low calorific value natural gas with H2 (below 20%vol.)

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## Demonstration in a new quarter

*NG-H2 mixture to feed a new urban area with 200 individual and collective lodgings*



### ■ OBJECTIVES ⇔ work illustration

- **Technical** feasibility study ⇔ design optimisation of the H2 station vs energy needs (heating, hot water, cooking) and electricity supply
- **Safety** is a key point (current and future regulation) ⇔ risk assessment & administrative authorisations
- Performance assessment of « green » **hydrogen production & storage** ⇔ technology innovation for electrolysis (PEM) and H2 storage (solid at low pressure)
- Assessment of **social acceptance** ⇔ introduction of this new « gas » to habitants
- Assessment of **economic** and **environmental** results



## Demonstration of fuel for buses following the ALTHYTUDE project

Public transport network and buses operated by DK'Bus Marine  
at Dunkerque

Hythane® fuel, natural gas with 20%vol. H2

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## Demonstration of fuel for buses

*NG-H2 Hythane® aiming to fuel the local bus fleet and to deploy new energy fuel*



### ■ OBJECTIVES ⇔ work illustration

- **Technical and economical analysis** of Hythane® fuel supply for a fleet of natural gas buses ⇔ including the design optimisation of the H2 station vs fuel needs vs electricity
- **Safety** is a key point (current and future regulation) ⇔ risk assessment & administrative authorisations
- Deployment of Hythane® fuel for a fleet of buses ⇔ bus, engine and depot adaptation
- Assessment of 6% and 20% H2 fuel impact and long term operation process of **social acceptance** ⇔ introduction of this new fuel to passengers
- Assessment of **economic and environmental results**
- Development of a **sustainable economic model**

## Early project facts



- Project launched on January 30, 2014 at Dunkerque, and running for 5 years.
- 15,3 M€ budget (4,5 M€ financial support from ADEME)
- 12 French and International partners, including companies dealing with gas

**Further GRHYD news at the next IGRC !**



**CRIGEN is the operational R & D and expertise center  
of the GDF SUEZ group dedicated to the gas, new energies  
and emerging technologies**

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