

# France Update

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IPHE Meeting London 22-24 May 2013

# French Policy for H&FC

- Hydrogen is seen now more from an environment and health point of view than solving the CO<sub>2</sub> problem.
- French energy policy is to develop all carbon free energies. Fighting Climate change and Pollution is the ultimate goal.
- France aligns its H&FC policy with EU strategy
- Legal framework is now getting in place.
- CEA the leading Public Technological Research Organization, Air Liquide is one of the leading industries in the domain of H&FC.
- New: Alliance Renault-Nissan with Daimler and Ford.



# Solar Energy and Hydrogen Storage in Corsica



PEMFC + Electrolyzer

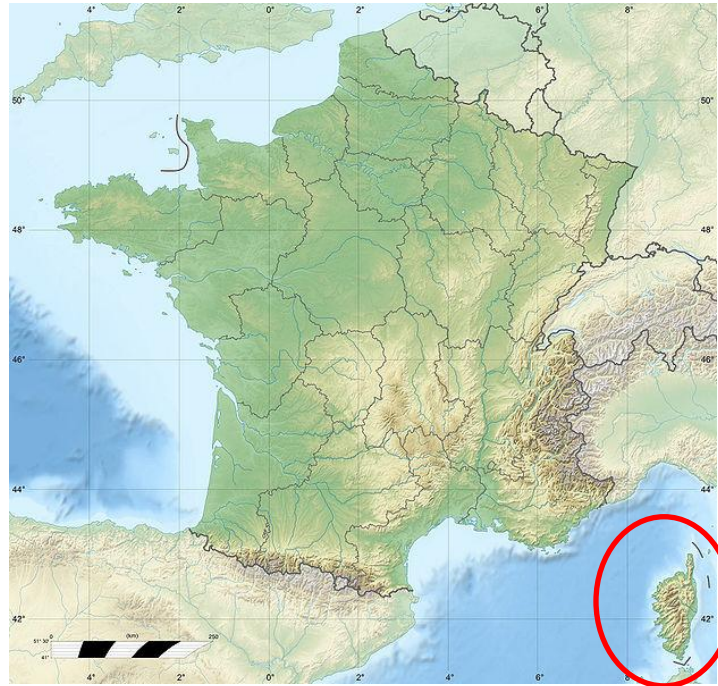
Hydrogen

Oxygen



# MYRTE Project

## Solar Energy and Hydrogen Storage in the Corsica island triggers a lot of interest



Electricity Production 550 kW  
1 Electrolyser + Hydrogen storage  
3 x 60 kW Fuel Cells

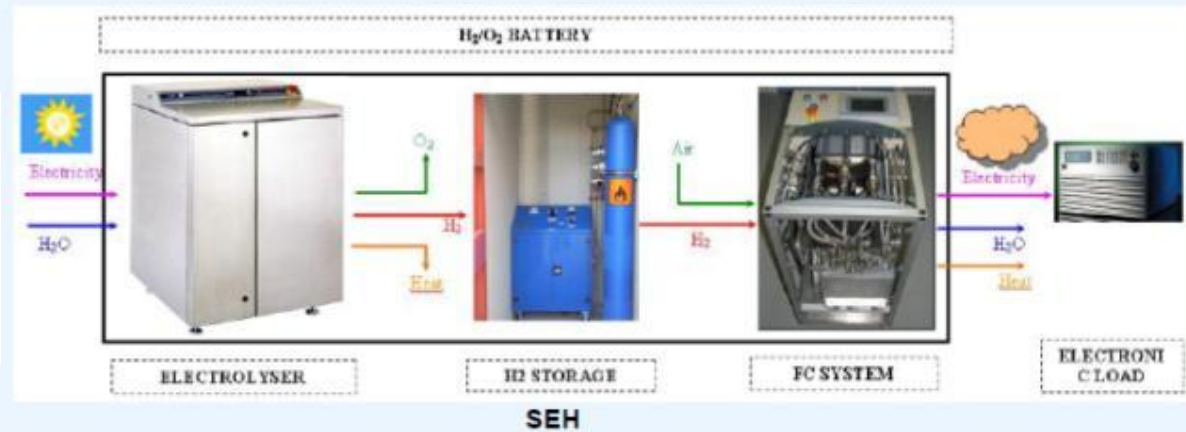


# CEA: FUEL CELL COUPLING WITH RENEWABLE ENERGIES

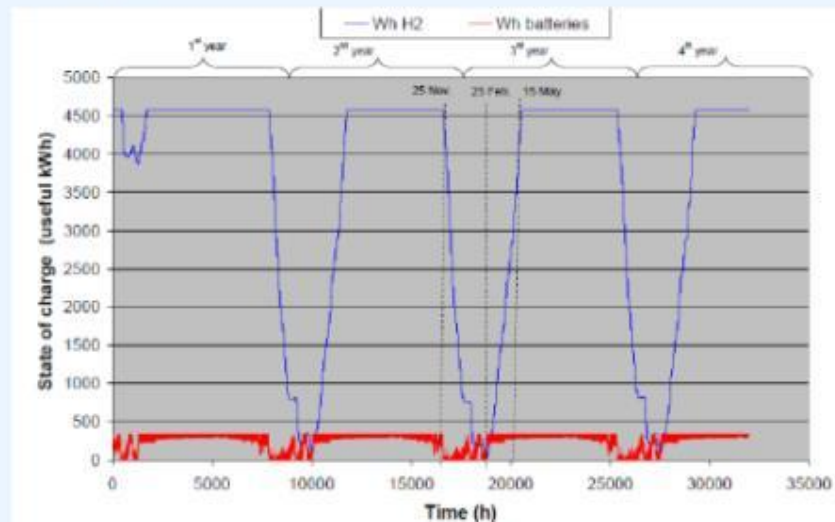
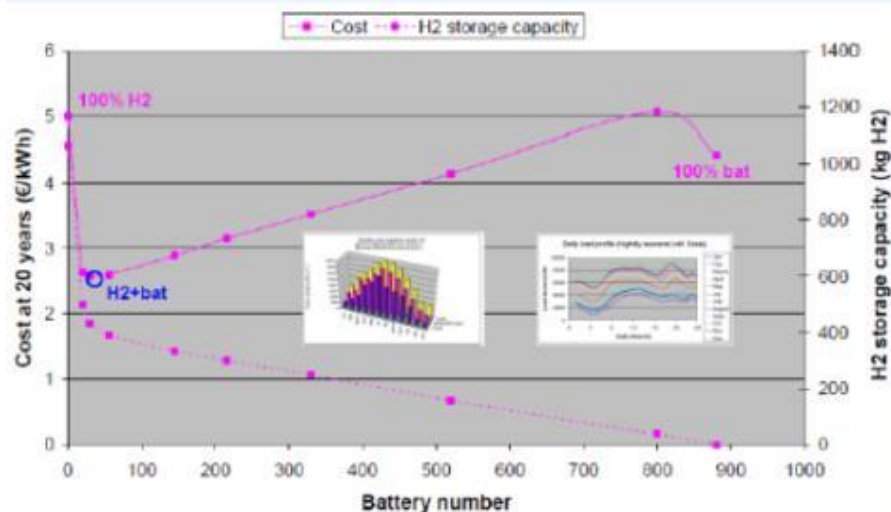


Batterie

And  
/  
OR



?



FOR EULAS - CEA use

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# MOBILITY WITH H<sub>2</sub> FOR MAIL DELIVERY



Supported by

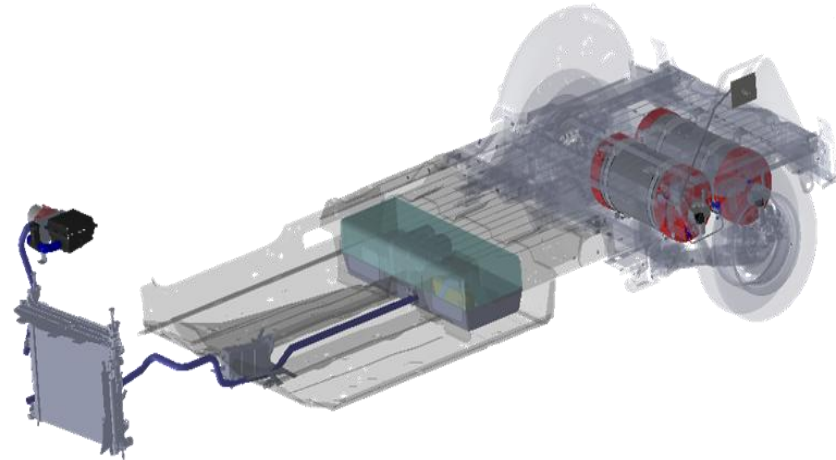


✓ 8 partners (2011-2014)



- ✓ Objective: experimentation of an innovative system coupling « solar » hydrogen and FCEV's for postal delivery
- ✓ Coherent with the « eco-mobility » projects driven by La Poste

# RENAULT KANGOO ZE WITH RANGE EXTENDER



- A standard, mass-produced electric vehicle equipped with H<sub>2</sub> range extender
- First customer deployment (Solvay Group, in France)



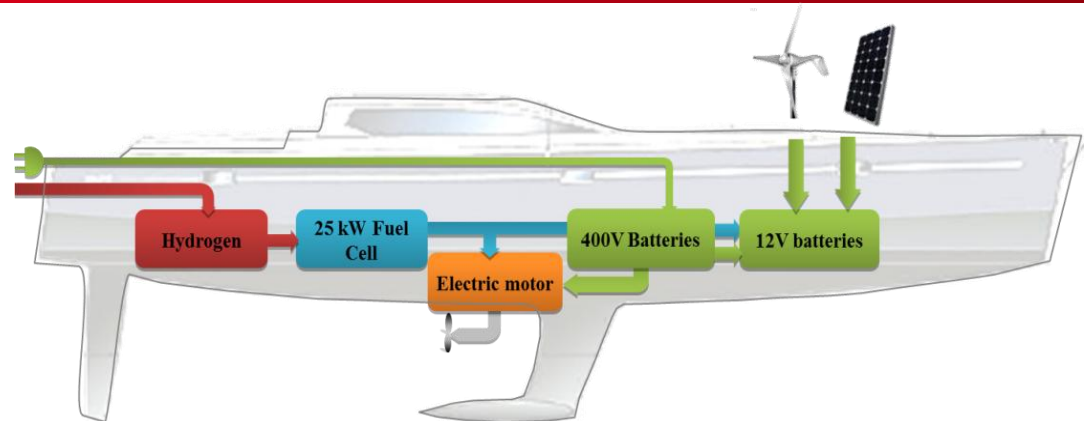
5 kW Fuel Cell System

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# SAILING BOAT « ZERO CO<sub>2</sub> »

FROM RESEARCH TO INDUSTRY



## Batteries

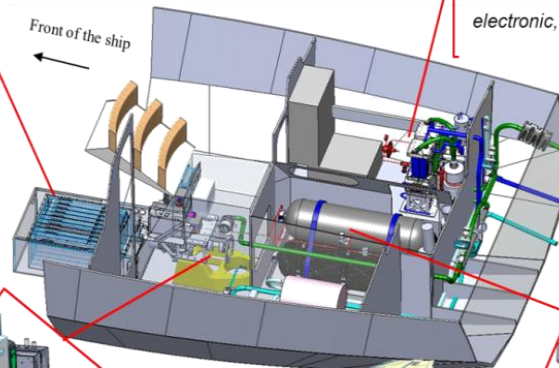


- CEA design
- LiFePO<sub>4</sub>
- 40 Ah and 400 V
- Energy storage: 14.8 kWh

## Motor

- Synchron motor
- Permanent magnets
- 23 kW (1800 r/min – 110 N.m)
- Frequency variator

Front of the ship

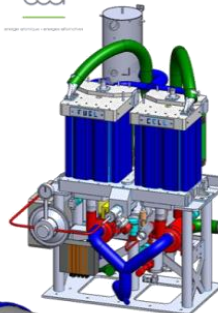


## Fuel cell system

- CEA design (25 kW)
- 2 CEA stacks
- 3 cooling loops (stack electronic, water vessel)

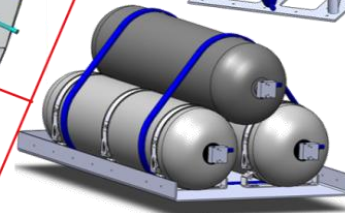


energy system - hydrogen technology



## Hydrogen storage

- 3 cylinders of 150 L, Type III
- Service pressure: 35 MPa
- Hydrogen mass stored: 10.5 kg
- Total energy stored (LHV): 350 kWh



835 sensors

550 safety thresholds

Monitoring

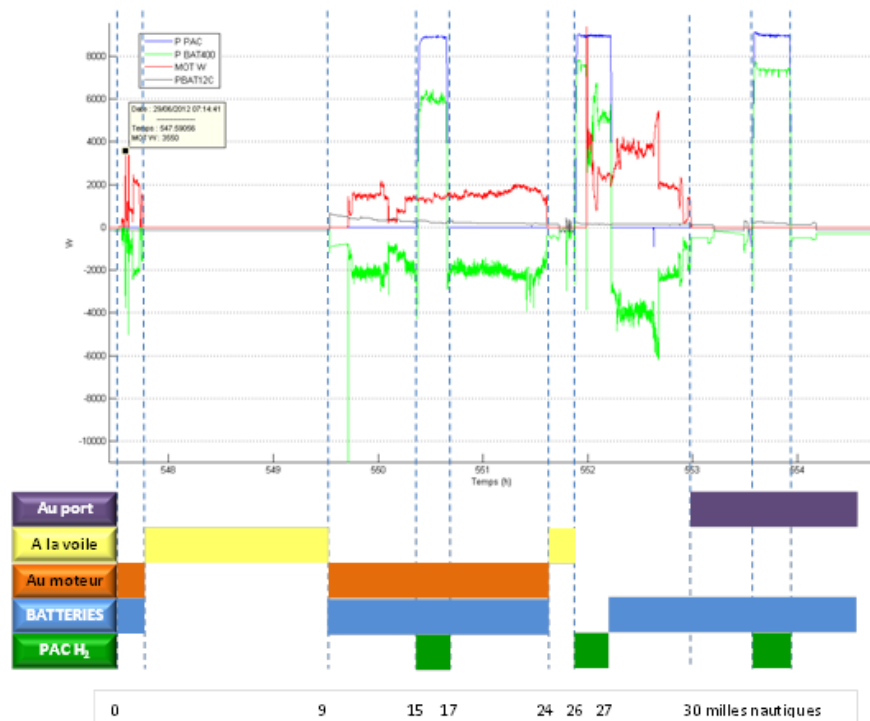


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# SAILING BOAT « ZERO CO<sub>2</sub> »

- Use of the sailboat for offshore Air Analysis in the Mediterranean



- FC System Efficiency: 42.3 %
- Energy Consumption:
  - for 10 nautical miles 6 to 15 kWh

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# McPhy Energy S.A.

*Green and safe hydrogen solution*

## French company

established in 2008

## Strong support of Investors

Key knowledge in a **unique and patented solid hydrogen storage** technology

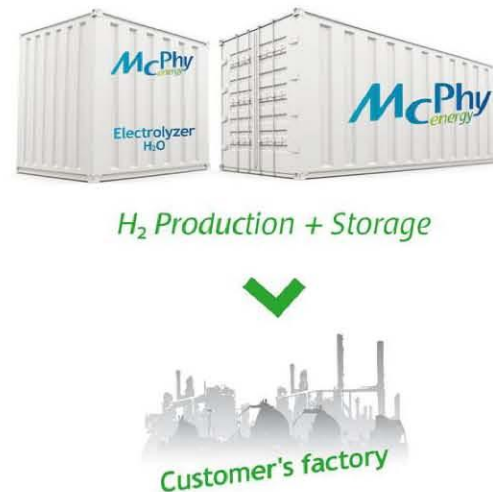
Migration towards **hydrogen solution**: water electrolysis + hydrogen storage

## Achievements:

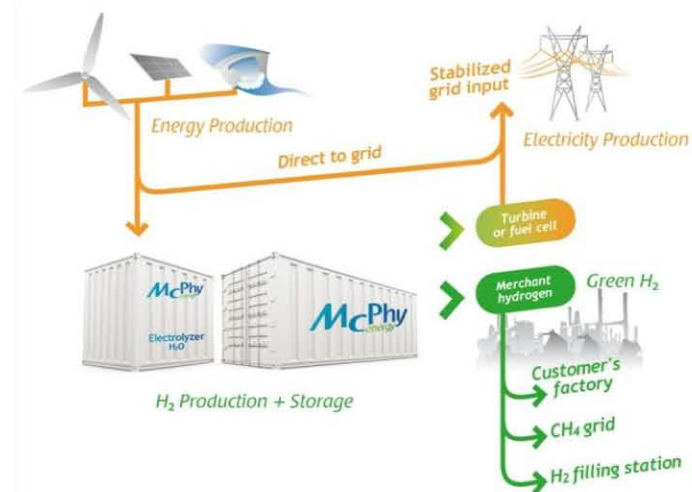
- ✓ Production line ready for mass production
- ✓ First products delivered: ENEL (Italy), IWATANI (Japan), Nottingham ...
- ✓ Involved in **Key French and European projects** in energy storage, green H<sub>2</sub> for mobility...

## Markets

### *On site hydrogen*



### *Renewable energy storage*



**Unique engineered solution**  
**Drastic transformation of the hydrogen supply chain**  
**Green (low carbon) hydrogen**



McPhy  
energy

Green and Safe Hydrogen Solutions

Products

- > H<sub>2</sub> Generators
- > Solid State H<sub>2</sub> Storage
- > Integrated Solutions

Markets

- > Industry Supply
- > Mobility
- > Energy Storage
- > Power to gas

Solid State Storage  
100 kg H<sub>2</sub>

Electrolyzer  
60 Nm<sup>3</sup>/h

McPhy  
energy

Green and Safe  
Hydrogen Solutions



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# SME's in France

List is not exhaustive

H2 Production	Storage & distribution	Fuel Cell	System Integration
<p><b>PEM Electrolyzer</b></p> <p><b>HELION</b> HYDROGEN POWER</p> <p><b>CET H<sub>2</sub></b></p>	<p><b>Storages</b></p> <p>EADS/Composites Aquitaine</p> <p>Raigi</p> <p>HyCan</p> <p>McPhy</p> <p>Mahytec</p>	<p>Helion</p> <p>PaxiTech, Pragma</p>	<p>HyPulsion</p> <p>SymbioFCCell</p> <p>Soprano</p> <p>Michelin</p> <p>Mia-Electric</p> <p>FAM auto</p>



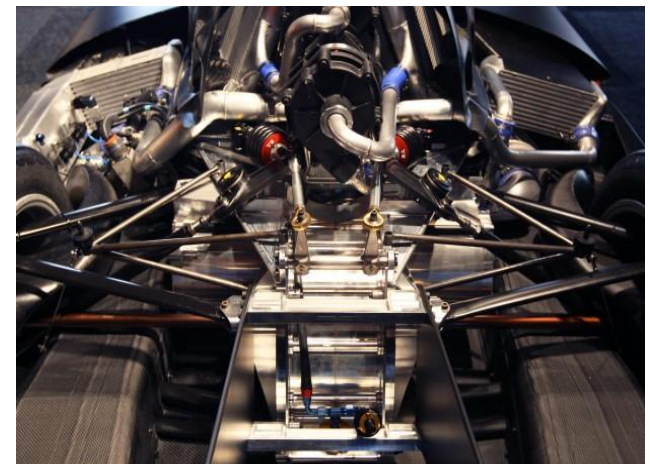
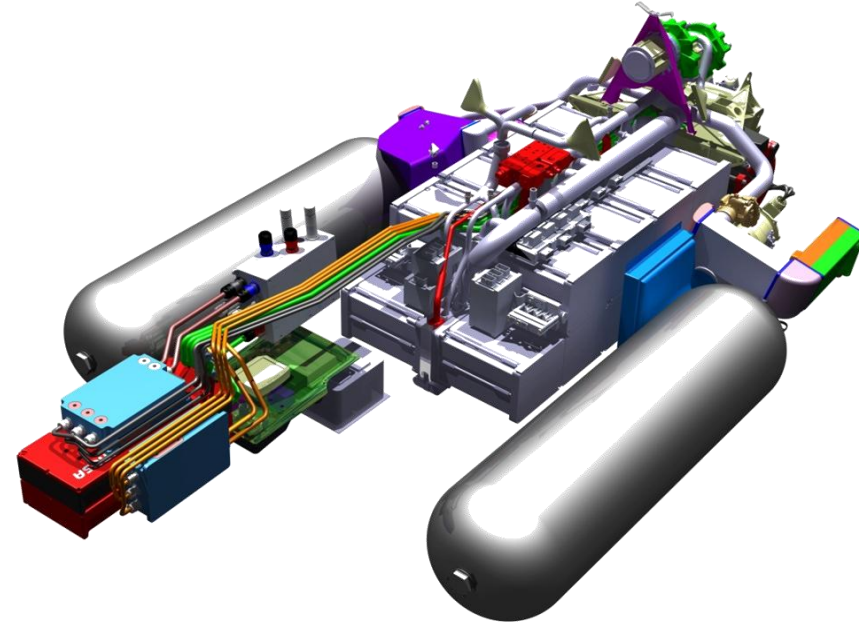


# GREEN GT H<sub>2</sub> RACE CAR



GreenGT H<sub>2</sub>: 300 kW net Power

- Validation running's in progress
- “Innovative” Booth 56, Le Mans, June 2013
- The first 100% Fuel Cell racing car in the world famous race



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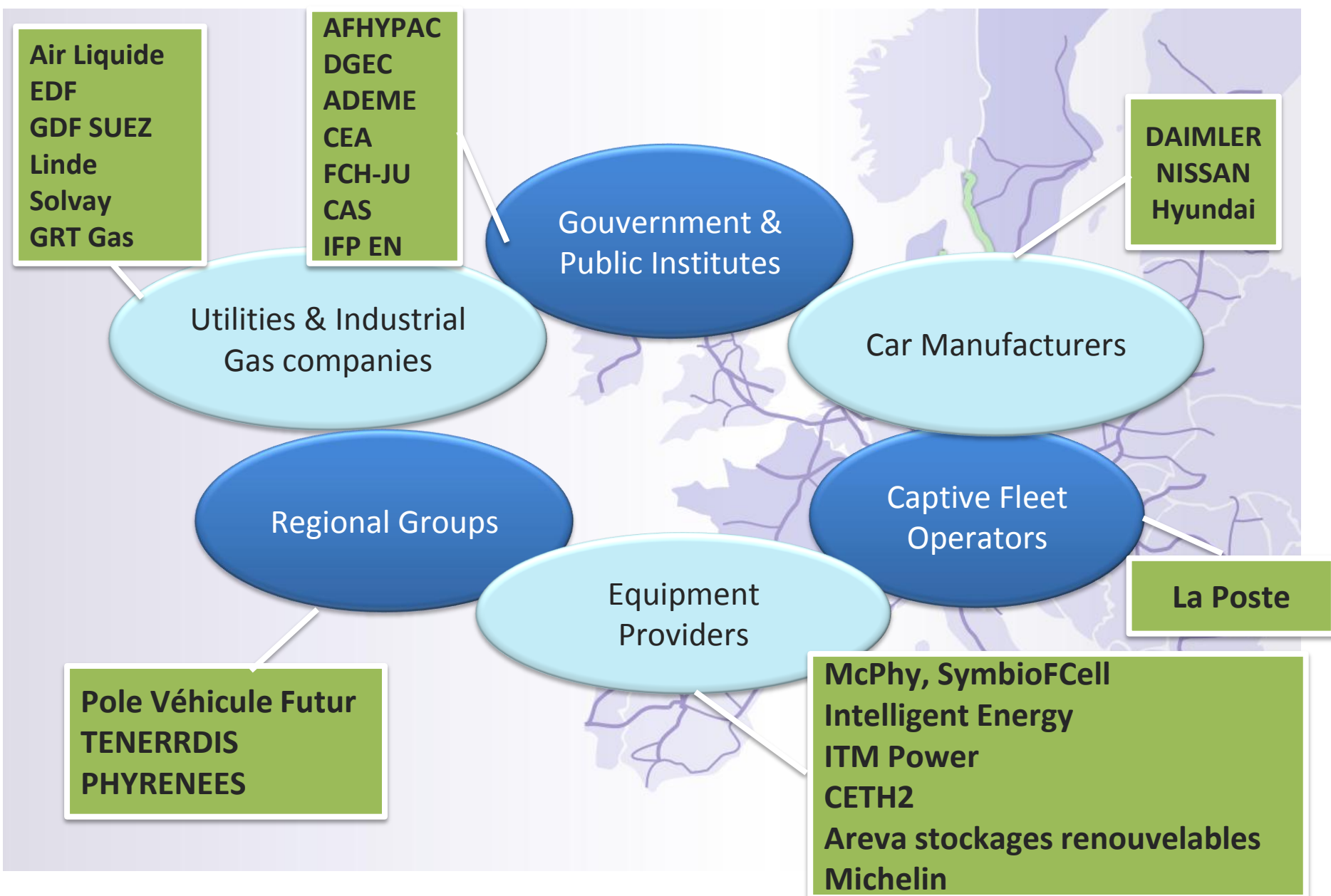
**MOBILITÉ HYDROGÈNE FRANCE**

- French part of the European development plan for a EU Hydrogen Infrastructure
- A European project lead by the Netherlands (DK, FR, NL, Sweden)

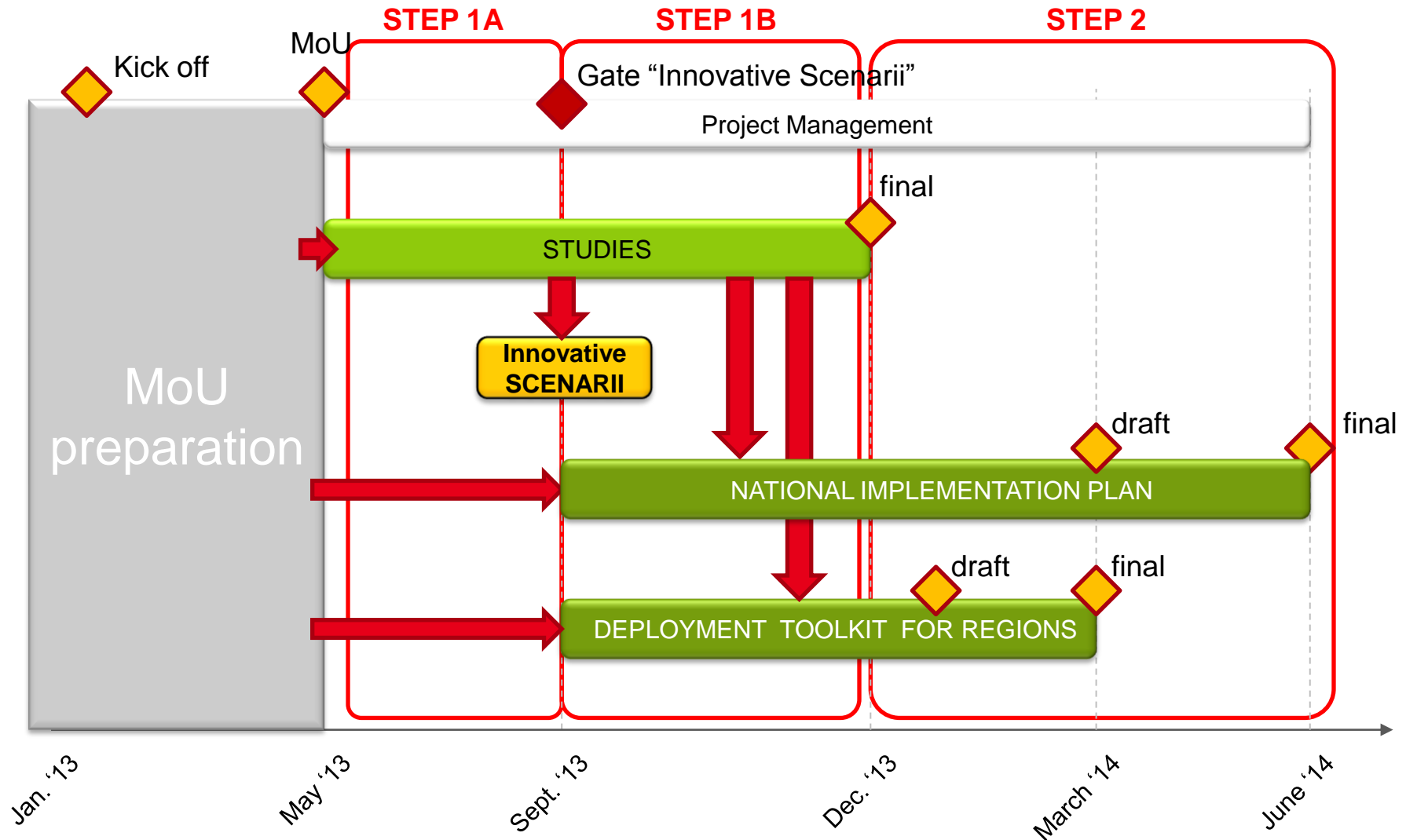




# STAKEHOLDERS



# AN INNOVATIVE AND SUSTAINABLE IMPLEMENTATION PATH





# Future of HFC in France

-  Minister Delphine Batho is very supportive: « Exciting meeting with the HFC strategic committee Hydrogen and Fuel Cells in the Grenoble-Lyon region » (17 May 2013)
- Strong support to the continuation of FCH-JU and IPHE
- Innovative projects with Aircraft Industry in progress
- Strong Technological R&D in support of Industry
- H<sub>2</sub> Mobility France will contribute to build a coherent deployment plan for Europe **H<sub>2</sub> Mobility EU**.