

# Hydrogen Energy & Fuel Cells in France Today, and prospective

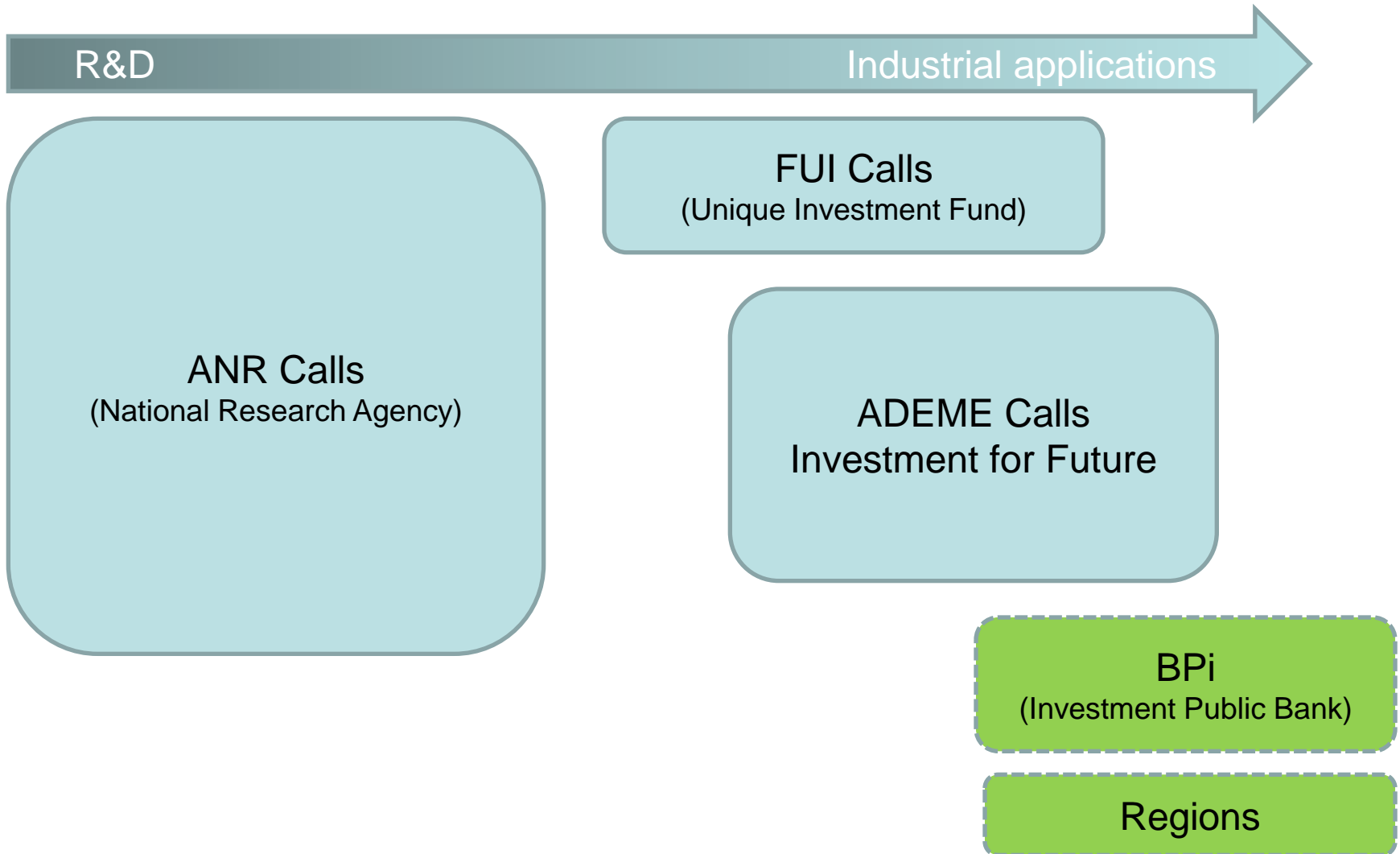
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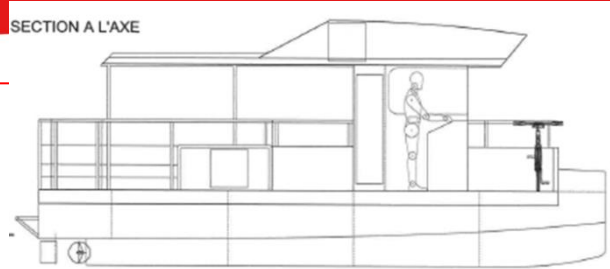


## ADEME and hydrogen energy

- R&D : thesis, research events, road map
- Demonstration and industrial transfer projects (1,2 M€/y)
- Investment for Future Program operator :
  - Renewables and low carbon energies
  - Clean Transport
- Studies (ex : LCA), collaboratives works (ex : regulations on hydrogen production, green certificates)
- Supporting AFHYPAC

# Public supports for H2 & FC in France





## NAVHYBUS Project

- Partners : Semitan, MH2, Ruban Bleu, Ship-Studio, BV, IHT, Matis Technologies
- Support : ADEME & Région Pays de la Loire
- Electric boat, public transport network in Nantes (80 000 p/y)
- Optimization of the existing solution :
  - 2 PEMFC of 5kW ; 1 battery Li 8 kWh
  - 12 kgH<sub>2</sub> / week
- Objective : to extend the commercial service limited by the current & wind
- Test and exploitation : January 2015



## HYTRAC Project

- Partners : Tronico, Green GT, Symbio FCell, AD-Venta, Raigi, McPhy, CEA, FCellSys
- Support : BPi (Investment for Future Program)
- Electric System (> 100 kW) for :
  - public works machines (bulldozers, loaders)
  - dustbin lorries, trucks (12/18T)
- Plug & Play H2 refuelling station, on site
- Objective : to reduce local impacts (noise, pollutants), to extend the operational time slot (ex : morning / evening) in urban areas





## HYWAY Project

- Partners : Tenerrdis, SymbioFCCell, Air Liquide, CNR, CEA, McPhy
- Support : ADEME & Région Rhône Alpes
- Two H2 mobility clusters around 2 refuelling stations : Lyon and Grenoble
- Experimentation of 50 H2 vehicules / 30 users
  - Kangoo ZE with range-extender
  - PEM FC 5 kW ; 1,8 kgH2 on board (350 bars)
- Objective : to provid ZEV with high range (200 / 300 km) and high availibility for professionnal users in urban areas / cities.

## Prospective for H2 mobility

- Fuel cell and battery : **complementary technologies**, not opposite
- The mix of the two technologies offers opportunities (energy vs power) in many applications
- **Captive fleets** in urban / suburban areas :
  - A response to the reinforcement of local environmental constraints
  - Economical balance for professional mobility : CAPEX optimization (vehicles and small size H2 refuelling stations)
- **Environmental benefits** : only if H2 ex renewables (electrolyse) or CCS with SMR ; warning on distribution impacts !

## RENESTA & RHYTA Project

- Partners : Cassidian (EADS)
- Support : EUROOGIA+ and FUI
- Energy Solution for off-grid sites :  
Telecom, refuges, etc.



- Low power (kW), reliability 99%, low maintenance, competitor to GenSet
- Integrated solution :
  - PV or wind power + battery (short term storage)
  - Electrolyser + H<sub>2</sub> solid storage + Fuel Cell (inter seasonal storage)
- Business Case : ROI = 3 years, competitive compared to classic solutions (simplicity, silent, not redundant)



## EPILOG Project

- Partners : GrDF, CRIGEN, Viessmann, Costic
- Support : ADEME, start in sept 2013
- Field tests of PEM fuel cell in 3 houses
- Included in the project :
  - Training program for craftsmen
  - Codes : good practises and acceptance in the new thermic regulation for buildings
- Adapted to new houses (low thermic demand)
- Commercial launch in 2015-2016 in France





## GRHYD Project

- Partners : GDF Suez, CU Dunkerque, McPhy, CETH, GNVert, CEA, INERIS, CETIAT, AREVA, STDE, INEO
- Support : ADEME (Investment for Future), start in January 2014
- Local power to gas project :
  - H2 production from the local electricity distribution grid
  - Injection in the local natural gas grid (until 20%) connected to a neighbourhood (200 houses)
  - Use of the mix H2+NG as fuel in 50 buses of the Dunkerque public transport network



## Hydrogen & Fuel Cells in the energy transition : key drivers

- Increase of **electric renewables** on grids (need of control)
- Appropriation of energy and environmental issues by local authorities, regions
- **New devices to develop** : mobility operators and services, grids regulators / balancing
- Business models to design, integrating the different bricks
- Risk management and **adaptation of the European regulations**

Thank you for your attention !

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