

Fuel Cell and Hydrogen: from research dreams to industrial reality

Axel STRANG

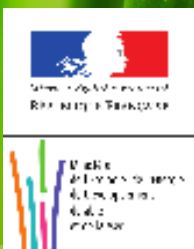
**French Ministry of Ecology, Energy, Sustainable
Development and the Sea**

General Directorate for Energy and Climate

Fuel Cell and Hydrogen Joint Undertaking
Stakeholders' General Assembly
Brussels, November 9th 2010

Resources, territoires et habitats
Énergie et climat
Prévention des risques
Développement durable
Infrastructures, transports et mer

**Présent
pour
l'avenir**



**Ministère de l'Écologie, de l'Énergie, du Développement durable et de la Mer
en charge des Technologies vertes et des Négociations sur le climat**

Past initiatives for Fuel Cell and Hydrogen in France



PACO network (1999-2005)

- Coordinated by CEA and ADEME
- Missions: define research priorities and fostering R&D



PAN-H program (2005-2008)

- Coordinated by the National Research Agency (ANR)
- Objective: funding of R&D
- Outputs: 73 projects involving 420 organisations, for a total budget of 83 M€



H-PAC program (2009-2010)

- Coordinated by the National Research Agency (ANR)
- Objective: funding of R&D
- Priorities:
 - low and high-temperature electrolysis
 - hydrogen storage
 - stationary applications
 - early markets
 - renewable energy management
 - mobile applications including transport

Current initiatives: towards a Fuel Cell and Hydrogen industry in France

➤ On-going initiatives towards a green economy

- « Grenelle de l'Environnement » (2007): brought together representatives from administrations, NGOs, public and private entities, to define a roadmap for sustainable development in France
- « Strategic sectors for a green economy » report (march 2010): the hydrogen and fuel cell sector was identified among others such as renewable energy, biofuels, smart grids, energy storage...
- Workshops with research and industry players and other stakeholders: draft an implementation plan for the development of the fuel cell and hydrogen industry in France

➤ Funding of large-scale demonstration projects through the « Investissements d'Avenir » program

- Funding of pre-industrialisation projects between 2010 and 2015
- « Transport of the Future »: 1 billion euros
- « Low-Carbon Energy and Green Chemistry »: 1.6 billion euros
- Hydrogen and fuel cells solutions : a candidate among other technologies



The French Hydrogen and Fuel Cell Roadmap

Fuel Cell Hydrogen-Joint Undertaking
Stakeholder's General Assembly 2010
Brussels, 9 November 2010



Towards the “French Hydrogen and Fuel Cell Roadmap 2020-2050”

- **HyPaC (French Hydrogen and Fuel Cell Platform):**
 - created in 2008 to encourage the deployment of these technologies
 - brings together around 80 players involved in the hydrogen and fuel cell value chain.
- **“French Hydrogen and Fuel Cell Roadmap 2020-2050”:**
 - 25 experts consulted during 20 interviews and 3 workshops, between May and October 2010
 - Key stakeholders involved:
 - Large industry players: Air Liquide, EDF, France Telecom, GDF-Suez, Peugeot Citroën, Total, Veolia Environment ...
 - SMEs: CETH, N-Ghy, Héliion ...
 - Research institutes: CEA, CNRS ...
 - Local authorities: Rhône-Alpes Region, Mission Hydrogène Pays de Loire...
 - Associations / industry platforms: AFH2, Alphéa, HyPAC
 - Due for publication in January 2011.

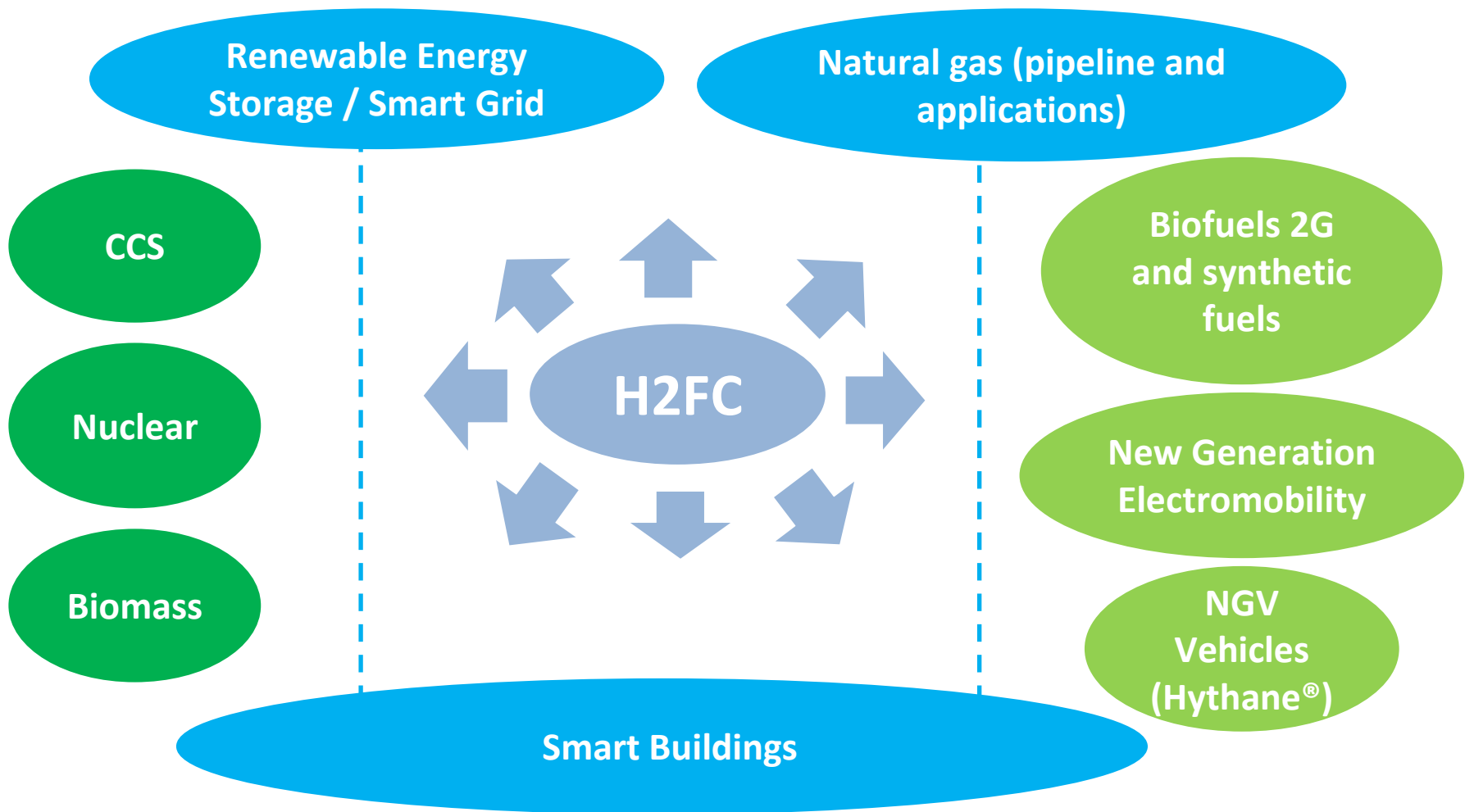


Integrating hydrogen in the French energy landscape: synergies, added value and flexibility

Upstream synergies:
Low carbon hydrogen
production

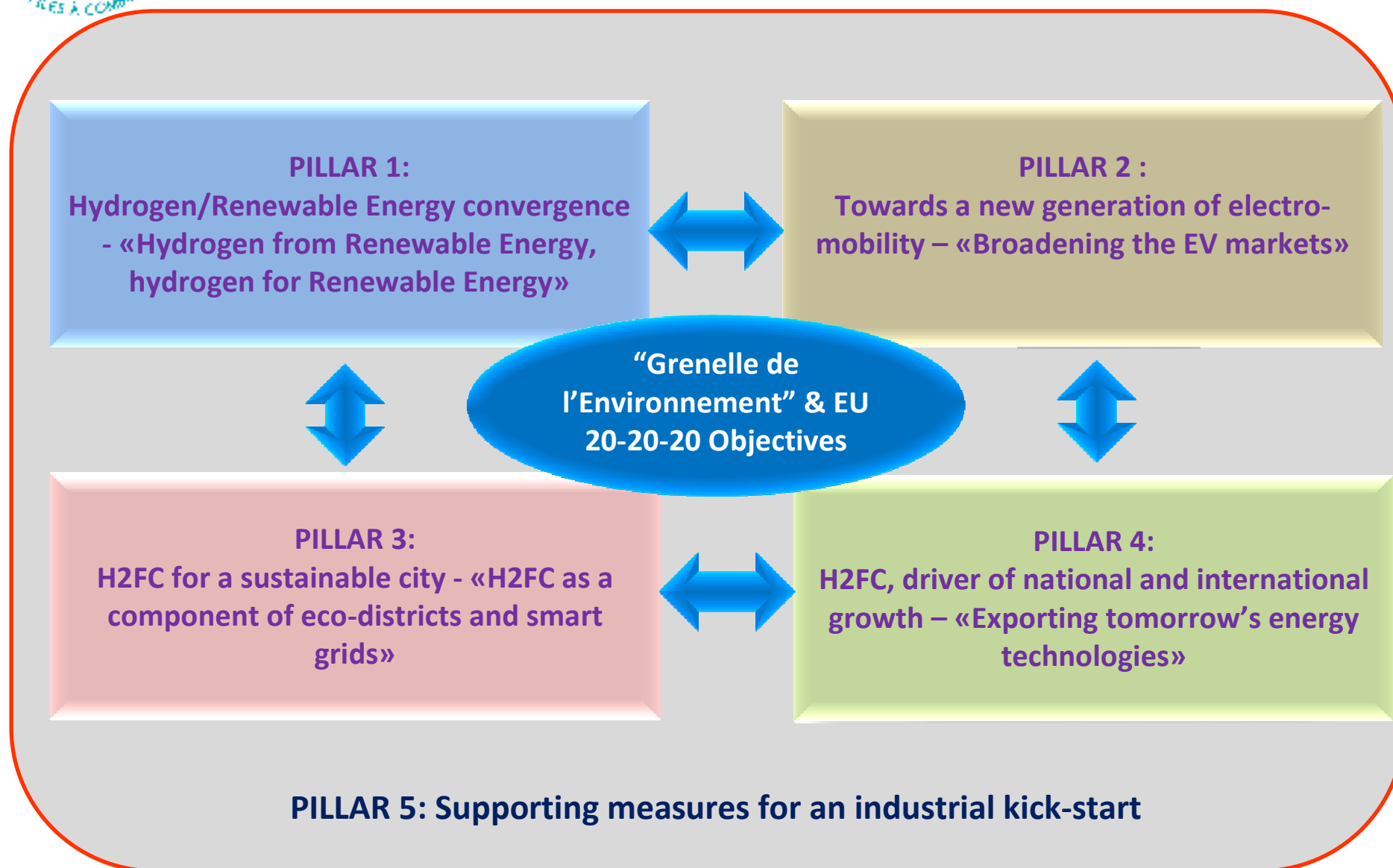
Network / Infrastructure synergies:
Intelligence and optimized storage,
« Smart Energy Grid »

Downstream synergies:
Energy efficient applications





The French stakeholders' unified vision for 2020





HyPAC wish-list: 5 prioritized development programs

Pillar 1: Hydrogen/RE convergence

- Duration:
5 to 7 years
- Budget:
150 - 200 million €
- Proposed actions:
3 R&D projects
3 demonstration
projects

Pillar 2: Towards a new generation of electro- mobility

- Duration:
10 years
- Budget:
200 million €
- Proposed actions:
2 R&D projects
3 demonstration
projects
1 industrial pre-
deployment project

Pillar 3: H2FC for a sustainable city

- Duration:
10 years
- Budget:
150 - 360 million €
- Proposed actions:
1 R&D project
6 demonstration
projects

Pillar 4: H2FC, driver of national and international growth

- Duration:
5 years
- Budget:
105 - 180 million €
- Proposed actions:
1 demonstration
projects
4 industrial pre-
deployment projects

Pillar 5: Accompanying measures for an industrial kick-start

- Duration: 5 years
- Proposed actions:
4 public procurement actions
5 public funds and subsidies actions
5 specific measures

Next steps: implementing the roadmap



Integrate proposals within planned demonstration programs

- Positive energy buildings and neighborhoods (on-going until March 2011)
- Hydrogen production (2011)
- Energy storage (2011)
- Transport of the future



Further detail planning and deployment priorities

- Adaptation of regulations
- Incentives' amplitude and duration
- Consumer and workforce education



Coordinate with international and European initiatives