



Make it happen with early customers now

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Marianne JULIEN, H2E Program Director

Air Liquide Hydrogen Energy

<http://www.airliquide-hydrogen-energy.com>

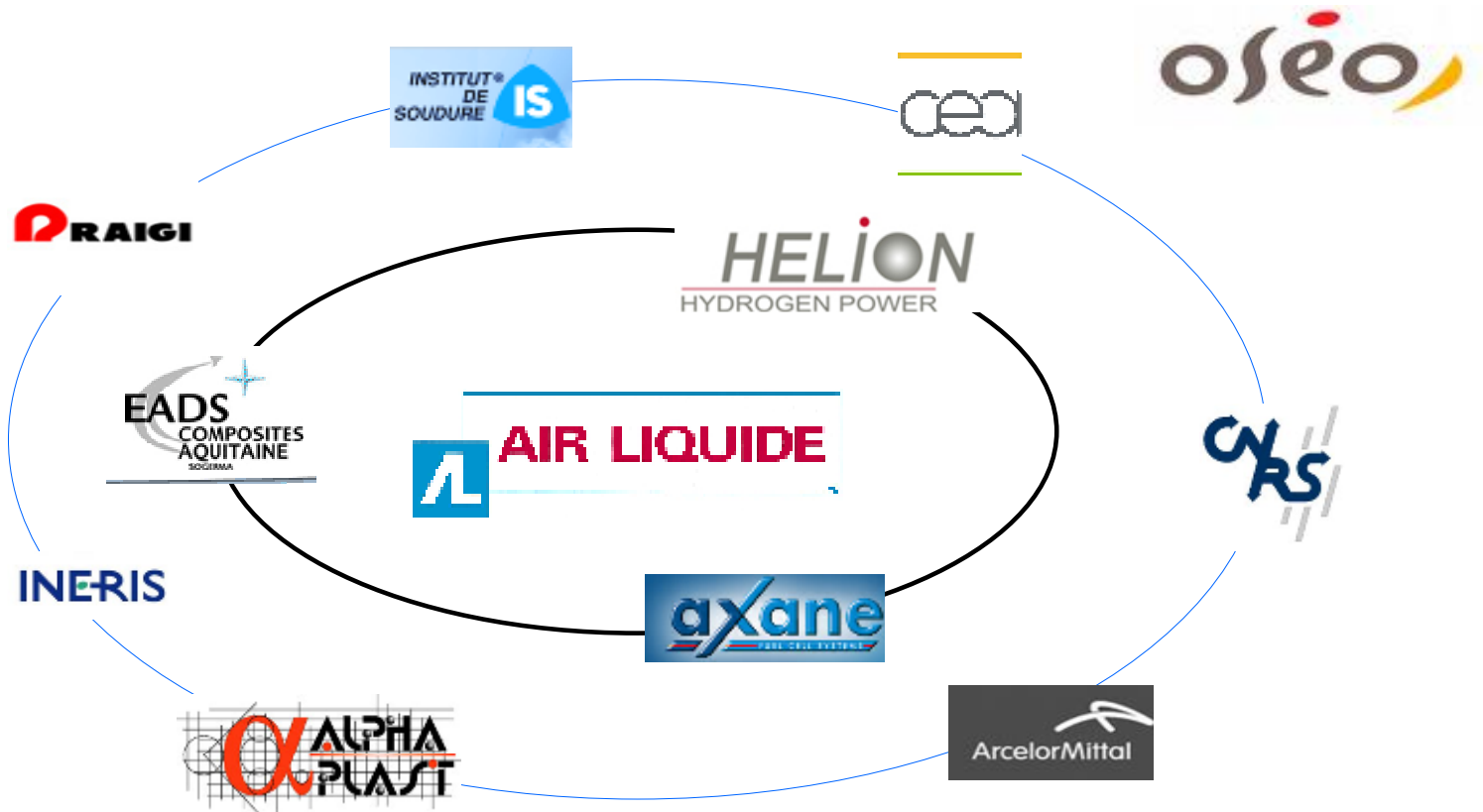
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With a French consortium...



19 Partners

June 2009 – June 2016

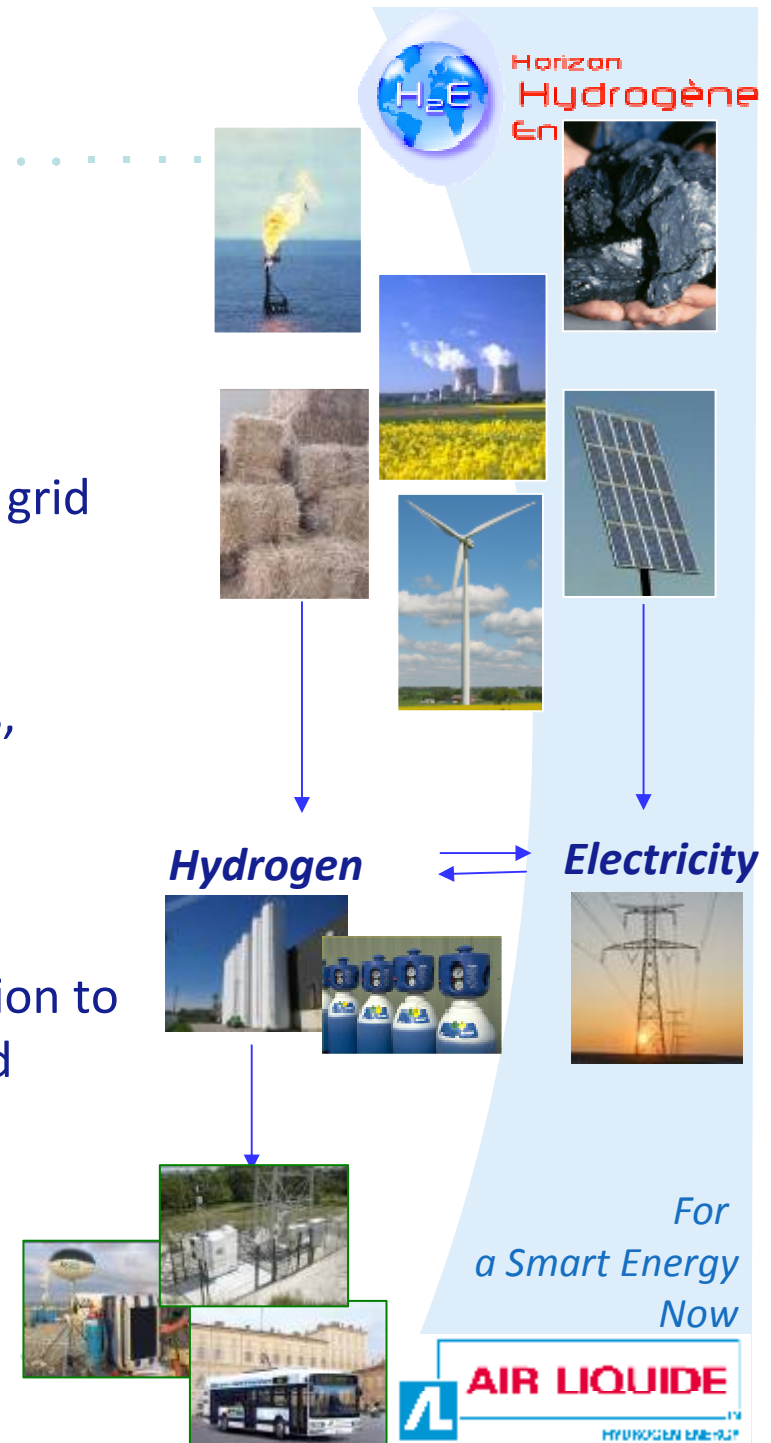
190 M€ budget 2/3 Private , 1/3 Public

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... around a common vision

Hydrogen is needed for « Smart low-CO₂ Energy Grids »

- Produced from multiple sources : natural gas, grid electricity, renewable,
- Adds value to wind farm facilities, solar plants, nuclear plants during period of low electricity demand (off-peak hours)
- Enables the use of electricity with no connection to the grid : electric vehicles, mobile and isolated equipment



The early customers we target



**Stationary
back-up power**

In 2015⁽¹⁾ ~ 13 000



**Off-grid
sites**

~ 3 000



Special Fleets

~ 12 000



**Portable
generator**

~2 000

- Applications with achievable performance objectives
- Large enough Market volumes to reach cost targets
- Early markets can initiate industrialization of H2 energy technologies :
fuel cells & H2 supply chain

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(1) Air Liquide 2010 estimates from various market studies. Fuel cell in the 0.5 to 20 kW power capacity range
FCH JU Gen. Assembly Nov 10, 2010

With unique service business models

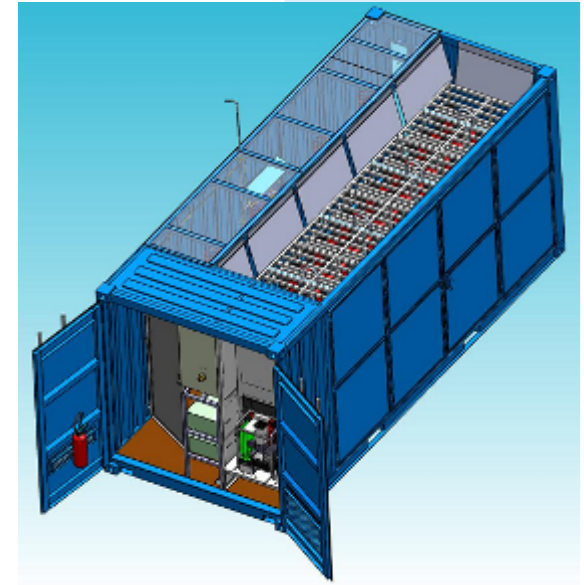
❑ Off-grid sites such as telecom towers

✓ An offer based on an “Energy Container”

- 1 – 5 kw modular Fuel Cell
- Electric management system
- Hydrogen Storage (700 kWh)

+ Hydrogen Delivery Service

+ Training, Installation, operation, maintenance



❑ Technical Vehicles such as forklifts

✓ An offer based on a fast filling H2 station

- 50+ kg / day , 350 bar

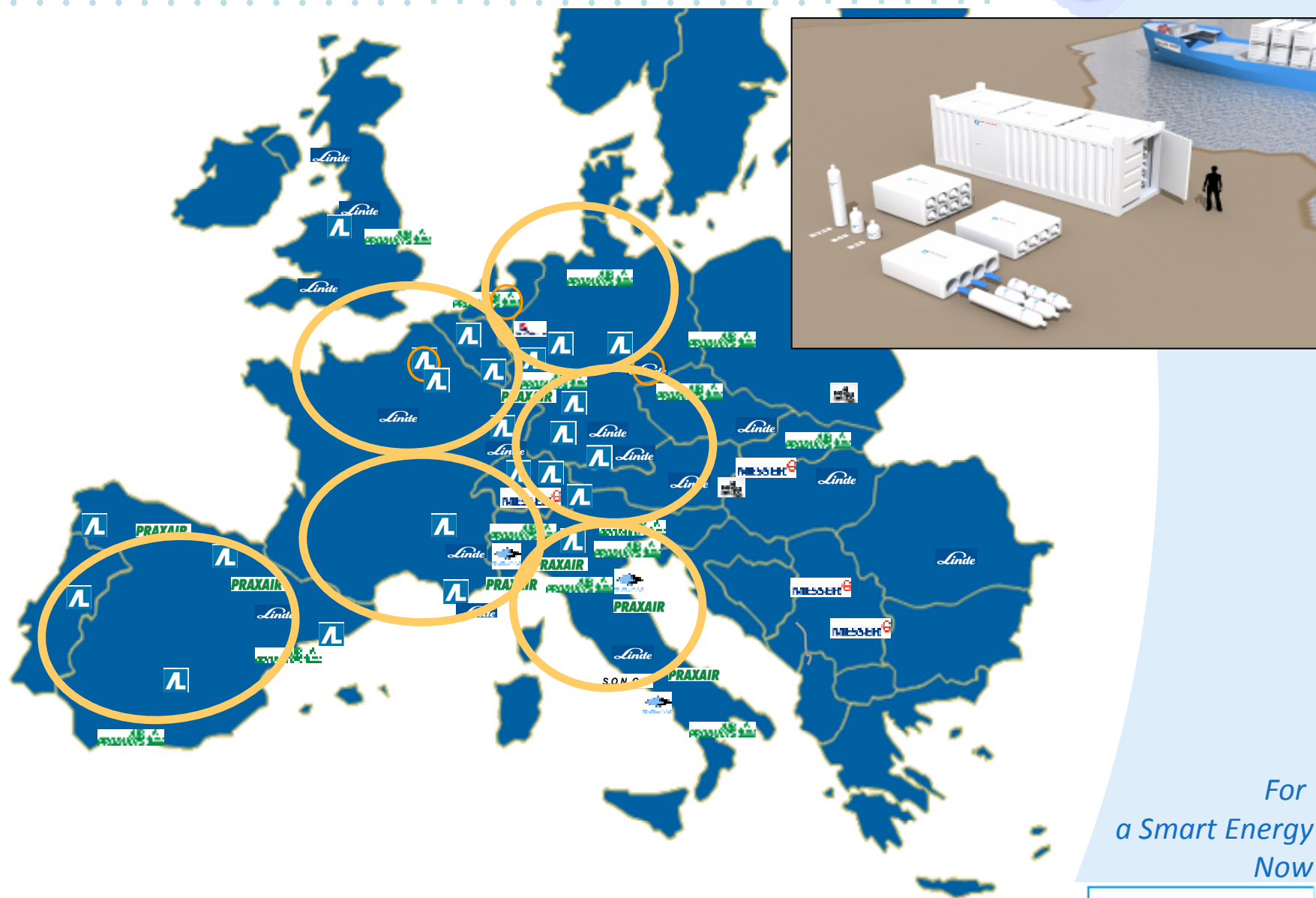
+ Scalable project management assistance

+ Hydrogen Delivery Service

+ Training, Installation, operation, maintenance

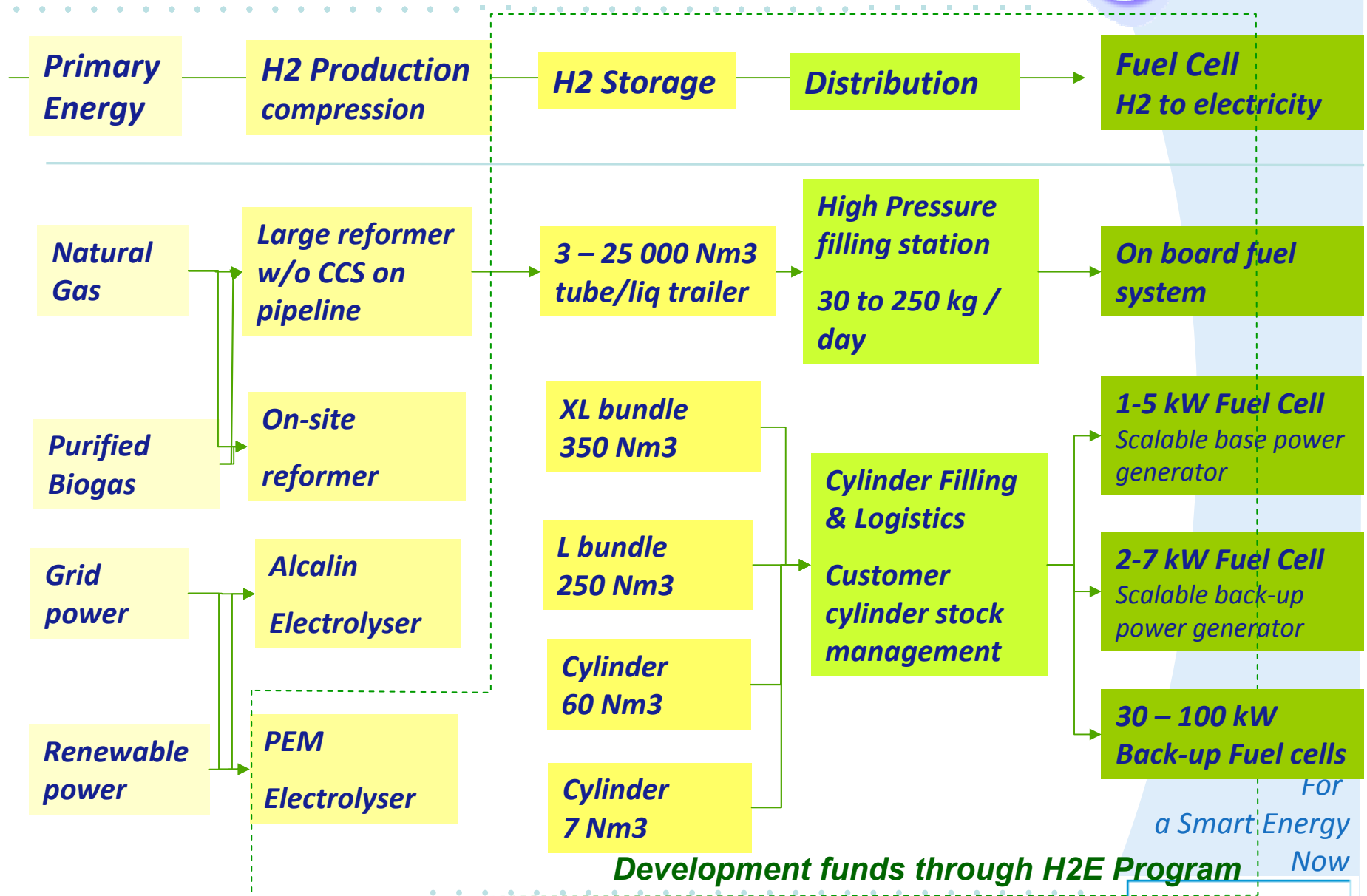


While building a cost-effective logistic infrastructure



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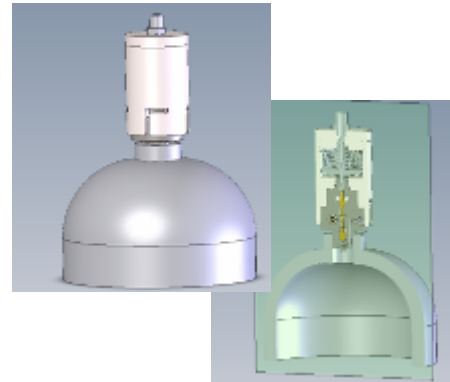
+ an ambitious development roadmap



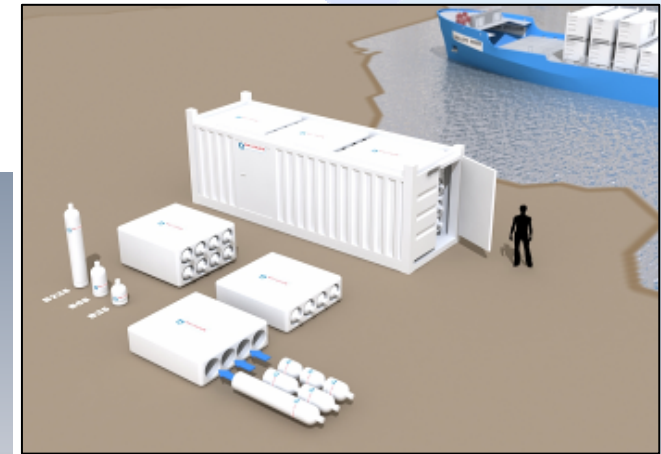
In 2010 : First Prototypes & Concepts



Helion PEM Electrolyser

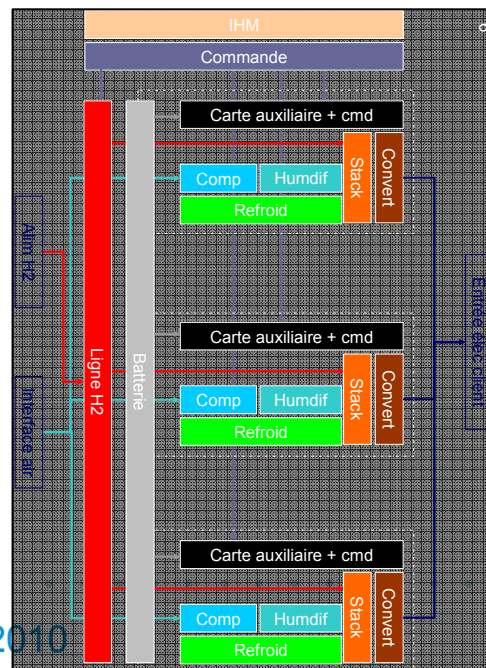


HP Connection



**Flexible H2 cylinder packs
Composites Aquitaine**

**Modular 1-5 kW
Fuel Cell Systems
AXANE**



H2/O2 30 kVA Helion Fuel Cell

Cross-cutting issues are key leverages



□ Build **strong consensus** on H2-as-an-energy benefits

- ✓ Early customers
- ✓ National and local institutions
- ✓ Safety teams

□ Grow an appropriate **RCS framework**

- ✓ Pre-normative research - *links with JTI projects*
- ✓ Working group in France
- ✓ Participation to ISO initiatives

-> need for

support by institutions, expertise to be build in
incentives for end customers : market value for CO₂ reduction

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To take away

After 18 months

- 25 service contracts with early customers in Europe
- Markets exist in Europe to grow a sound business
- 36 technology bricks under development

*Thanks to competences
and technologies built
through the HyChain
project*



*Early market growth can be **LEVERAGED** through :*

- Incentive for final customers who switch to H₂
- Target for renewable H₂ production in production mix
- And incentives for local green H₂ production

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