CEA-LITEN: the French Institute for Energy Transition

FROM RESEARCH TO INDUSTRY, TOWARDS A GREEN HYDROGEN ECONOMY

International seminar CALAC, Opportunities for the development of green hydrogen, March 11th 2021

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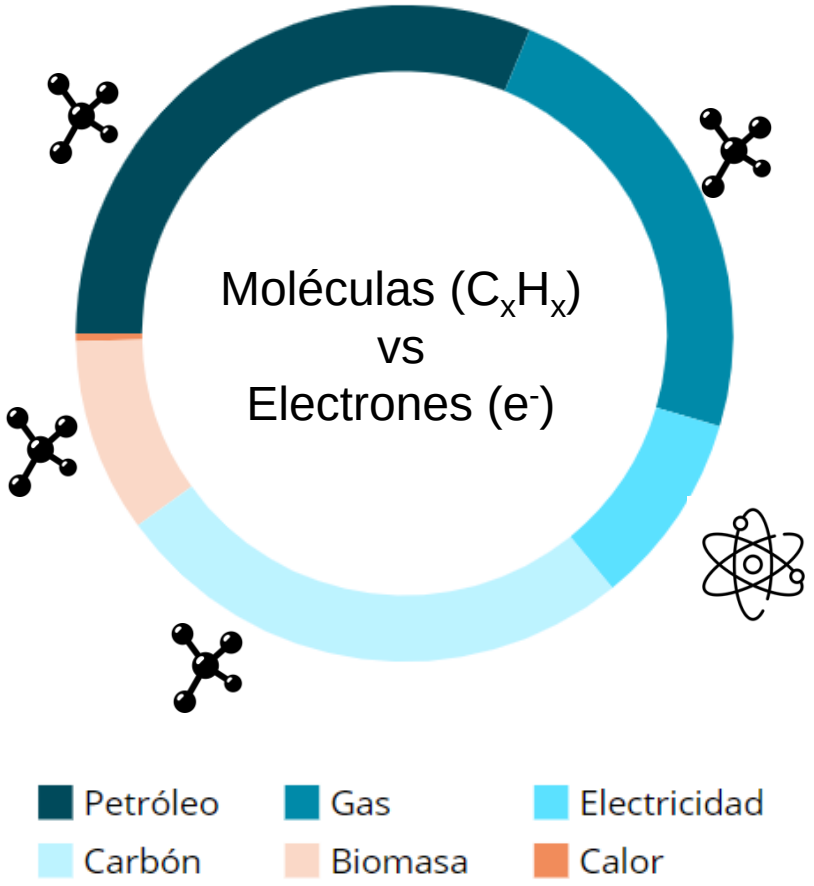
PORQUÉ EL HIDRÓGENO VERDE ?

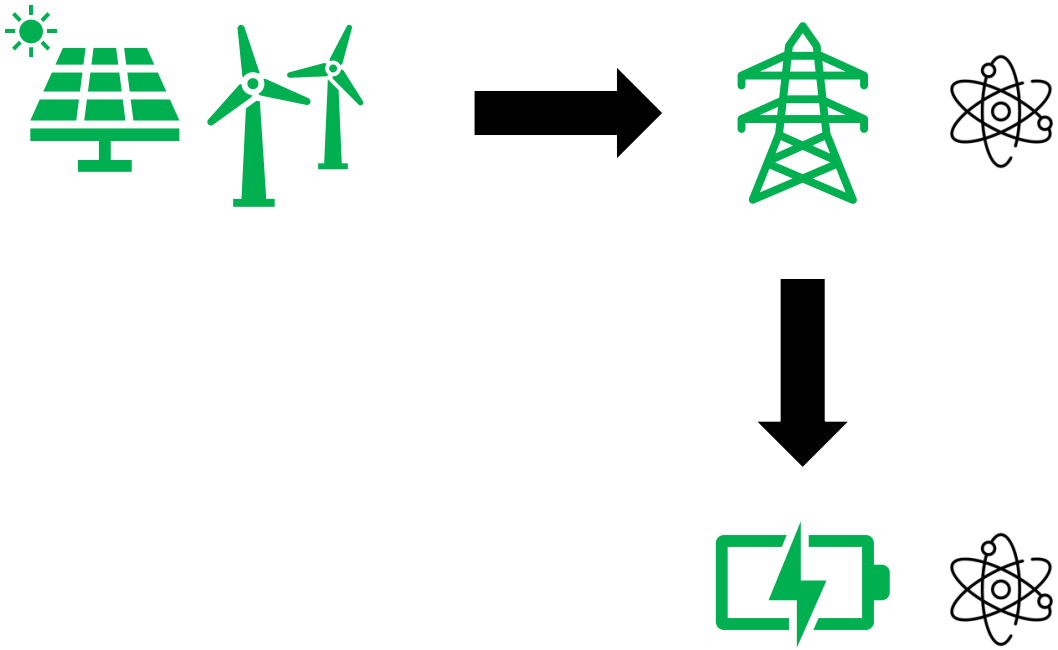
Consumo final de energía (global)

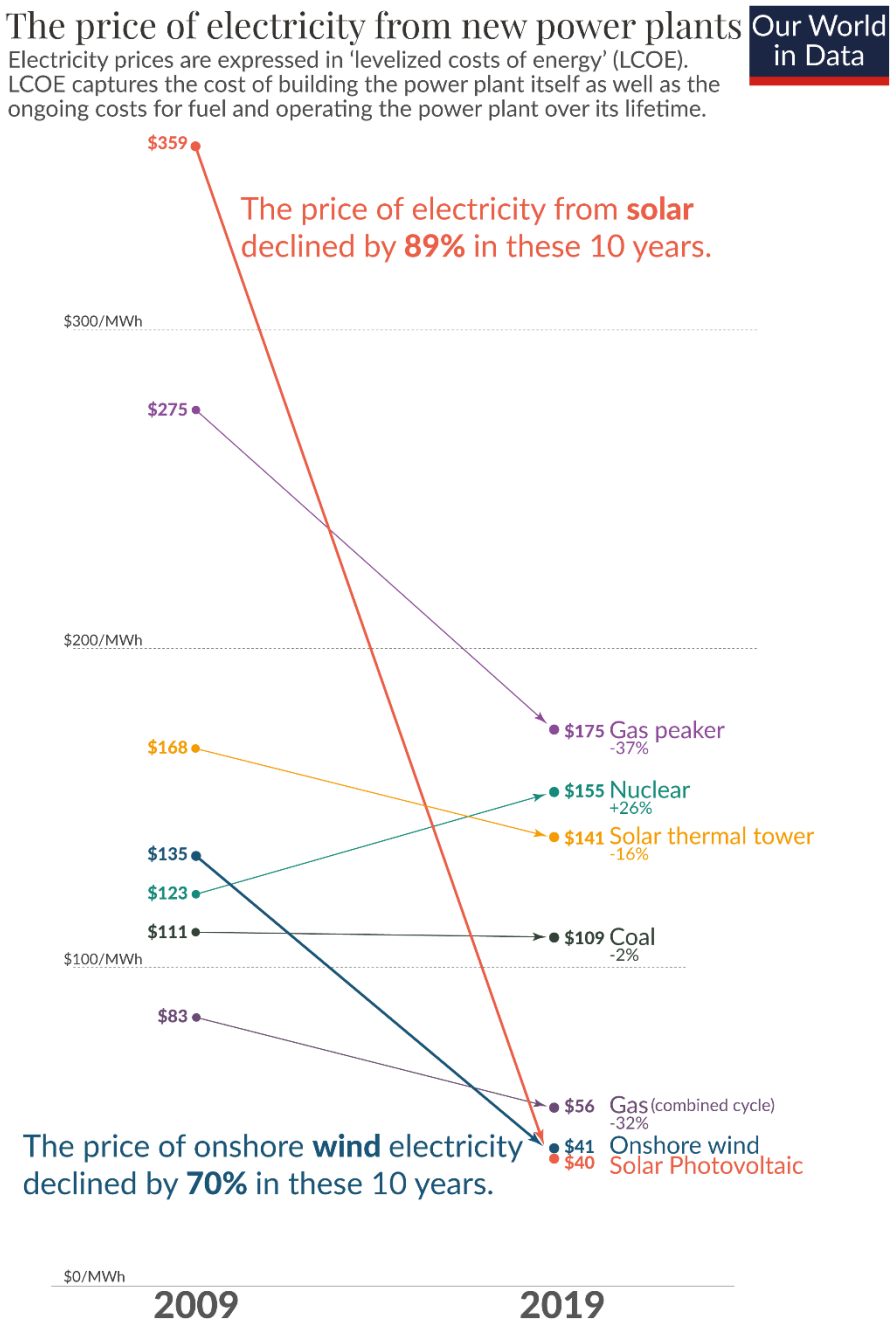


Para descarbonizar la matriz energética
necesitamos combustibles verdes

Fuente: https://datos.enerdata.net/energia-total/datos-consumo-internacional.html

3 GRANDES ALIADOS PARA DESCARBONIZAR LA MATRIZ: PV, WIND Y BATERÍAS





Fuente: https://ourworldindata.org/cheap-renewables-growth

Data: Lazard Levelized Cost of Energy Analysis, Version 13.0
OurWorldinData.org – Research and data to make progress against the world's largest problems.
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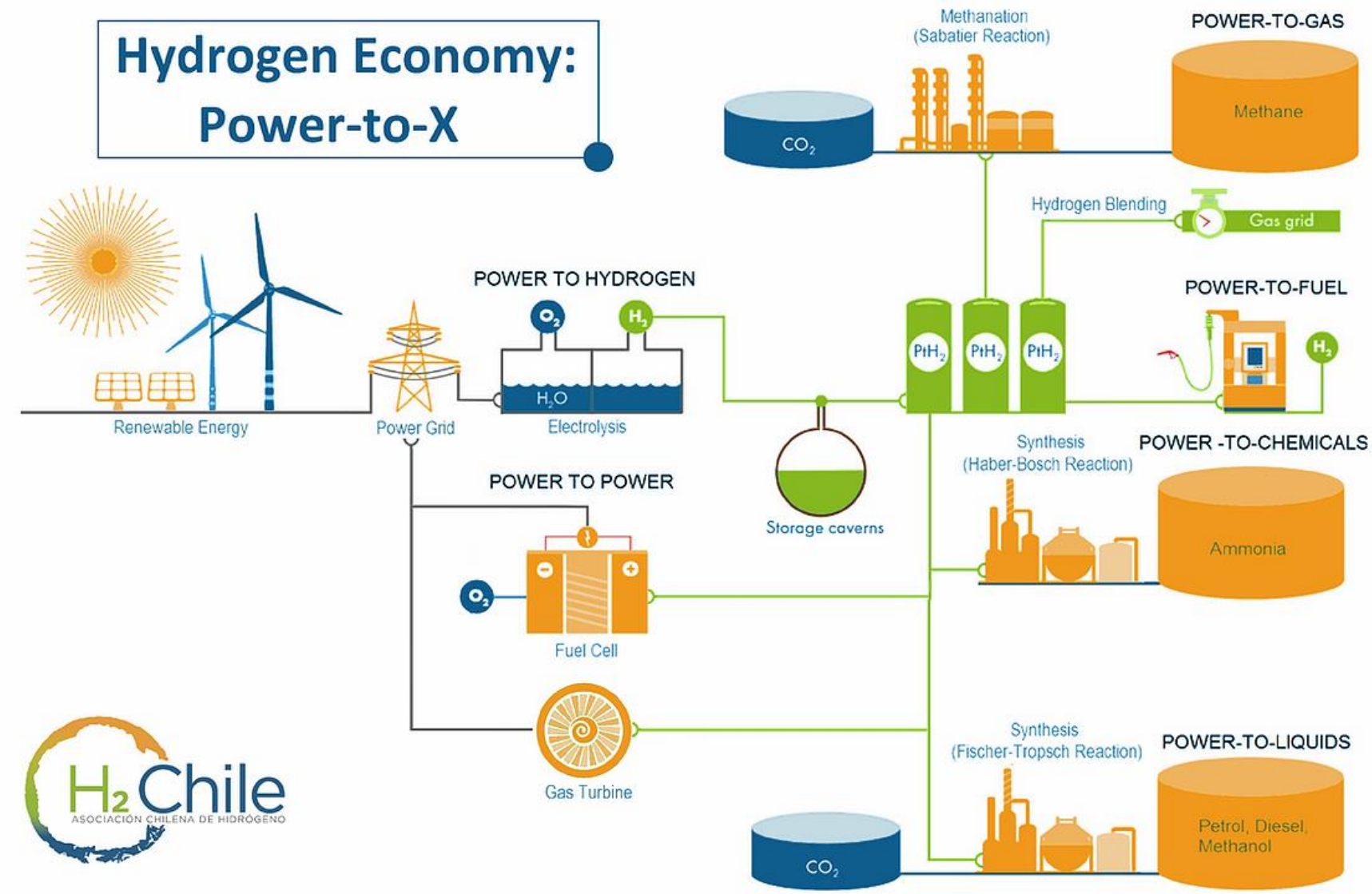
CONCEPTO DE POWER TO X



Fuente: H2 Chile (h2chile.cl)

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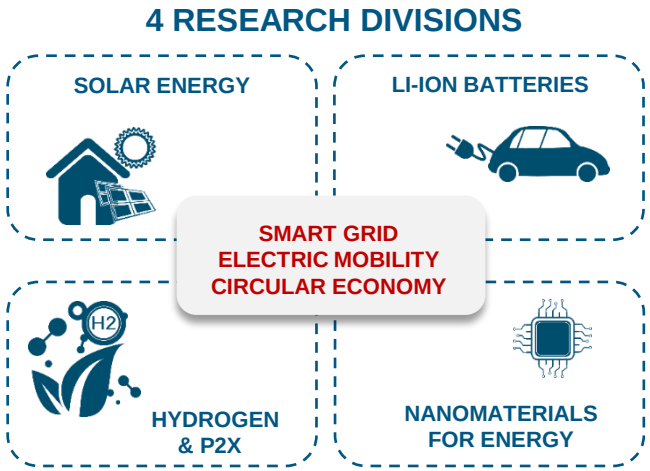


Misión: apoyar la industria hacia la transición energética

Cómo: desarrollando conocimiento y tecnologías para y con la industria

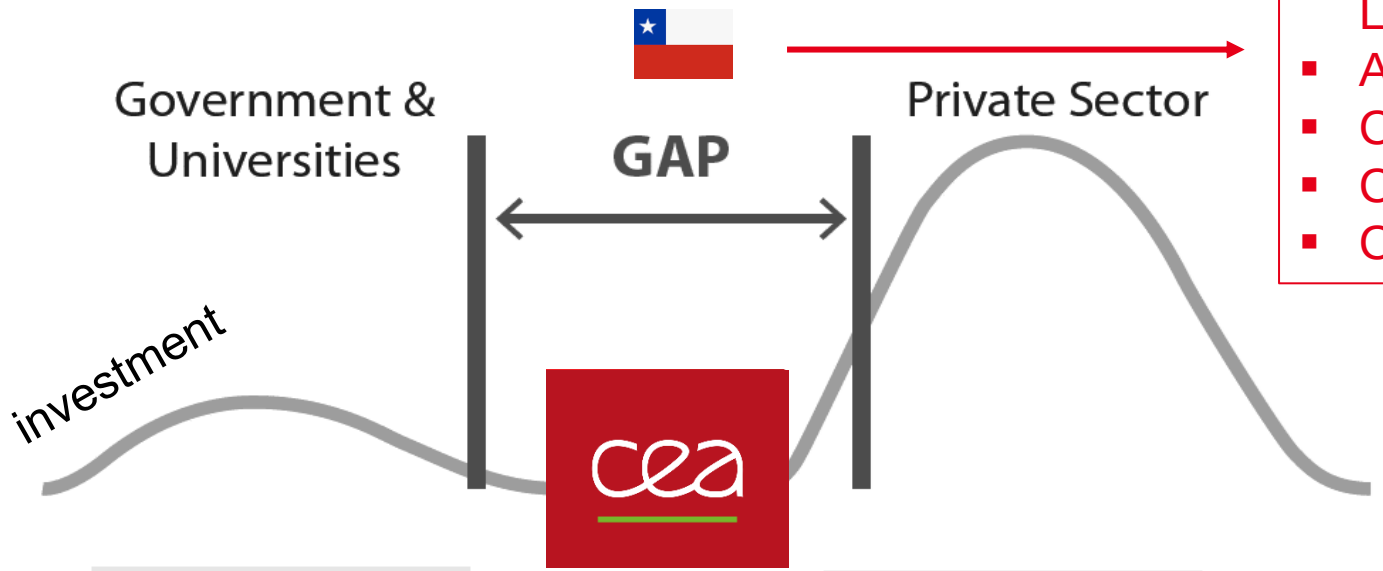
2 sitios (infra. & equip. >300M€) para tests y prototipaje pre-industrial

1.100 empleados, 1.200+ patentes, **250+ clientes industriales**

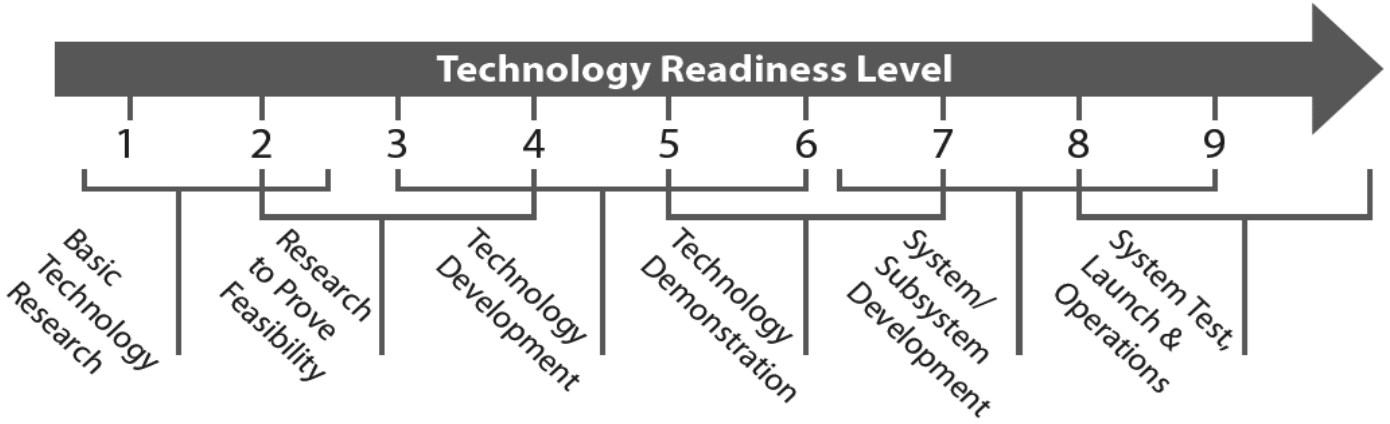
14 plataformas para pilotaje tecnológico

FROM RESEARCH TO INDUSTRY : MIND THE GAP !

- Instituto de Tecnologias Limpias
- Atamostec
- Centro Economia Circular
- Centro Electromovilidad
- Centros H2



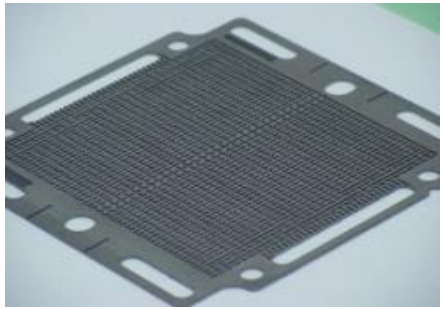
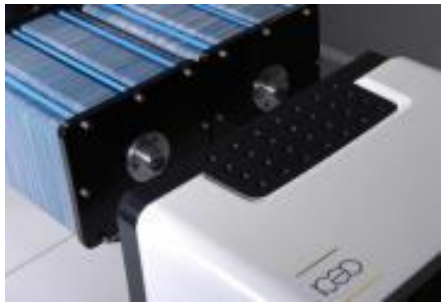
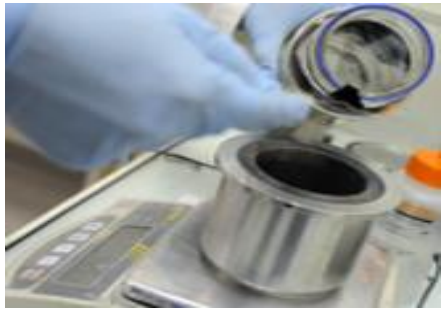
Knowledge



Market

CEA-LITEN: SOLAR PLATFORM

PLATAFORMAS BATERIAS & HIDRÓGENO: VISIÓN INTEGRAL

	Materials synthesis	Cell assembly	System development	System integration
HYDROGEN PLATFORM				
BATTERY PLATFORM				

Modeling, Characterization, technological watch

HYDROGEN DEMONSTRATORS WITH INDUSTRIAL PARTNERS

SENEPY

H_2 Production
= 0.5 Nm^3/h

- Small scale
- Demonstration of technical feasibility for hybrid hydrogen-battery solutions (LFP). Simplification and optimization of energy efficiency strategy.

Hyway

H_2 mobility
= 100 vehicles

- Intermediate scale
- Demonstrator of H2 production storage, distribution and H2 mobility for delivery companies

PROHYTEC

H_2 Production
= 20 Nm^3/h

- Large scale
- Coupled to real renewable energy source

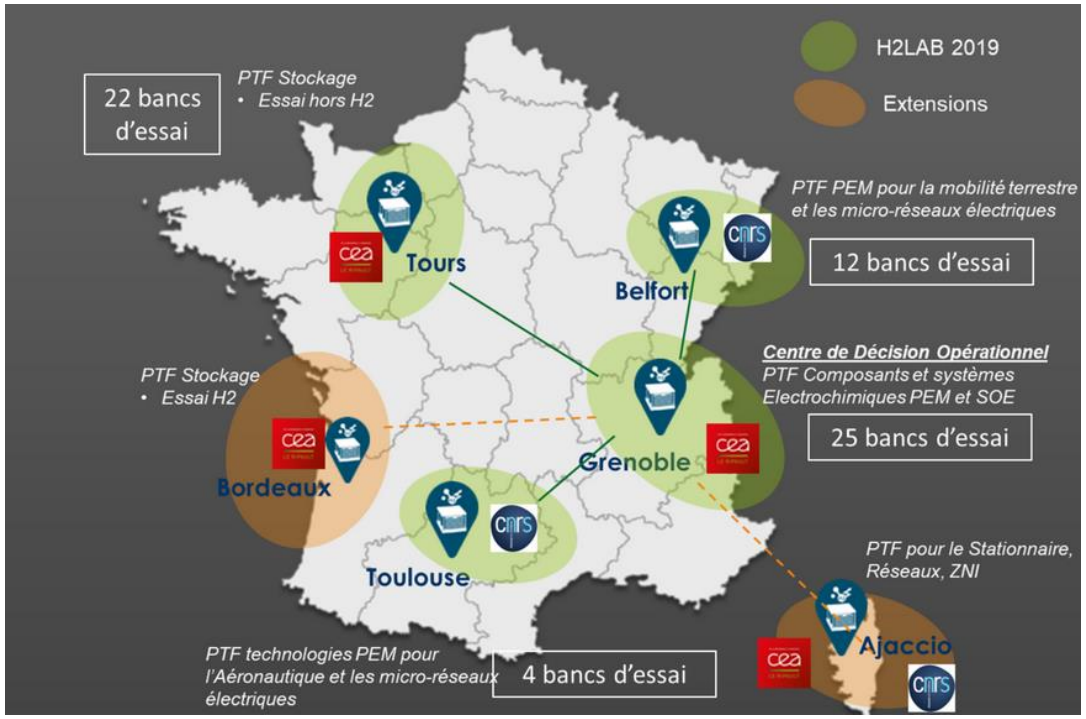
MYRTE

4.2 MWh of energy stored into H_2

- Real-life conditions
- Solar coupling
- Re-injection into grid

H2LAB

The French testing platform for industry



FROM RESEARCH TO INDUSTRY : EXAMPLE OF SUCCESSFUL TRANSFERS

2005 — 2010 — 2020

Transfer to industry

PV modules

Strategic decision
Launch of HJT activities

Proof of concept

Demonstrators

Transfer
to industry

Electrolyzers

Strategic decision
Launch of SOC activities

Proof of concept
First electrolyzer rSOC

Demonstrators

Transfer
to industry

Fuel cells

Strategic decision
Launch of PEMFC activities

Proof of concept
first stack PEMFC

Demonstrators
From EZ to ~100 vehicles

Transfer
to industry

enel Green Power

Schlumberger

VINCI CONSTRUCTION

SYMBIO
A FAURECIA MICHELIN HYDROGEN COMPANY

MICHELIN

faurecia
inspiring mobility

Fuel cell characterization for technological adaptation

Proprietary database of real using cases

Feedback of previous demonstrations
Real driving cycles

Vibration tests - Endurance

Components and/or systems testing
Vibrating pot device

Climatic tests

Pressure, Temperature
Effects of altitude on FC performance and lifetime

Terrain inclination tests

Effects of terrain on FC performance and lifetime

Electricals tests

Electromagnetic compatibility (EMC)
- RF immunity, RF susceptibility

Qualification tests in representative cycle
- Power cycling, Partner network

Casos exitosos CEA-LITEN:

Energy Observer

GAUSSIN MANUGISTIQUE

AGCO Your Agriculture Company

Next steps?

Experience in H2 safety and standardization

Strong knowledge and active participation in RCS (Regulation, Codes & Standards) organizations

Large domains:

- Aeronautic, Maritime, Railways and road applications

Hydrogen implementing:

- Mobility directives and standards
  - European 79/2009 and 406/2010 Directive
  - Hydrogen Refueling Stations (HRS)
- Stationary
  - ATEX directive, DESP directive

Active member in standardization committees

Prenormative (PNR) research programs involvement

- **Ex Hytunnel: H2 safety in tunnels and confined space experiments**

Member of international Technical Committees

- IEC TC 105 (fuel cells), ISO TC 197 (hydrogen)
- UN GTR 13
- IPHE

A VERTICAL APPROACH: EXAMPLE OF THE LI-ION BATTERY SECTOR

Material

Cells

Packs & BMS

Recycling

¿COMO APOYAMOS A LA INDUSTRIA?

- ✓ IP, know-how and technology transfer
- ✓ Testing, Characterization, Understanding, improvement
- ✓ Training
- ✓ Benchmark, Techno-economical analysis (database)
- ✓ Proof of concept, demonstrators, pre-industrialization
- ✓ Modeling and simulation

ATAMOSTEC: THE BIFACIAL INSTITUTE FOR DESERT PV

Planta de pruebas Lalcktur (1 MWp)

Objetivo:
minimizar el LCOE (y entonces el LCOH) en el desierto de Atacama

CEA-Liten contribution in ATAMOSTEC :

- Design of PV panels adapted to Atacama desert
- Qualification ➔ Desert Label
- Modeling and data analysis
- Competitiveness analysis (objective LCOE < 15 USD/MWh)
- Training, IP Transfer

Laboratorio outdoor - PSDA (Plataforma solar del desierto de Atacama)

GRACIAS

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