European Hydrogen Week

24 - 28 October 2022

Brussels, Belgium

euhydrogenweek.eu

Hydrogen Europe

Flagship Expo

Clean Hydrogen Partnership

HYSILABS

The enabler of zero emission massive H_2 transportation & storage

Corine Dubruel CEO

Hydrogen (H_2)

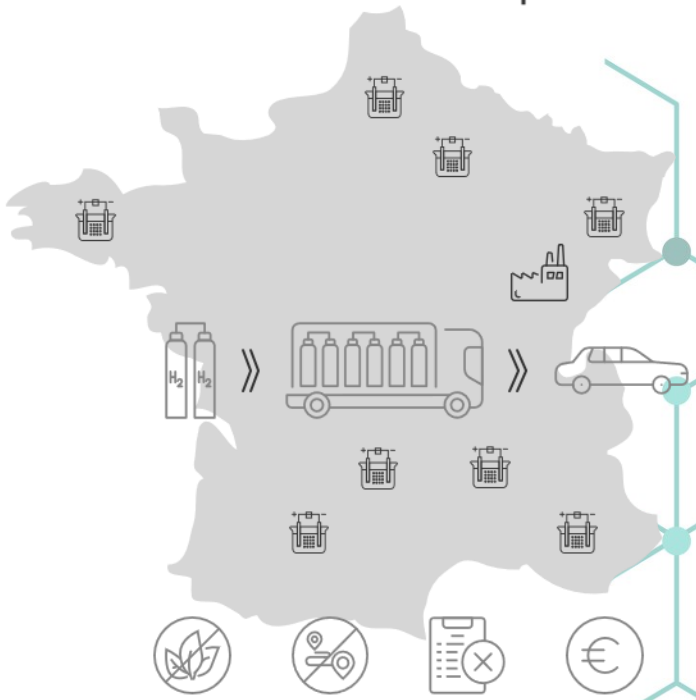
is a key element in the energy transition…

« H_2 could meet up to 24% of the world's energy needs by 2050 »

(Bloomberg NEF 28.5.2020)

… but its logistics remain complex and expensive

H_2 transportation is limited to small distances and little quantities



Current transportation and storage methods

Compressed gas

Transporting H_2 in gaseous state by compressing it.

✕

- Difficult to handle (200-700 bars pressure)
- Small quantitly of H_2 transported
- Difficult for big volumes
- Difficult for long distances

Pipeline

Transporting H_2 in gaseous state by pipelines.

- H_2's lightness → greater leakage rate
- Possibility of H_2 embrittlement
- Not adapted for long distances

Considered transportation and storage methods

Cryogenic (liquefied) H_2

Transporting H_2 in liquid state at very low temperature.

✗

- Infrastructures not deployed
- Need of keeping a constant temperature (-253°C)
- Energy intensive for liquefaction
- Boil-off (H_2 losses over time)

Ammonia (NH_3)

Transporting H_2 combined with nitrogen.

- Toxic
- Unconceivable for downtown usages
- Need of specialised staff
- H_2 losses when unloading
- Not linked to H_2 transport yet

New transportation and storage methods

Transporting H_2 in an organic hydrogen carrier.

- Organic: carbon-based
- Aged carrier with time: oxidized
- Need of energy input for releasing H_2 from it
- Need of H_2 purification after release
- Costly raw material

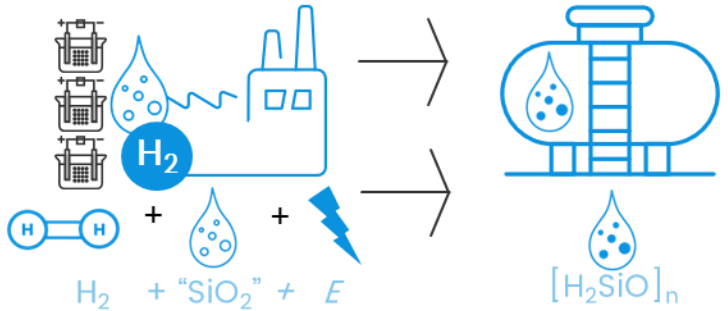
Hydrogen Stored as Liquids (HydroSil)

Transporting H_2 in a unique, non-organic hydrogen carrier.

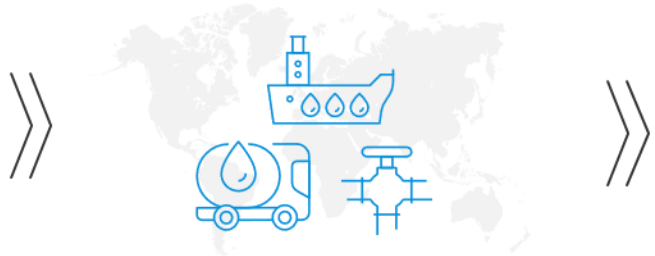
- ✓ Liquid, stable, safe
- ✓ Earth friendly
- ✓ No energy needed to release H_2
- ✓ Non-organic molecule
- ✓ Use of conventional infrastructures

HSL solutions™ to easily store & transport H_2

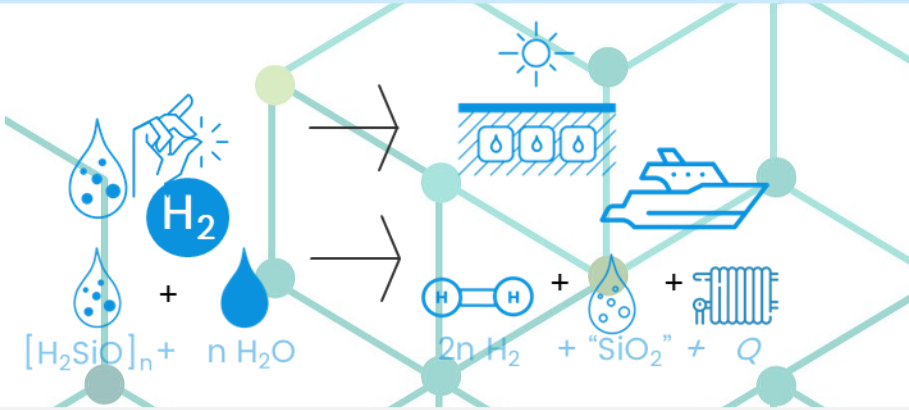
HySiLabs has developed two innovative chemical processes to charge and release H_2 in and out of the carrier.



Industrial processes to load the carrier with H_2 and energy



Same logistics as conventional liquid fuels



H_2 is released from HydroSil on demand without energy

69 owned patents

- Charging process
- HydroSil molecule
- Release process

The only one in the world in liquid state with a non-organic basis

HySiLabs | The enabler of zero emission massive H2 logistics

Vision

A H_2 economy for a zero-carbon future.

Mission

Enabling massive H_2 logistics with a safe and cost-competitive solution.

69 patents

6 M€ total funding

18 employees

2022 1st system delivered

5 co-dev projects

This project has received funding from the **European Union's Horizon 2020** research and innovation programme under grant agreement No 101009244

UNION EUROPÉENNE
Fonds Européen de Développement Régional

RÉGION SUD PROVENCE ALPES CÔTE D'AZUR

Projet cofinancé par React-EU - Dispositif de relance de l'Union européenne en réponse à la pandémie de COVID-19

7 AFFORDABLE AND CLEAN ENERGY

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

LES DEEP TECH

SOLARIMPULSE EFFICIENT SOLUTION JUNE 2019

GREENTECH INNOVATION

Financial

RÉGION SUD INVEST

eit InnoEnergy Knowledge Innovation Community

European Commission kreaxi

bpifrance

Ecosystem

France Hydrogène Engagée pour la transition écologique

Capenergies

Hydrogen Europe

Purpose and applications

A 74B€ market in 2030

Among all the H_2 usages, HSL Solutions are unbeatable on these three

Green H_2 transportation and H_2 hubs

- Building a pilot near a H_2 hub
- Total addressable market: 26% of the total H_2 market in 2030
  (IEA green H_2 project database; end-use sectors of non-captive H_2)

Ports

H_2 valleys

Heavy duty on-board applications

- Building a pilot to feed the demand
- Total addressable market: 32% of the total H_2 market in 2030
  (IEA green H_2 project database; end-use sectors of non-captive H_2)

Ship-owners

Dockyards

Strategic storage

- Building a pilot with key partners from the sector
- Total addressable market: 1% of the total H_2 market in 2030
  (IEA green H_2 project database; end-use sectors of non-captive H_2)

Cavern storage

Stockists

A cost competitive solution for any use case

Savings up to*
40%
GHG emissions

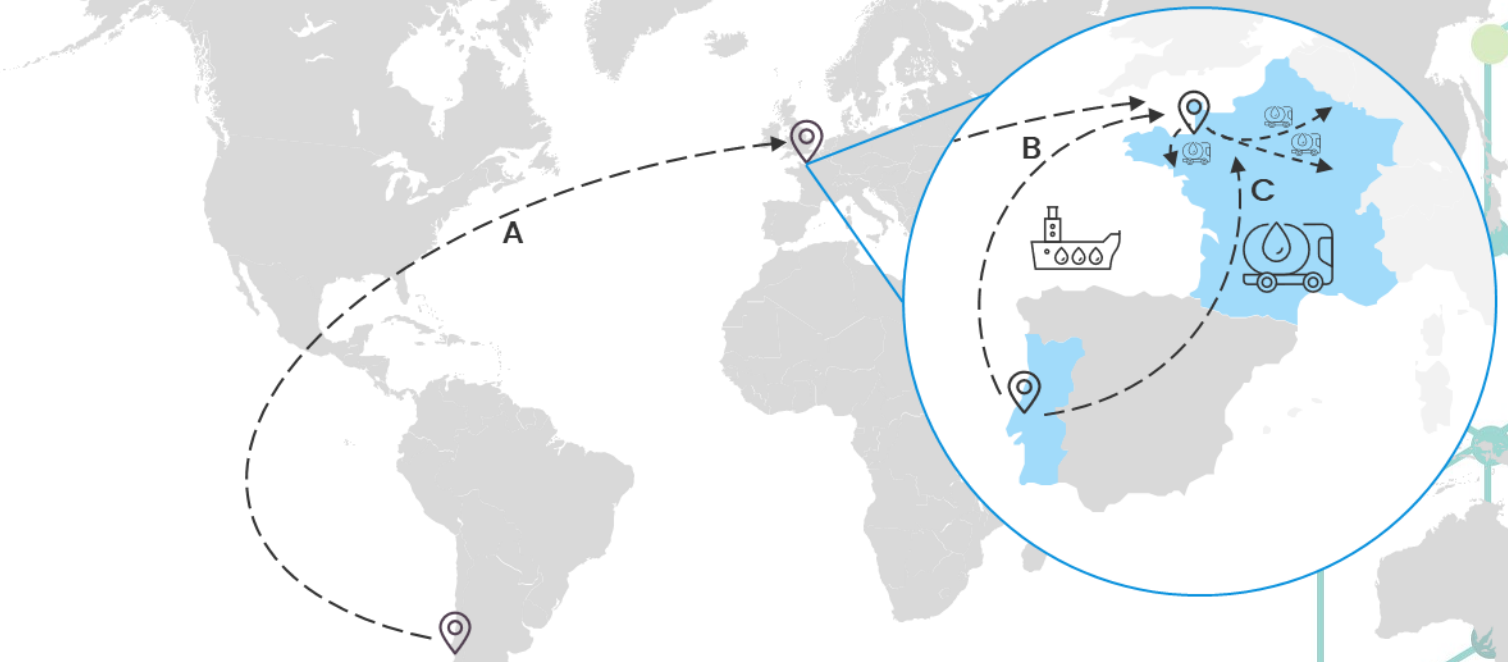
Saving up to*
30%
costs

No
H_2
losses

Chile - France

By sea** A

- **12%** vs LOHC
- **13%** vs LH_2
- **21%** vs NH_3



Portugal - France

By sea** B

- **5%** vs LOHC
- **5%** vs LH_2
- **16%** vs NH_3

Portugal - France

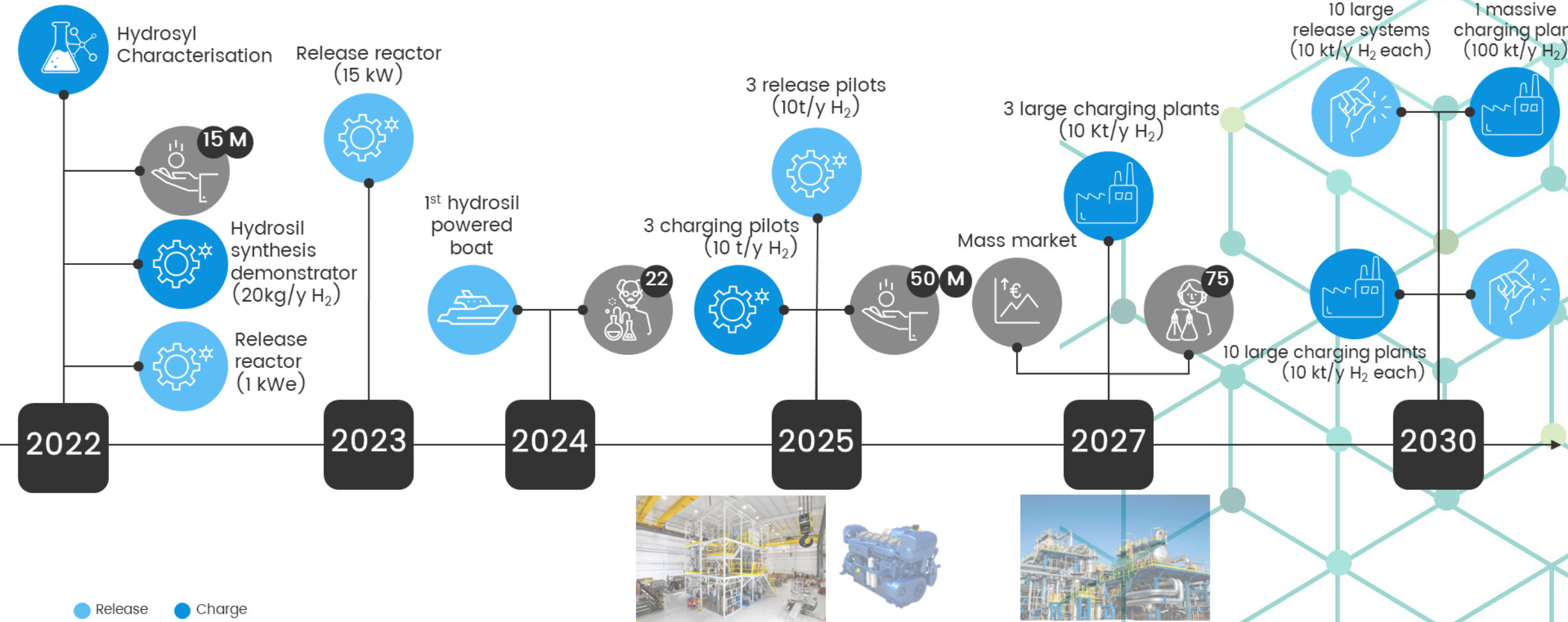
By road** C

- **4%** vs LOHC
- **9%** vs LH_2
- **30%** vs CGH_2***

The data shown are made on the assumption that LH_2 and CGH_2 have a deployed infrastructure.

* Compared to other carriers ** Real business cases based on ongoing discussions (other cases available) *** 350 bars, Type IV

Our industrial roadmap



strictly confidential

Large charging plants | A 2027 ambition

5 industrial charging plants

Enough H_2 for refuelling:

- 250 000 x
- 16 500 x
- 5 500 x
- 2 000 x
- 200 x

- Industrial charging plant:
- **200M€** infrastructure
- **10 kTpa** H_2 charged
- Construction: between **2025-2029**
- Coupled to H_2 production

strictly confidential

Executive summary

HySiLabs has conceived the 1st way to transport and store H_2 as any conventional liquid, using the existing infrastructures and with a zero-carbon basis.

By enabling massive H_2 logistics, a new way of conceiving long distance transportation for the molecule is possible.

HSL Solutions' USP: liquid state at standard conditions, carbon free, use of conventional liquid infrastructures, no energy input for releasing the H_2, suitable for on-board maritime applications.

HySiLabs provides H_2 to consumers together with partners of the value chain via Hydrogen Stored as Liquids solutions.

After proving the concept at large scale, HySiLabs is ready to go onestep further and industrialise its process thanks to a 15M€ fundraising.

Scalability will guide HySiLabs to make revenues starting 2025, to access the mass market in 2027 and to break even in 2030.

Enabling massive hydrogen logistics for all kind of applications

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