Industrial challenges of alkaline electrolysis

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3èmes Rencontres académie-industrie du CNC

photo: GSE-Unanime Architectes

McPhy | A leading low-carbon H_2 Equipment Manufacturer

History

2024
Opening of the Gigafactory
Partnerships materialization

2022
R&D acceleration
Industrial scale up

2020
180 M€ raised
Technip & Chart partnerships

2018
EDF partnership

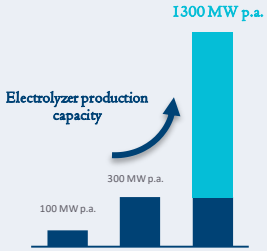
2013
Refueling stations development
Enertrag's electrolyzer acquisition
PIEL acquisition

2008
Incubation with CEA & CNRS

People & footprint

260 employees

24% women
25 nationalities
50+% PhD / engineers



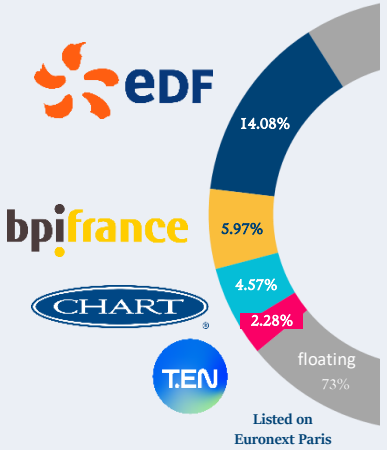
3 Plants


FLORENCE


BELFORT


GRENOBLE

Shareholders & partners

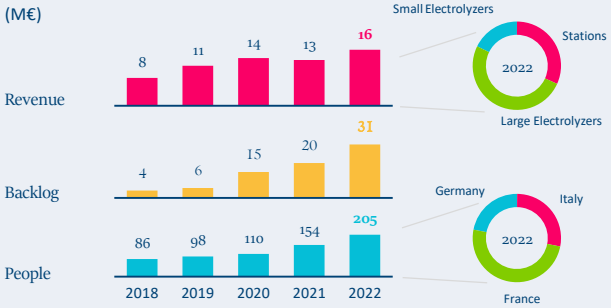


Our products


Electrolyzers


Refueling stations

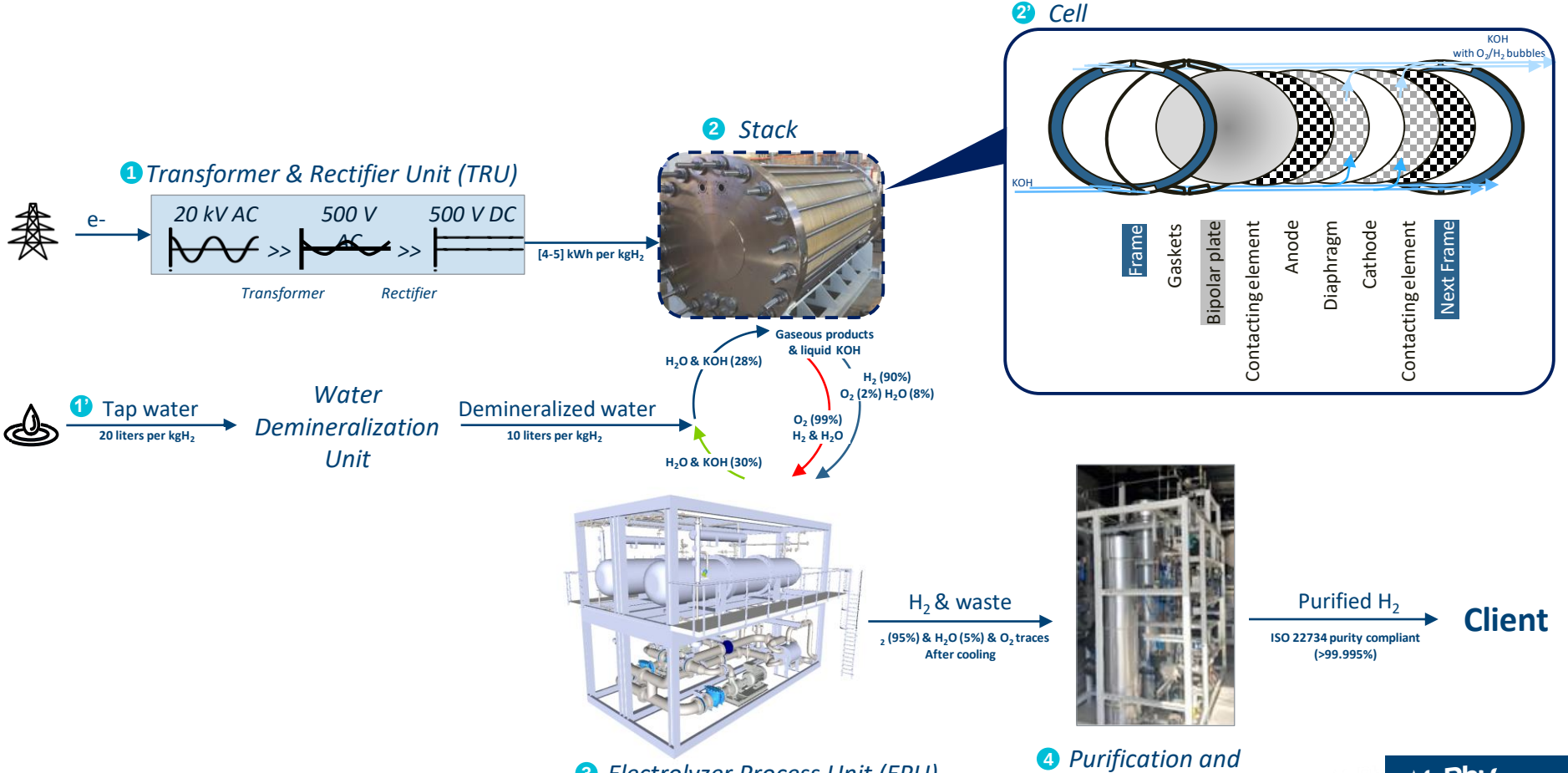
Key figures



Pan-European Pure Player

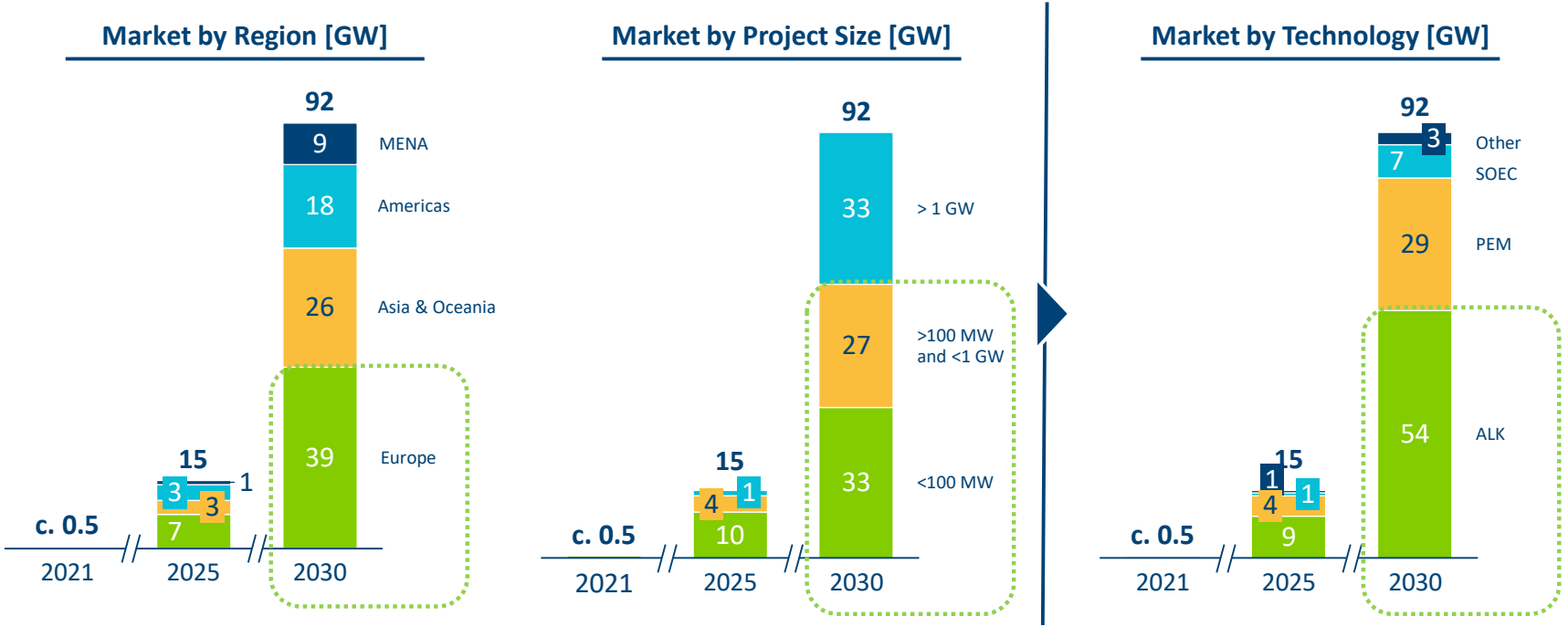
McPhy pressurized alkaline technology

Stack is at the heart of H_2 production, but needs a full industrial platform around



Main market driver: Green H_2 industrial applications…

Estimated Cumulated Installed Electrolysis Capacity [in GW]



Sources: IEA, Hydrogen Council, Desk research

… to abate 2% of worldwide CO_2 emissions

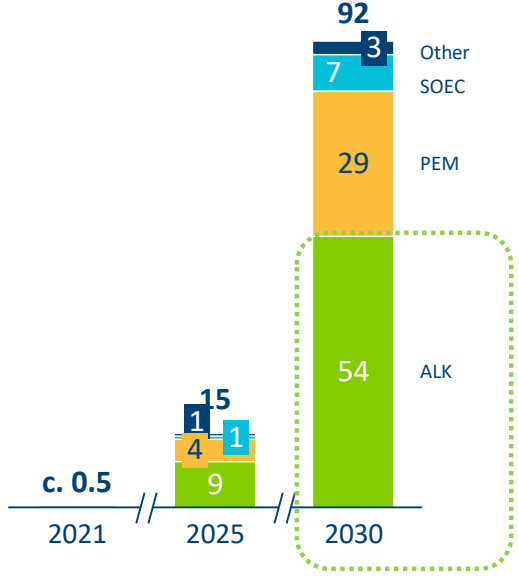
Estimated Cumulated Installed Electrolysis Capacity [in GW]

Grey H_2 production = 100 Mt/year
= ca. 800 Mt/year of CO_2
= ca. 2% of world GHG emissions

1 MW of electrolysis = 18 kg H_2/hour
= 140 t H_2/year (at 90% average load) / Grid connected
= 80 t H_2/year (at 50% average load) / Renewable Energy

50 GW = 4-7 Mt H_2/year
= 25-50 Mt CO_2 emission saved (70-90% saved)

Market by Technology [GW]

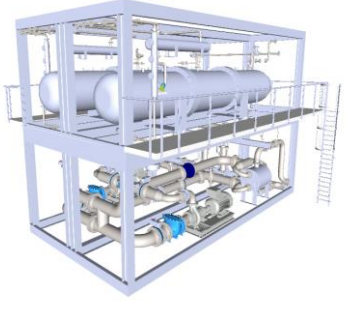


Sources: IEA, Hydrogen Council, Desk research

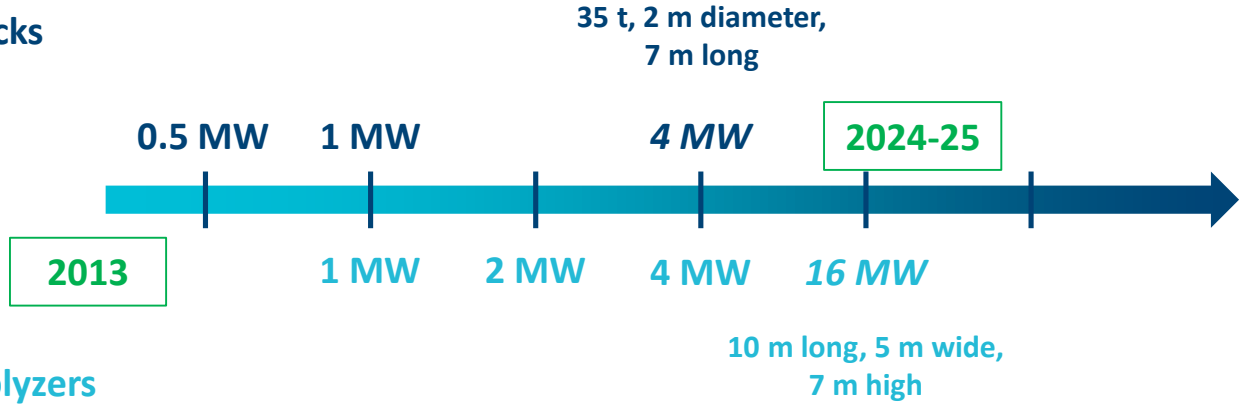
Answering large industrial needs

McPhy building blocks of 4 x 4 MW stacks with 16 MW EPUs

Stacks



Electrolyzers Processing Units (EPUs)



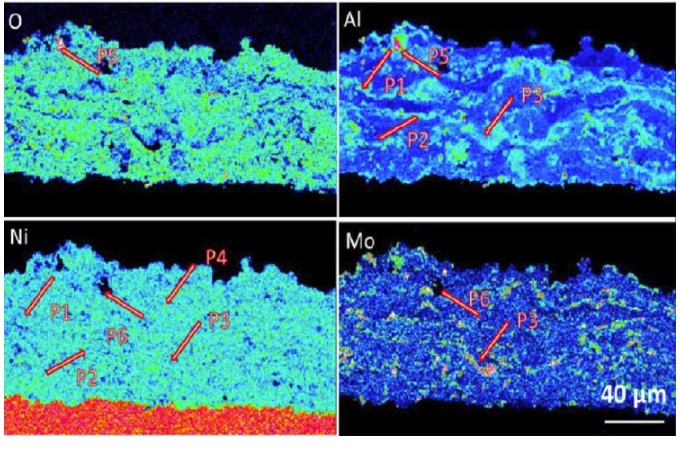
***Our next building block*: 4 x 4 MW stacks with a 16 MW EPU for large capacity industrial applications**

The different challenges for large-scale deployment

| A mix of chemical, physical & engineering challenges

Chemical challenges at the **cathode** level

- 3 industrial technologies: (1) NiS, (2) microporous Ni, (3) Pt-based electrodes
- Many emerging technologies
- The heart of electrolysis
- The most expensive part



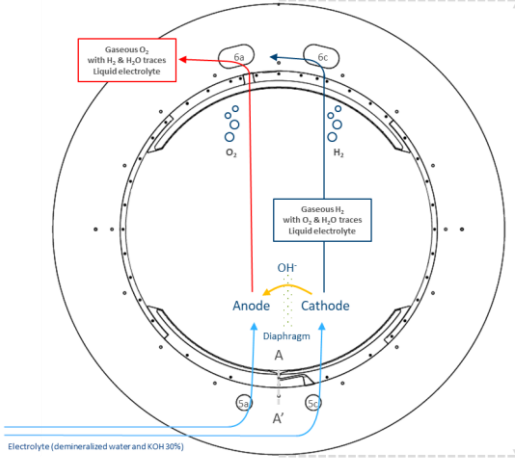
The different challenges for large-scale deployment

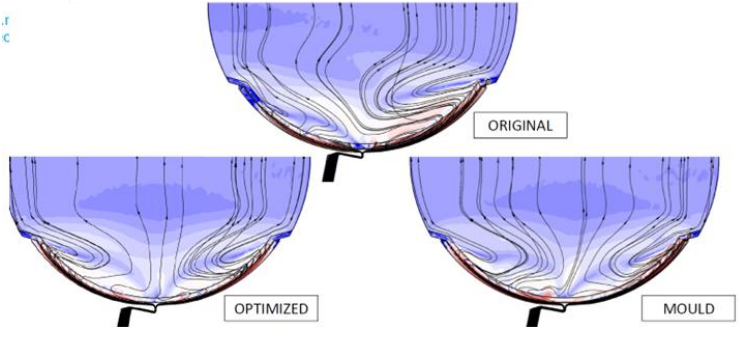
| A mix of chemical, physical & engineering challenges

Chemical challenges at the **cathode** level

Physical challenges at the **cell** level

- Flow of electrolyte as homogeneous as possible
- Ohmic losses brought by hydrogen bubbles





The different challenges for large-scale deployment

| A mix of chemical, physical & engineering challenges

Chemical challenges at the **cathode** level

Physical challenges at the **cell** level

Engineering challenges at the **stack** level

- Automatization of stack production
- Polymer vs. metal frames
- Electronic conduction at the electrodes level
- Safety management of internal pressure

The different challenges for large-scale deployment

| A mix of chemical, physical & engineering challenges

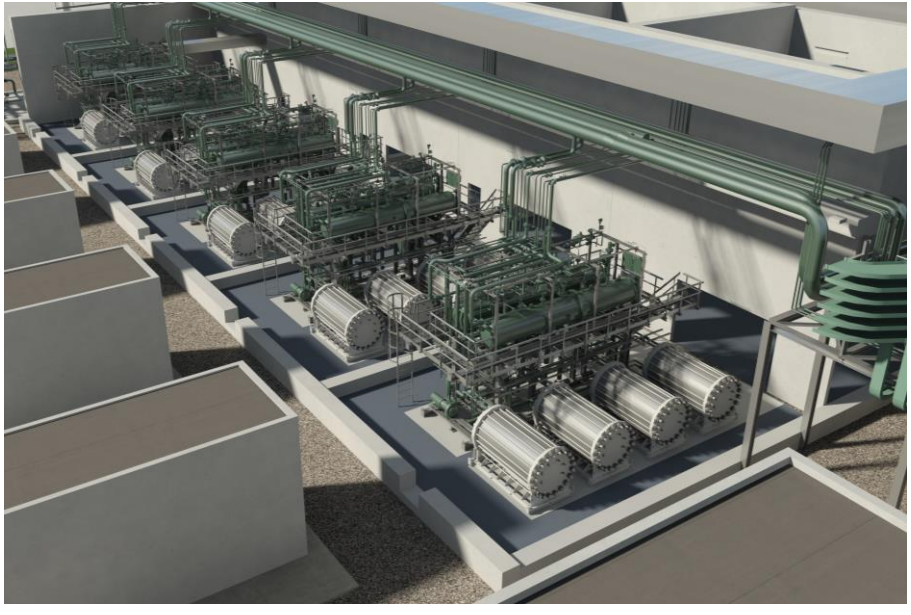
Chemical challenges at the **cathode** level

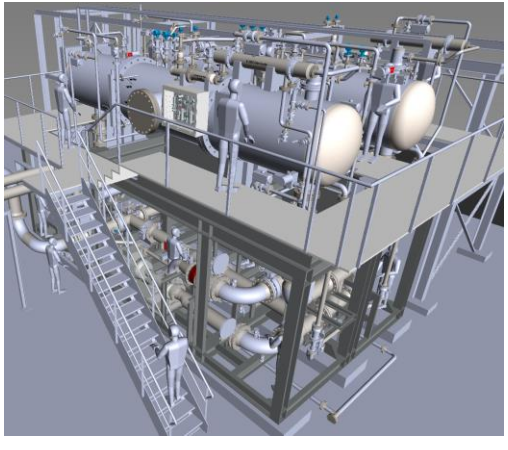
Physical challenges at the **cell** level

Engineering challenges at the **stack** level

Process safety challenges at the **EPU** level

- Explosive & self-igniting mixture 4+% O_2 in H_2





The different challenges for large-scale deployment

| A mix of chemical, physical & engineering challenges

Chemical challenges at the **cathode** level

Physical challenges at the **cell** level

Engineering challenges at the **stack** level

Process safety challenges at the **EPU** level

Digital challenges at the **multi-stack platform** level

- Optimization management of 100+ stacks to cope with constantly changing electrical load

McPhy

Driving
clean energy
forward

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