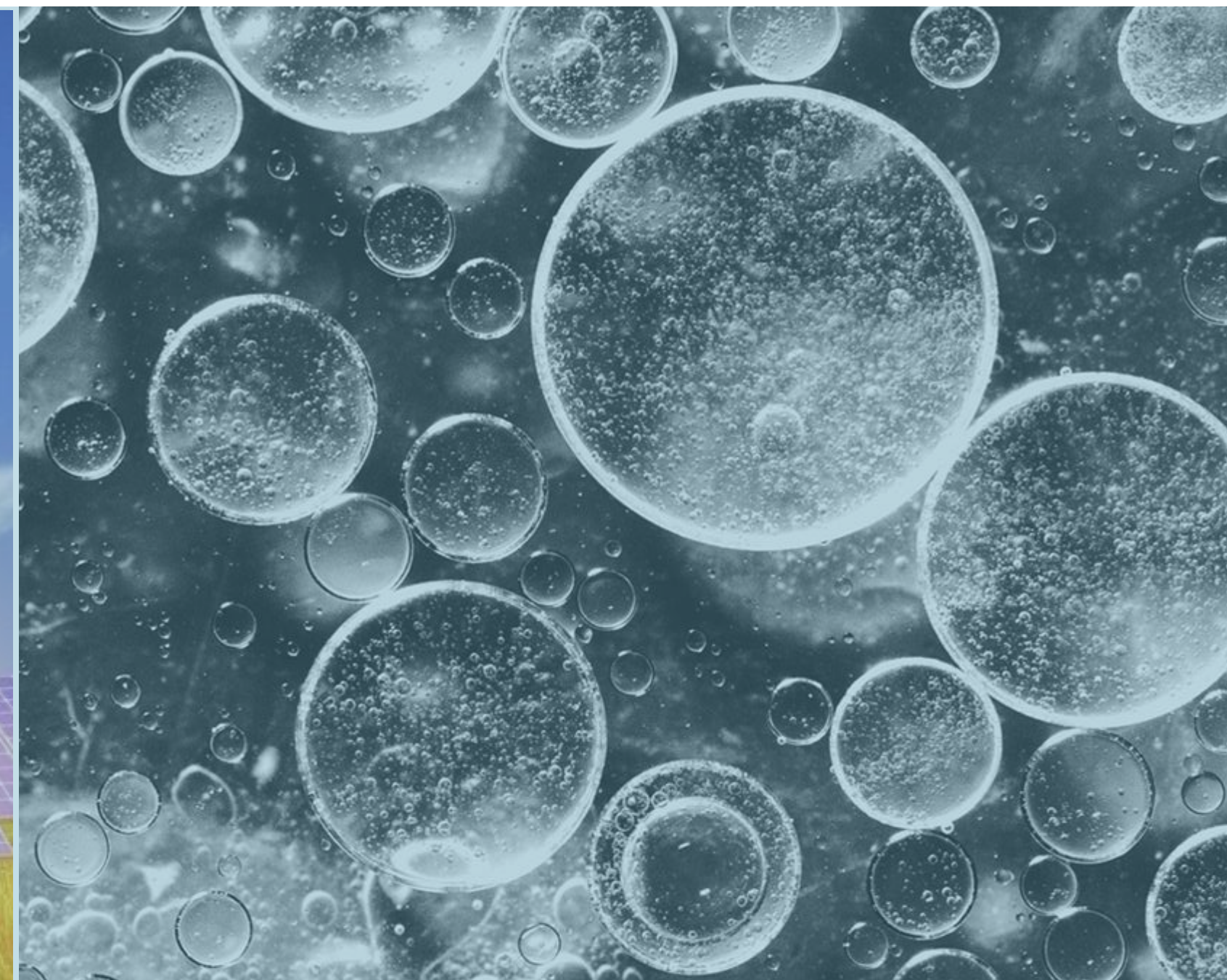




NEXT-GENERATION  
OF COMPETITIVE SUSTAINABLE  
HYDROGEN PRODUCTION





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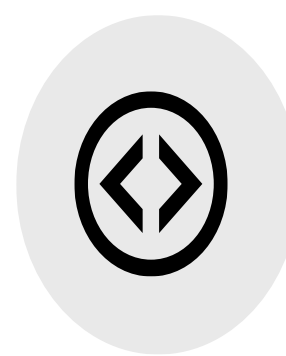
# Investment Summary

Sakowin is accelerating the energy transition by innovating and proposing a solution for the future:

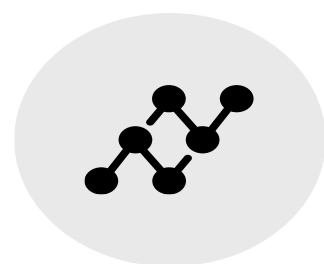
Disruptive Innovation  
for Sustainable  
Hydrogen Production at  
a Competitive Cost



NEEDS : - completing the recruitment of the team  
- completing the R&D



MILESTONES : - first 3 kW prototype in '22  
- 3 additional 6 kW prototypes in '23  
- 100 kW demonstrator in '24



FUNDING FROM BPI & EIC : €9.0M S1 '22  
€2.5M BPI : grant & redeemable financing  
€6.5M EIC : grant & equity



FUND RAISING : €4.0M EQUITY S1 '23  
valuation based on series A round

# The energy transition challenge

4

## 85% OF OUR ENERGY IS BASED ON FOSSIL FUELS COMBUSTION

Cheap, easy to transport, high energy density.

Fossil fuels come with a price:  
high CO<sub>2</sub> emission combustion.

2021 – 36.4 Billions of Tons of CO<sub>2</sub> emitted

## WE NEED URGENTLY TO DECARBONISE OUR ENERGY

To decarbonise our economies, progress on current technologies won't be enough. Investments in **disruptive technologies** are essential

2050 - Net-Zero CO<sub>2</sub> emission goal

## PARTLY BY HYDROGEN...

H<sub>2</sub> is a highly promising solution: versatile in terms of supply and use, it can help decarbonise a range of sectors and will be part of the 2050 energy mix.

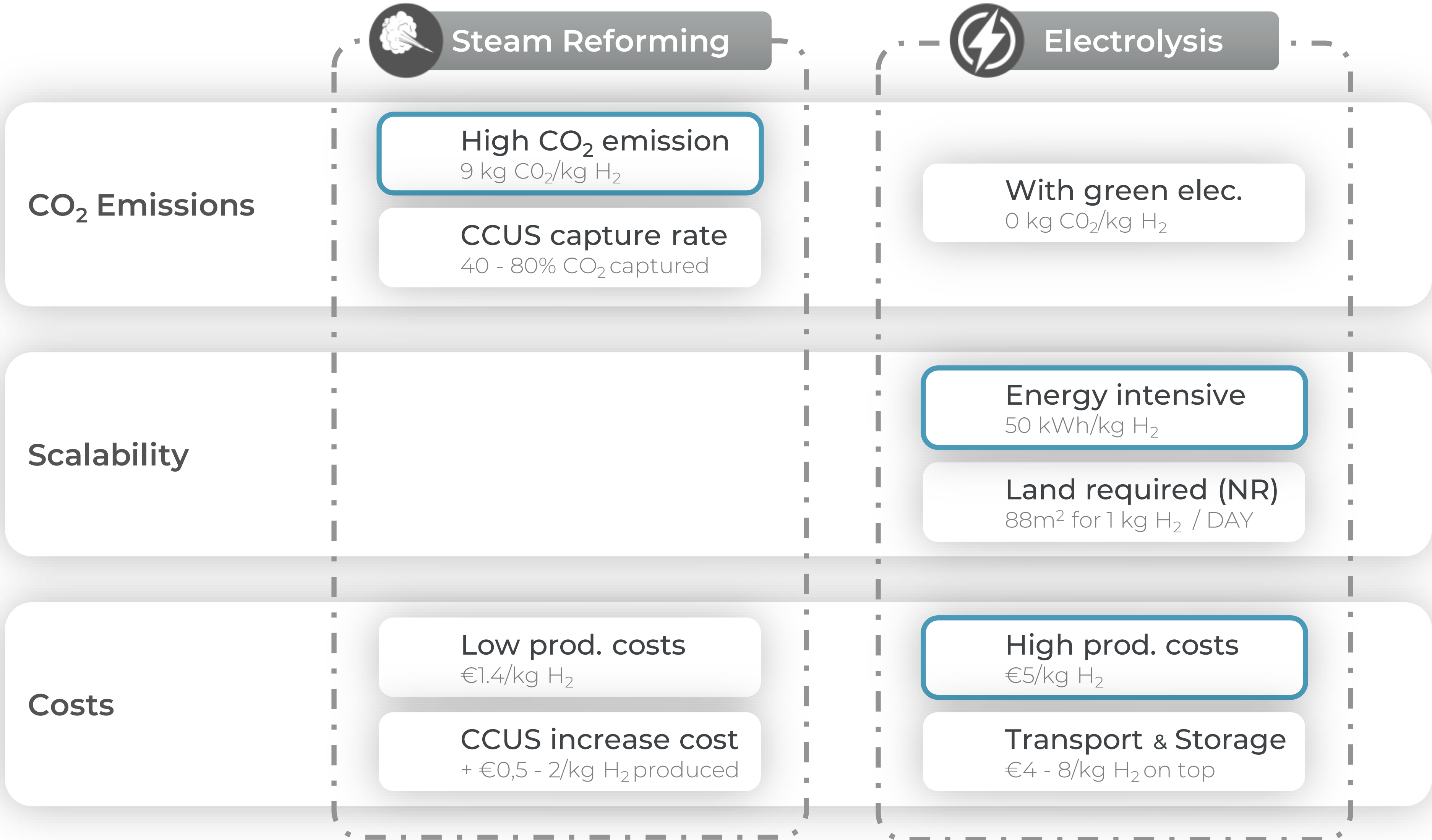
2050 - 10 Billions of Tons of H<sub>2</sub> needed

## ...BUT ONLY IF 3 CONDITIONS ARE MET

- Produced **without CO<sub>2</sub> emission**;
- At a very large **scale**;
- and produced at a **competitive price**.

Production Cost Objective :  
4.50€ / kg H<sub>2</sub> (transport and storage included)

# Current solutions do not meet the energy transition



# CO<sub>2</sub>-free Low-cost Sustainable Hydrogen

Developing the first  
compact, modular,  
on-site and on-demand  
low-cost hydrogen  
production module.

## CO<sub>2</sub> FREE - SUSTAINABLE HYDROGEN

Decomposing **methane without oxygen** using mature **microwave plasma** technology, we obtain **clean Hydrogen** and **Solid Carbon**, without CO<sub>2</sub> emission.

Used with bio-methane, we produce a CO<sub>2</sub> negative H<sub>2</sub> (-15t CO<sub>2</sub> / t H<sub>2</sub>)\*

## AT COMPETITIVE COST

Our Hydrogen-focused reactor allows to produce H<sub>2</sub> **at low energy levels**, which enables the production of **competitive H<sub>2</sub> without the need to valorise carbon**.

Our goal : 10 kWh / kg H<sub>2</sub>

## BREAKTHROUGH TECHNOLOGY FOR SCALABLE ON-SITE PRODUCTION

Our solution can be scaled thanks to a 1/ **largely available primary source of energy**, 2/ **lower energy usage**, 3/ **existing gas infrastructure**.

Milestone : the output of the 270 Sakowin equipment sold by 2030 is 20 kT H<sub>2</sub> \*\*



# Sakowin modular on-site production of Hydrogen

Sustainable, CO<sub>2</sub>-free, low-cost Hydrogen, for on-site and on-demand production by compact & modular equipment.

Can be installed on existing gas infrastructures, eliminating the need of H<sub>2</sub> transport and storage.

DISSOCIATION OF METHANE (CH<sub>4</sub>)  
BY LOW ENERGY SAKOWIN PROCESS



100 kW MODULE = 200 kg OF HYDROGEN/DAY

# A modular Scale-up approach from kW to multi-MW

Multiple 100 kW South Beach modules can be assembled in a single system to produce multiple tons of hydrogen per day.



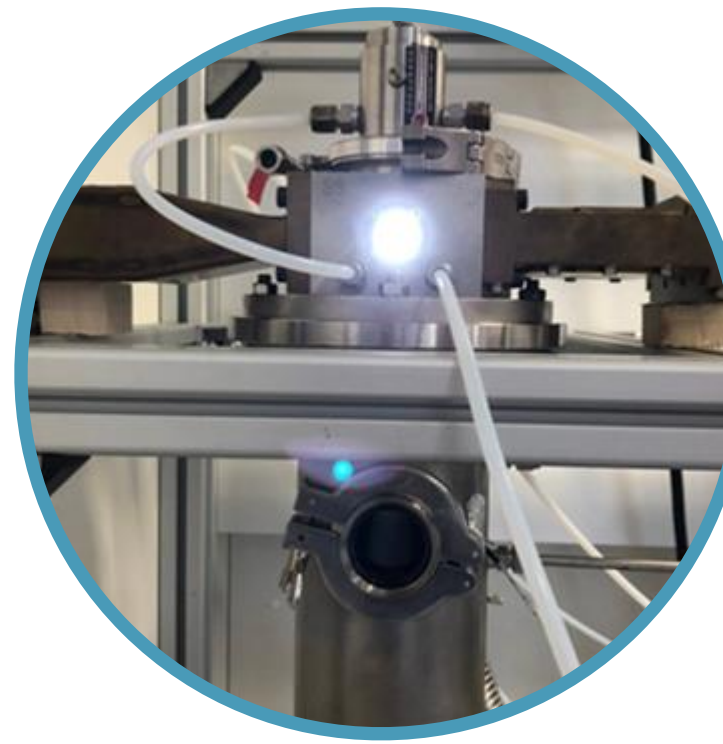


# CH<sub>4</sub> microwave plasma decomposition

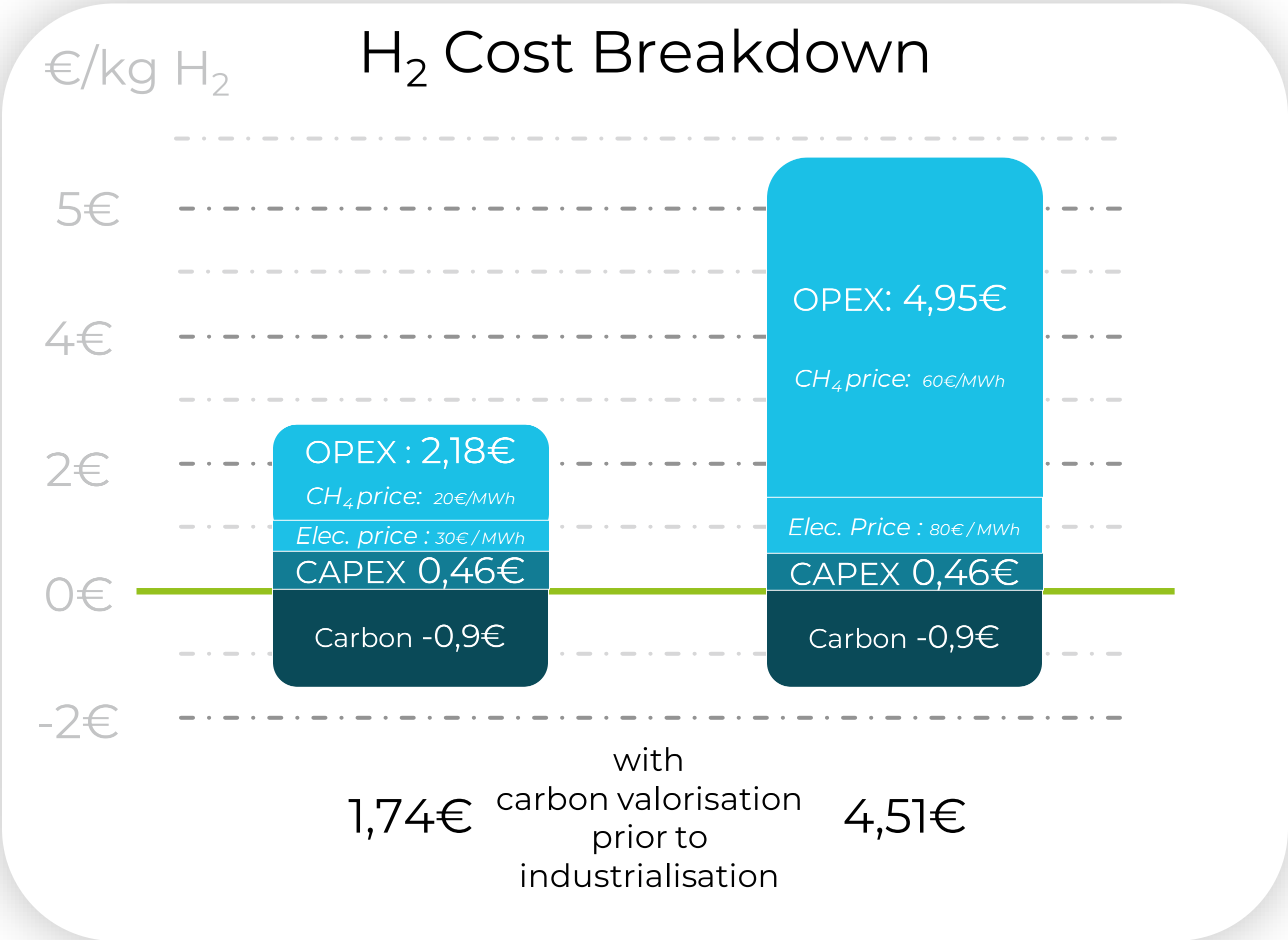
We use a **mature** and **industrial-grade technology** (microwave plasma) in a new domain : methane decomposition for Hydrogen production.

Potential for quick decrease of CAPEX with volumes.

## METHANE PLASMALYSIS



Highly efficient, 10 kWh/kg H<sub>2</sub>  
Patented, by 3 patents pending

















- Projections of hydrogen production costs vary from 1,81€ to 4,59€/kg H<sub>2</sub> for a 100 kW South Beach Module, prior to industrialisation.
- This indicates a strong potential for a lower production cost equivalent to grey hydrogen produced by Steam Methane Reforming.
- This estimation is based on reasonable energy market prices.
- Based on 10 kwh/kg H<sub>2</sub> of energy efficiency and valorisation of Solid Carbon.
- Without carbon valorisation, the price range is 2,64 € to 5,41 € /kg H<sub>2</sub>.



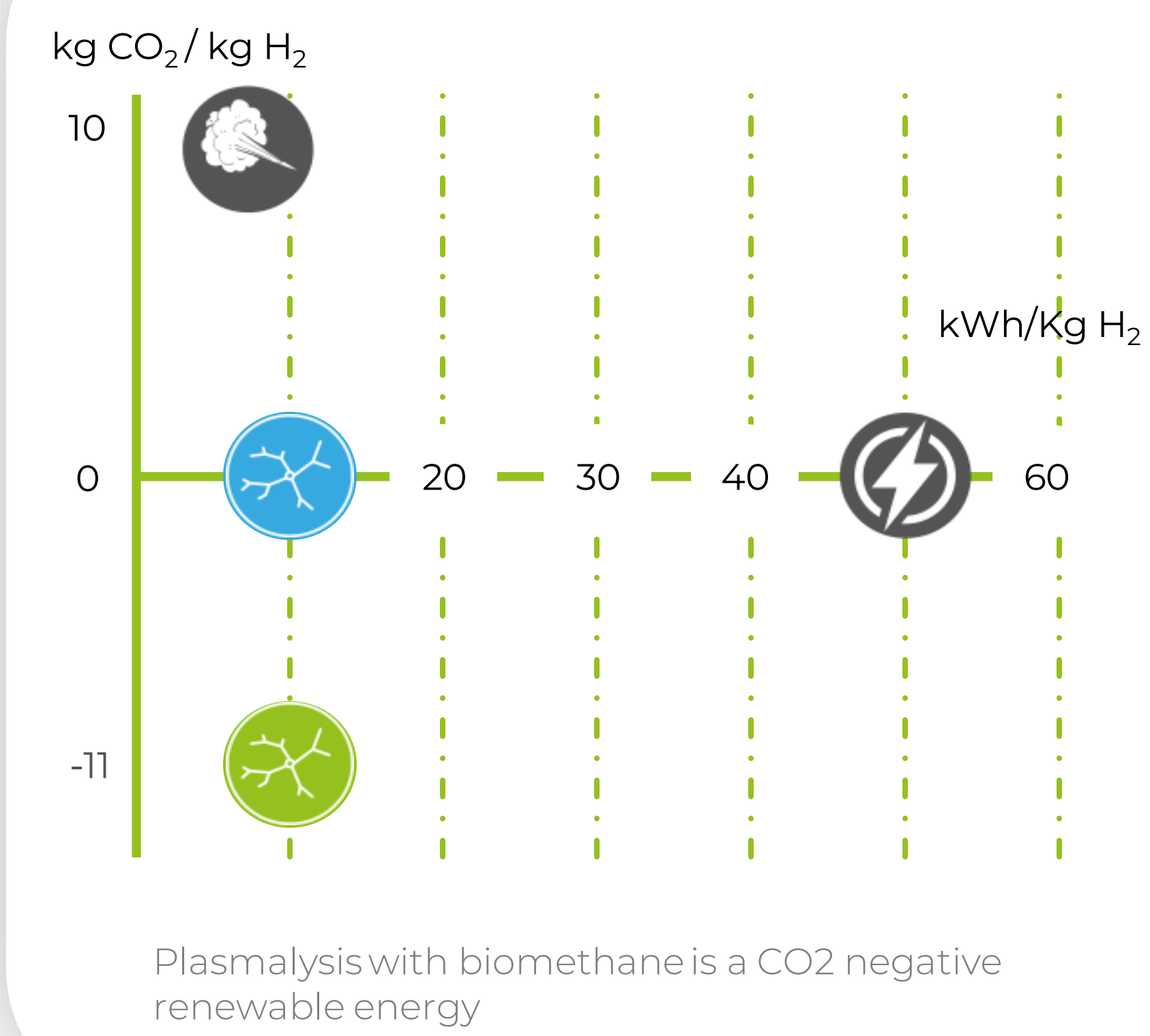
# Technologies Competitive Analysis

## OVERVIEW

				
CO <sub>2</sub> emission (t / t of H <sub>2</sub> produced)	9 – 11* tons (< 5 if CCS)	0 to 21* tons	0 to 4* tons	-11 to -7* tons
Energy needed				
Infra. invest. needed (distribution & storage)				
CAPEX needed on customer side				
Other valuable product				
Expected production price				
Expected “pump” price				

\* Depending on the energy mix used. With renewable energy 0 CO<sub>2</sub> emission

## Energy VS CO<sub>2</sub> emission



Steam Reforming



Electrolysis

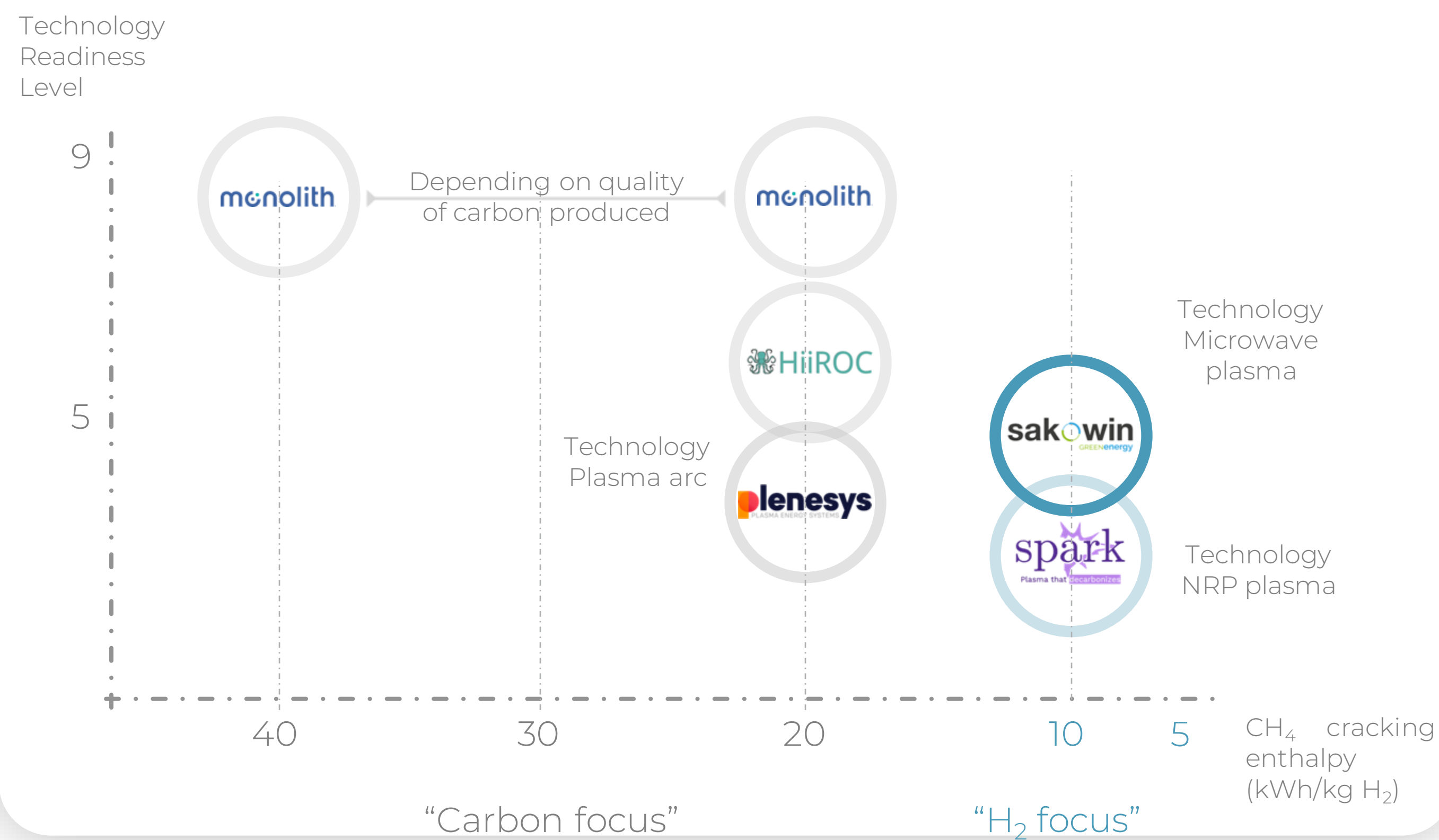


Sakowin Plasmalysis  
with Natural Gas



Sakowin Plasmalysis  
with Biomethane

## SUMMARY



## SUMMARY

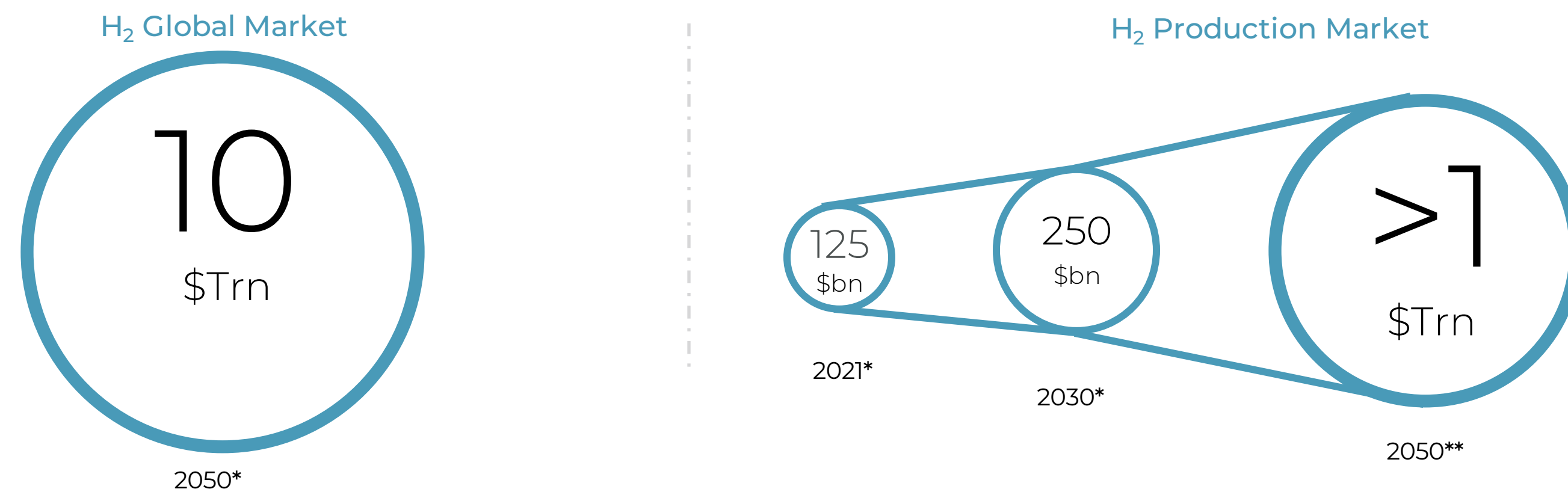
- An **atomised market** with emerging companies and startups (Monolith, biggest player - 146 FTE, \$139M).
- Competitors' business model are **dependent on Solid Carbon sales in a high value black carbon market** implying **small H<sub>2</sub> production quantities**.
- This strategy **can't generate the volumes required by the energy transition market, which are 1 000 times greater than the current carbon market**.
- At Sakowin, we **reverse this model by focusing on H<sub>2</sub> production and carbon as a byproduct. Which allows better energy efficiency**.



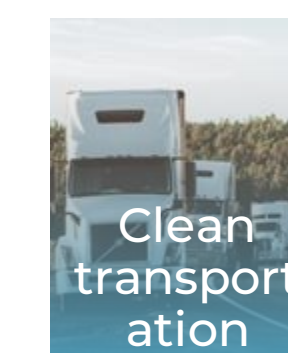
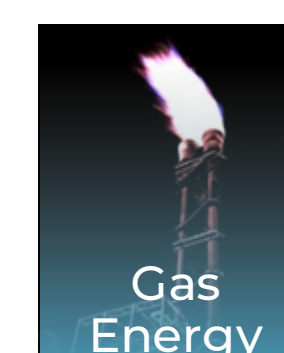
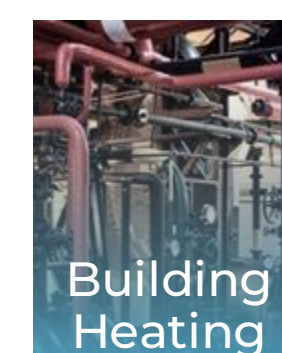
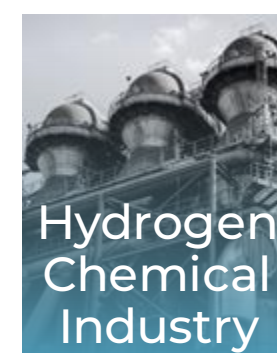
# A \$10 Trn hydrogen market by 2050...

“Hydrogen use extends to several parts of the energy sector and **grows sixfold from today's levels** to meet 10% of total final energy consumption by 2050”

Hydrogen “looks poised to become a once-in-a-generation opportunity” (Goldman Sachs)



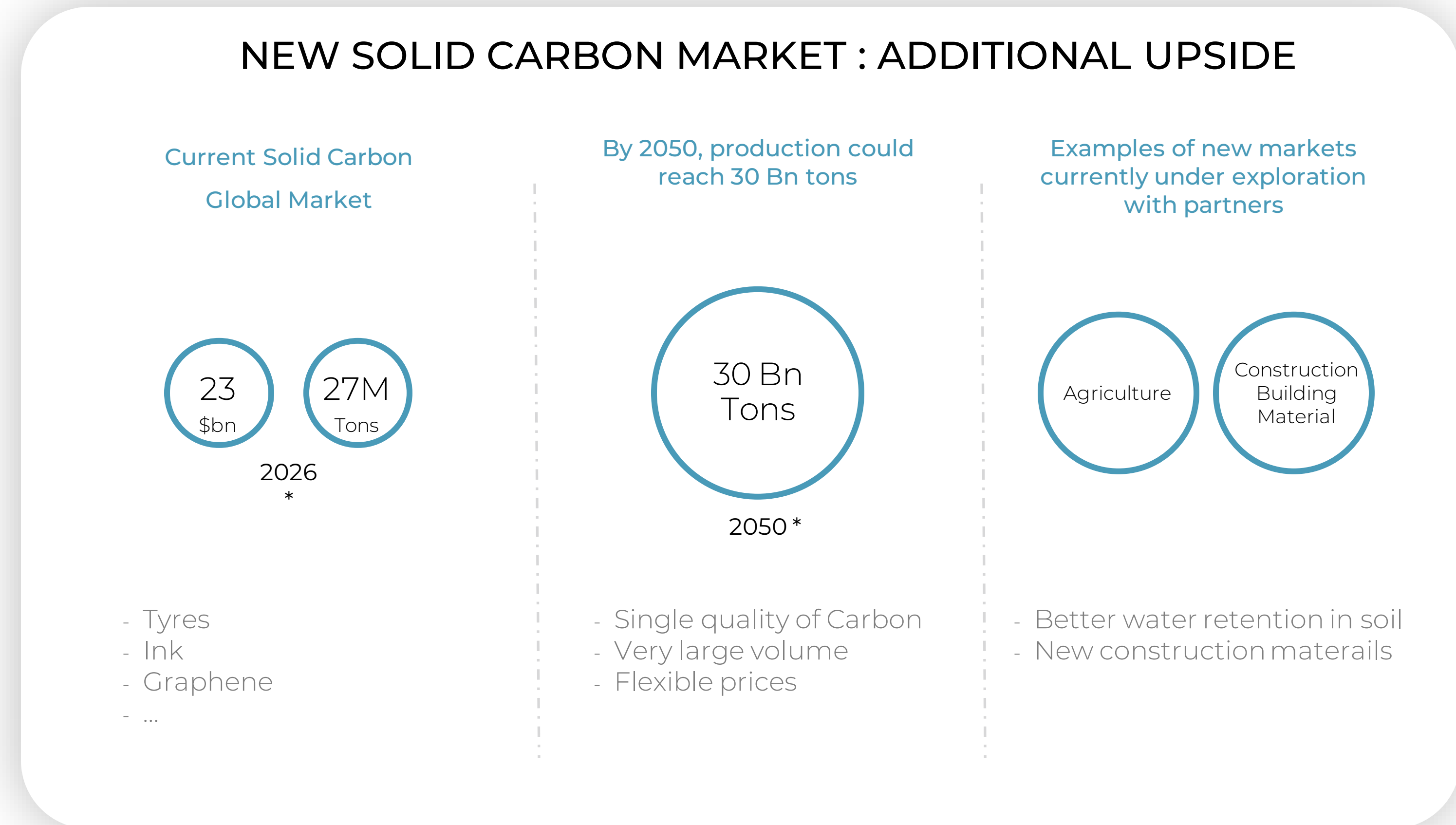
## MARKETS WITH NEEDS FOR DECARBONATION



...with an impact  
in developing  
the future solid  
carbon market...

Emergence of a new digital carbon market place driven by Sakowin for efficient carbon transactions between producers and buyers.

Decentralized production of carbon with short distance delivery.

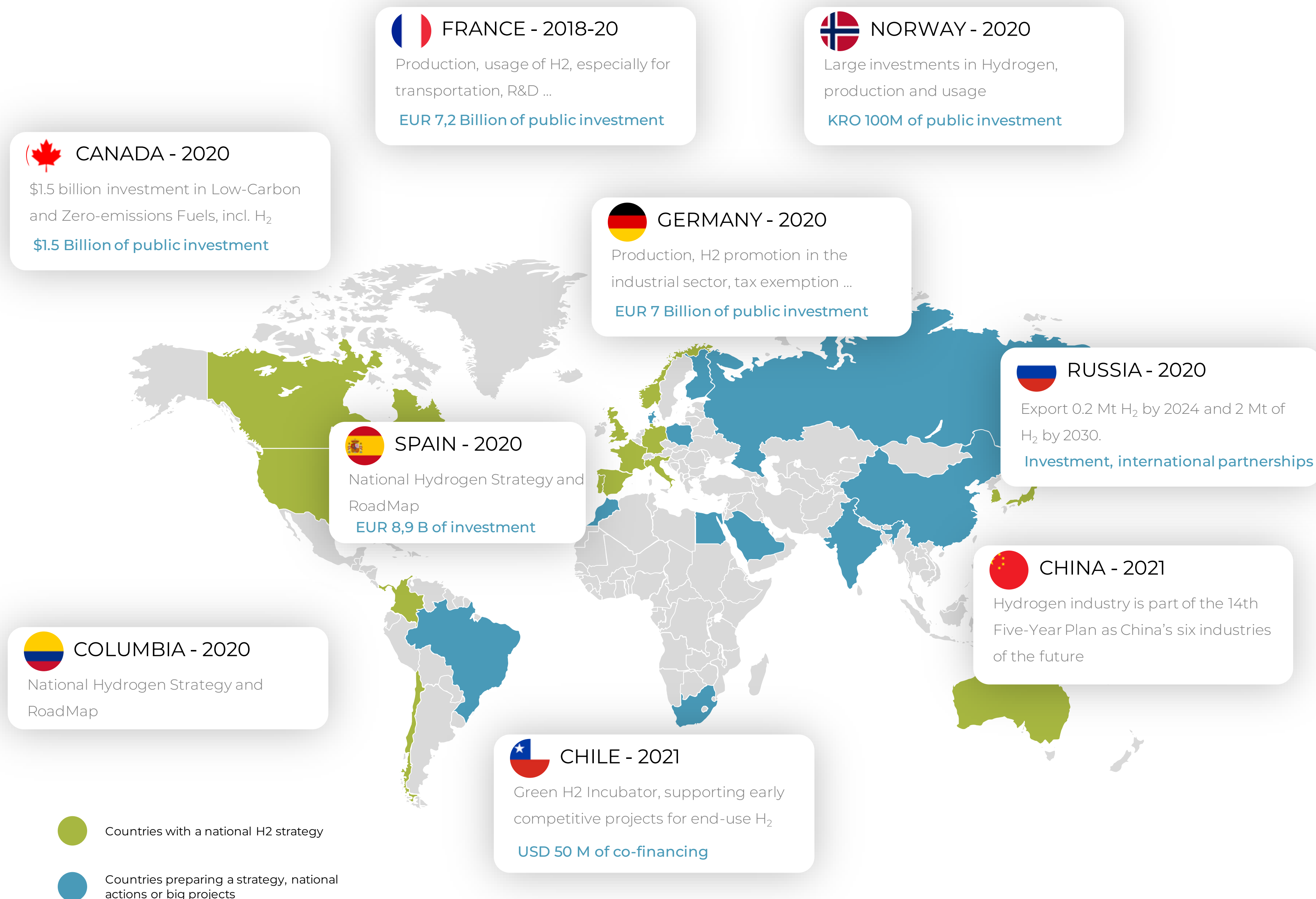


Total output of solid carbon from the 100 kw South Beach units sold by 2030 : 60 k Tons



# ...at a global scale.

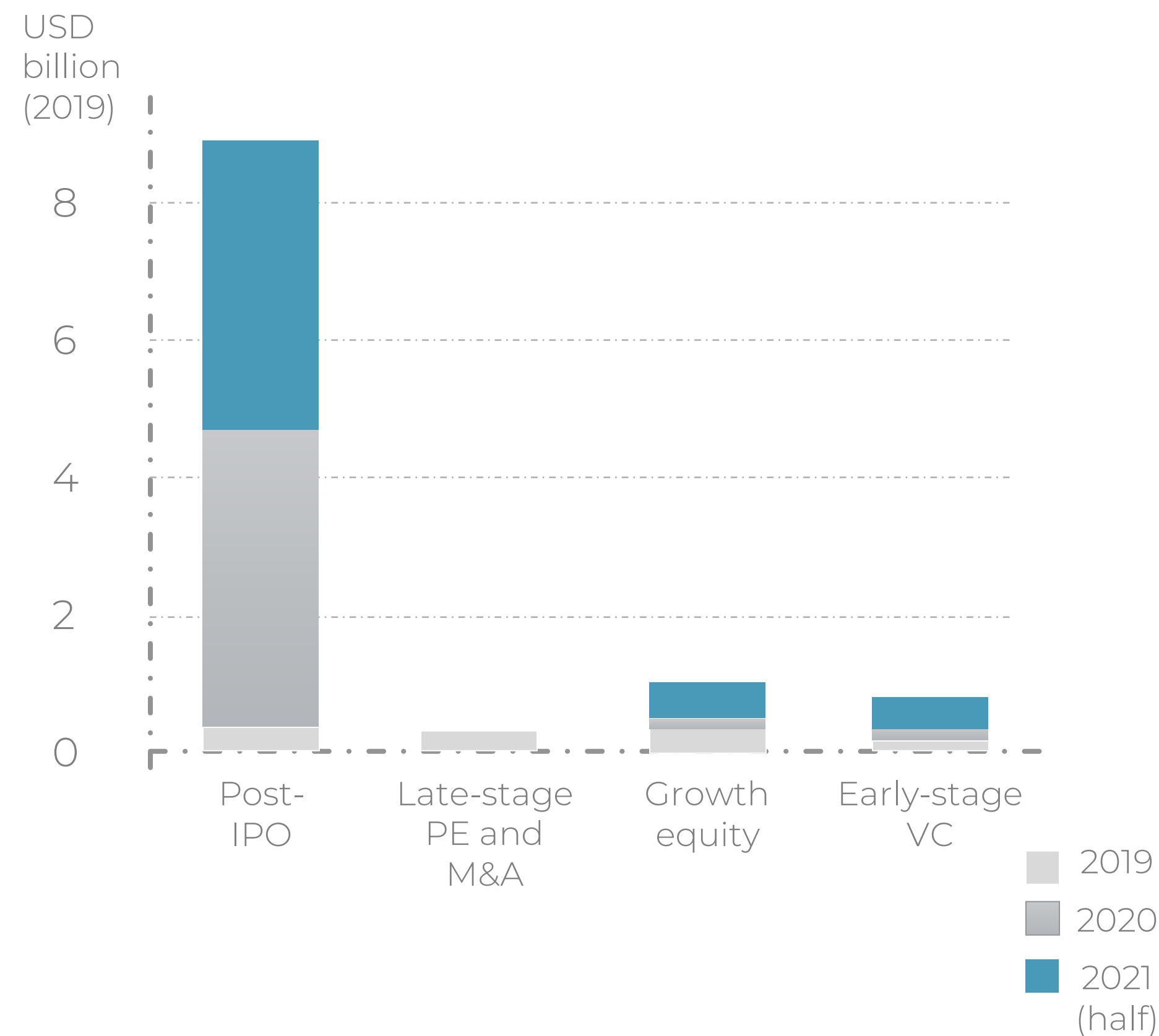
Time is ripe to tap into hydrogen's potential. "Today the crucial role of hydrogen is widely recognised, including by the European Green Deal" (von Der Leyen)



# Investments into H<sub>2</sub> are gathering momentum

“Hydrogen investments rising with unprecedented private fundraising, mostly for manufacturing and to meet project demand” (IEA)

HYDROGEN COMPANY FUNDRAISING BY STAGE OF FUNDING, January 2019 to mid-july 2021



HIGHLIGHTS of latest fund raising in methane pyrolysis

**BAYOTECH - 2021 - US**  
 Provider of solutions for on-site hydrogen production (Steam reforming)  
**PE Growth - \$157m**

**C||ZERO - 2021 - US**  
 Innovative thermocatalysis method to split methane and create hydrogen  
**SERIE A - \$11,5m**

**HIIROC - 2022 - UK**  
 Method to split methane and create hydrogen via a plasma  
**SERIE A - £10m**

**HAFFNER - 2022 - FR**  
 Recycling biomass into carbon-free energy (including Hydrogen)  
**IPO - €77m - valorisation €400m**



# Sakowin shows significant traction in industry and mobility

5 co-development programs signed with industrial groups and SME's in 2021

## 2021 : FIRST 5 VERTICAL MARKETS

**Our goal** : 20 partners in 2025, 38 in 2028 with co-development agreements to release complete solutions integrating Sakowin technological solution in 2025



CO<sub>2</sub>-FREE INDUSTRIAL  
PROCESS FOR MATERIALS



H<sub>2</sub> REFUELING STATION  
FOR AIRPORTS



CO<sub>2</sub>-FREE OIL & GAS  
EXTRACTION



H<sub>2</sub> REFUELING STATION  
FOR FARMS & BIOMETHANE



H<sub>2</sub> REFUELING STATION  
FOR TRUCKS



## Product readiness :

### Development phase

#### OEM PARTNER NETWORK SETUP

**Co-development agreements** with system integrators to **co-develop complete solutions** integrating Sakowin's technological brick to allow a **fast go-to-market**.

**Average** initial engagement per partner : **780 k€ ; 20 partners in 2025**

### Commercialisation phase (starts in 2025)

#### OEM BUSINESS MODEL (B2B2B)

We manufacture standard modules that we sell to **OEM partners**, organised **vertically and geographically** to progressively address **all market segments**.

**South Beach Module 100 kW module** (Estimated SP: 800 k€ - 56% margin)

#### ADDITIONAL REVENUE FROM CARBON

Our solution allow us to create recurring revenue based on (1) quantity of carbon produced and (2) the creation and animation of a Solid Carbon Marketplace.

**With a royalty equal to 0,10 €/kg of C, the additional revenue would reach 6 M€ in 2030 \***



# 3-stage market penetration

## 1. PRODUCT DEV. CO-DEV. AGREEMENTS

**Goal** break technological limitations and sell co-developments agreements

## 2. PRODUCT READINESS SYSTEM INTEGRATORS

**Goal** 100kW standard module ready to production, continuous improvement

## 3. STRONG BRAND ADDITIONAL BUSINESS MODEL

**Goal** Strong increase of number of module sold, additional BM around solid carbon

2022

2023

2024

2025

2028

2030

2033

2035

### Product Roadmap

POC 2 kW - TRL 5  
Achieved in 2021

Proto. 3 kW  
EMPA – Gas/Solid

Prototype 6 kW  
Continuous runtime: 8 hours

Demonstrator 100 kW  
200 kg of H<sub>2</sub> / day

Manufacturing Plant set up  
2000 m<sup>2</sup> - capacity: 400 units/ year

South Beach Module (Standard 100 kW)  
Selling Price: €800k M: 56%. (Installed base 2030 - 276 units)

South Beach Module scale-up program  
Capacity production: from 1 ton/day to 200 tons/day

Manuf. plant capacity increase  
Supporting growth by increasing capacities

### Partner Acquisition

5 Partners signed  
Signed in 2021

15 Partners  
by 2025

30 Partners  
by 2028

Vertical and geographical partner network expansion  
Midsize organisations focused on service to industry

### Business Model

Co-development agreements - Prototype selling  
Selling prototypes to generate revenue prior to product availability

Solid Carbon R&D and market development  
Partnerships with Saint Gobain - EMPA - ACMG - Universities, ...

OEM B2B2B Business Model  
Prioritised Targeted markets: CO<sub>2</sub>-free industrial process, mobility land sea and air, CO<sub>2</sub>-free electricity production from gas plant

Additional recurring revenue from Carbon + marketplace creation  
Market focus: agriculture, building materials

### Funding

2021 - €1M  
4 industrial investors

03/22 - €2.5M  
Bpi Deeptech

06/22 - €6.5M  
EIC Accelerator

10/23 - €2M  
Demo

10/24 - €2M  
Product

10/25 - €TBD  
Indus. & Launch

Exit strategies  
IPO, M&A, ...

First revenues on prototypes

First revenues on modules

Growth generated by goods sold + Solid Carbon revenues

# A committed and efficient organization

## STAFFING OVERVIEW

8

Full Time Employee

1

Co-development partner

6

Subcontractors

+112

Recruitments to  
come in the next  
6 years



GERARD GATT      CEO

With 35-year experience in growing companies, Mr. Gatt is one of the first 17 employees at Citrix Systems (NASDAQ). This is where he cut his teeth in growing and commercialising a tech product. In May 2020 started on the decomposition of methane through microwave plasma technology, a truly novel innovation at the time. Gerard built the team and successfully financed the development of a 1st prototype.

### R&D TEAM

6 PhD - 3 Engineers

- Laurent** - Chief Technical Officer (PhD in Physics)
- Dr. Marilena Radoiu** - Microwave expert (PhD in Chemistry)
- Alvaro Martin Ortega** - R&D Lab engineer (PhD in Physics & Microwave plasma)
- Damien Dussol** - R&D Lab engineer (PhD in Chemical)
- Ali Hleli** - R&D Lab engineer (PhD in plasma Physics)
- Marc Hervigo** - Product Engineer
- Ariel Mello** - Electronic Engineer
- Robert Michel** - Manufacturing Expert (PhD in Physics)
- Arnaud Boutibonnes** - Fluid dynamics Engineer

### COMMERCIAL & SUPPORT

2 Engineers - 2 Finance - 2 Business Developers

- Yves George** - Business Development
- Giovanni Trimboli** - Product Engineer
- Mathieu Schmitt** - Strategic partnerships & Business Development
- Philippe Lara** - Finances & Accounting
- Olivier Gillot** – Fund raising

# Awards & Memberships

Launched in 2020, our solution has already been recognised and awarded several times.

## AWARDS



- 06/2021 - H2 Hub Airport Winner
- 05/2021 - Forum National Eco-entreprises (Energy award)
- 10/2021 - Energy for Smart Mobility Forum (Energy award)
- 11/2021 - Pollutec (special jury prize)
- 11/2021 - BlueInvest readiness
- 2021 - Award World Impact Summit
- 12/2021 - Gazelle Accelerator - Aerospace Valley - EIT Manufacturing (finalist, 2<sup>nd</sup>)
- 03/2022 - Réseau Entreprendre member
- 03/2022 - BPI - DeepTech label
- 03/2022 - World Material Forum (finalist)

## MEMBER OF



## FINANCIAL SUPPORT





SUMMARY

Sakowin is currently undergoing a €4M fundraising round, which will be over 2 tranches :

- 1/ €2.0M equity (valuation uppraisal as of S1 '23)
- 2/ €2.0M quasi-equity (proposed form : bonds redeemable into shares in '24)

€4.0M commitment from EIC in June '22 will be invested along the two above tranches in the same terms end conditions

2025 €TBD ( to build the 1st factory and to launch international sales)

FOCUS

€2M – capital (+ €2M EIC)

- Extend the runway for R&D, recruit new co-development partners, expand the team.

€2M – bonds (+ €2M EIC)

- Optimisation of chemical reaction of methane decomposition to be reached <10 kWh (microwave) per kg/H<sub>2</sub>.
- Optimisation of the gas/solid separation process.

€TBD - 2025

- Build a 2 000 m<sup>2</sup> assembly factory to manufacture 100 kW standard modules with a capacity of 400 units per year.
- Develop international sales & marketing and expand team.

MILESTONES

**Q2 2022** deliver a 3 kW laboratory equipment to EMPA (existing client)

**Q1 2023** deliver three 6 kW prototype units, entirely integrated, including a pre-industrial gas/solid separation

**2024** 100 kW demonstrator module delivered to a 1<sup>st</sup> OEM partner

**2025** 100 kW South beach standard module product release  
2 000m<sup>2</sup> Assembly factory ready  
1<sup>st</sup> complete solutions from partners



2022



2023

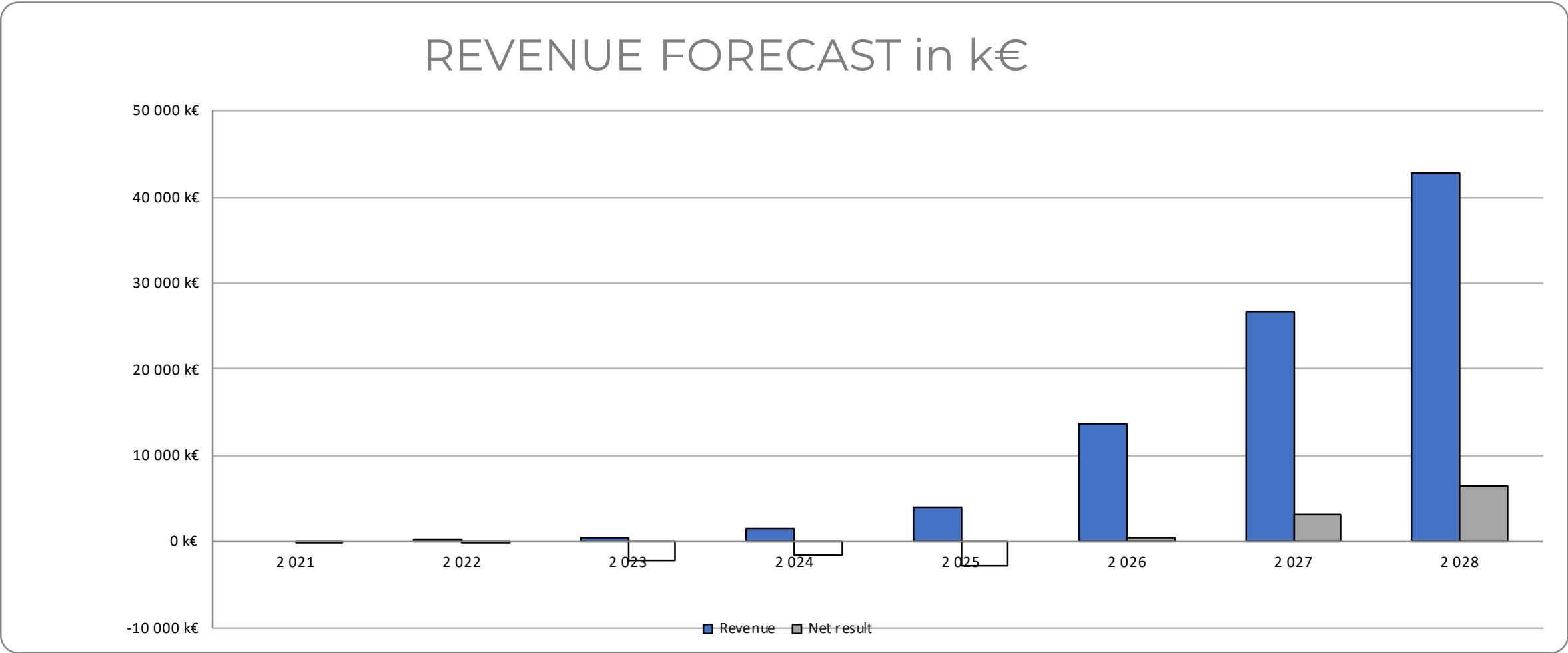


2024



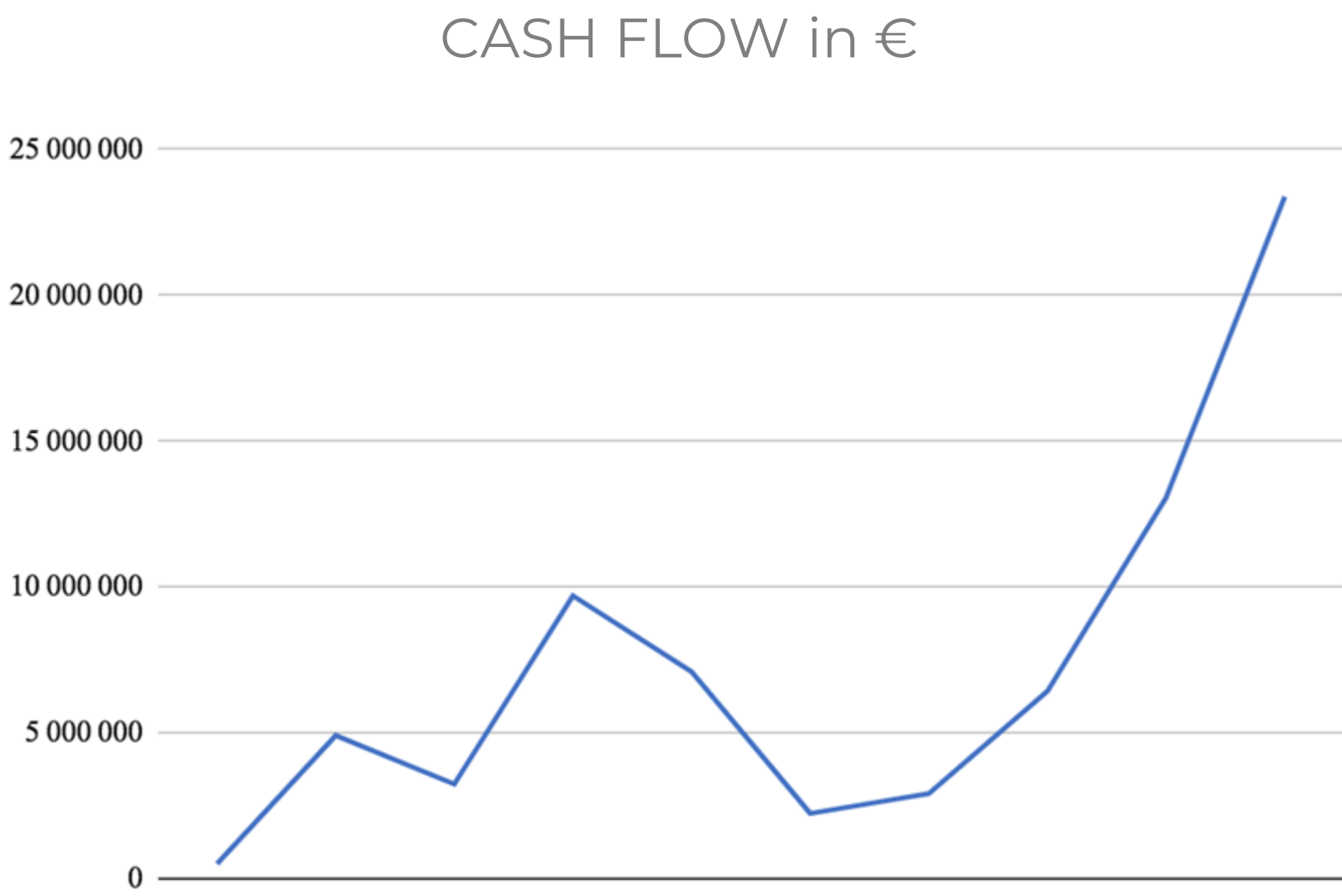
2025

# A profitable model based on sales of equipment







PROJECTIONS until 2028  
€90M CUMULATIVE REVENUE  
€10M CUMULATIVE NET PROFIT

Revenue	0 k€	91 k€	390 k€	1 430 k€	4 030 k€	13 777 k€	26 644 k€	42 719 k€	
Netresult	-40 k€	-48 k€	-2 270 k€	-1 659 k€	-2 757 k€	366 k€	3 219 k€	6 555 k€	
Headcount	3	9	18	25	40	60	93	125	TOTAL
# of co-development partners	0	0	3	6	6	6	6	6	33
# of Prototypes & Demonstrators	0	0	3	7	11	11	11	11	54
# of 100 kW South Beach Modules	0	1	0	0	0	12	30	54	97



## SALES FORECAST

				
2025	0	15	€4M	38
2028	54	30	€42M	120

- P6 \* : Les Notes Scientifiques de l'office du Sénat – Les modes de Production de l'Hydrogène - April 2021
- P11 \* : La Méthanisation en 10 Questions – ADEME - Octobre 2021.
- P11 \* : [https://bilans-ges.ademe.fr/documentation/UPLOAD\\_DOC\\_FR/index.htm?gaz.htm](https://bilans-ges.ademe.fr/documentation/UPLOAD_DOC_FR/index.htm?gaz.htm).
- P13 \* : Goldman Sachs Global – Green Hydrogen report: 2020 Page 29 of the report – “global addressable market for hydrogen could reach nearly €10trn by 2050E”
- P13 \*\* : Goldman Sachs Global – Carbonomics – the clean hydrogen revolution: 2022 Page 1 - 4 of the report – “with TAM for hydrogen generation alone having the potential to double to c. US\$250 bn bt 2030 and reach >US\$1 trn by 2050”
- P14 \* : Allied Market research (2020) cf. report overview “The global carbon black market was valued at \$17.5 billion in 2018, and is projected to reach \$23.0 billion by 2026, growing at a CAGR of 3.5% from 2019 to 2026”
- P16 \* : Source Global Hydrogen Review 2021



- P 6 \*\*:  $270 \times 240$  (kg H<sub>2</sub> produced per day)  $\times$  300 (days of production per year) = 19 444 000 kg H<sub>2</sub>  $\approx$  20 kT H<sub>2</sub> per year
- P 10 : Capex : 800 000 € (100 kW module price) / (240 (kg H<sub>2</sub> per day)  $\times$  365  $\times$  20 (amortization duration in years)) = 0,46€ / kg H<sub>2</sub>
- P 10 : Opex (CH<sub>4</sub>, electricity, magnetron and maintenance) = 157 et 357 k€ per year / 72 T of H<sub>2</sub> per year = 2,18 to 4,95 € / kg H<sub>2</sub>
  - CH<sub>4</sub> : 960 kg (feedstock per day)  $\times$  300 days (of production per year) = 288 T CH<sub>4</sub> per year  
Industry market price 20 to 60 € / MWh or de 278 à 833 € / T = 80 to 240 k€ per year
  - Electricity : 100 kW running 8 000 hours/year or 800 MWh per year = 24 à 64 k€ per year  
Industry market price per MWh : 30 à 80€
  - Magnetron : 21 k€/year
  - Maintenance : 32 k€/year (4% of CAPEX)
- P 11 : CO<sub>2</sub> avoided by plasmalysis of biomethane = 0,2 kg CO<sub>2</sub>/kWh PCI CH<sub>4</sub>  $\times$  13,9 = 2,779 kg CO<sub>2</sub> / kg CH<sub>4</sub>  $\times$  4 = 11,118 kg CO<sub>2</sub> / kg H<sub>2</sub>  
*PCI (Pouvoir Calorifique Inférieur) = LCV (Lower Calorific Value)*
- P 14 : 20 kT H<sub>2</sub>  $\times$  3 (kg C/kg H<sub>2</sub>) = 60 k Tons
- P 18 \* : 20 kT H<sub>2</sub>  $\times$  3 (kg C/kg H<sub>2</sub>)  $\times$  0,1 (royalty in € per kg C) = 6 million €