Effective gas cracking tech to **decarbonize** industry

BUILDING THE LEADING EUROPEAN PLAYER IN HEAVY INDUSTRY DECARBONIZATION

World Unique Technology:

Eliminates hard-to-abate industrial emissions with clean hydrogen and solid carbon material.

- Eliminates emissions in **two industries with a single technology**
- **Maximizes carbon value** via highly efficient pulsed plasma
- Offers a **competitive alternative to fossil fuel combustion**

Unmatched Barriers To Entry:

Proprietary patents, deep expertise, and strategic partnerships secure a unique competitive edge.

- Turning gas into **clean energy and advanced carbon materials**
- **5x less electricity and 3.5x lower cost** than electrolysis
- **Up to 5$/kg H_2 savings** with scalable, on-site production

Proven Traction Driving Green Transformation (40+ LOI)

- 1st industrial prototype successfully deployed (Evergaz site)
- 1 Demo Plant contract signed (3-5m€)

outokumpu · evergaz créateur d'énergies circulaires · VERKOR · HUTCHINSON® Subsidiary of TotalEnergies · Groupe CB · Constellium

Metrics Driving Our Impact:

-85% CO_2
emission

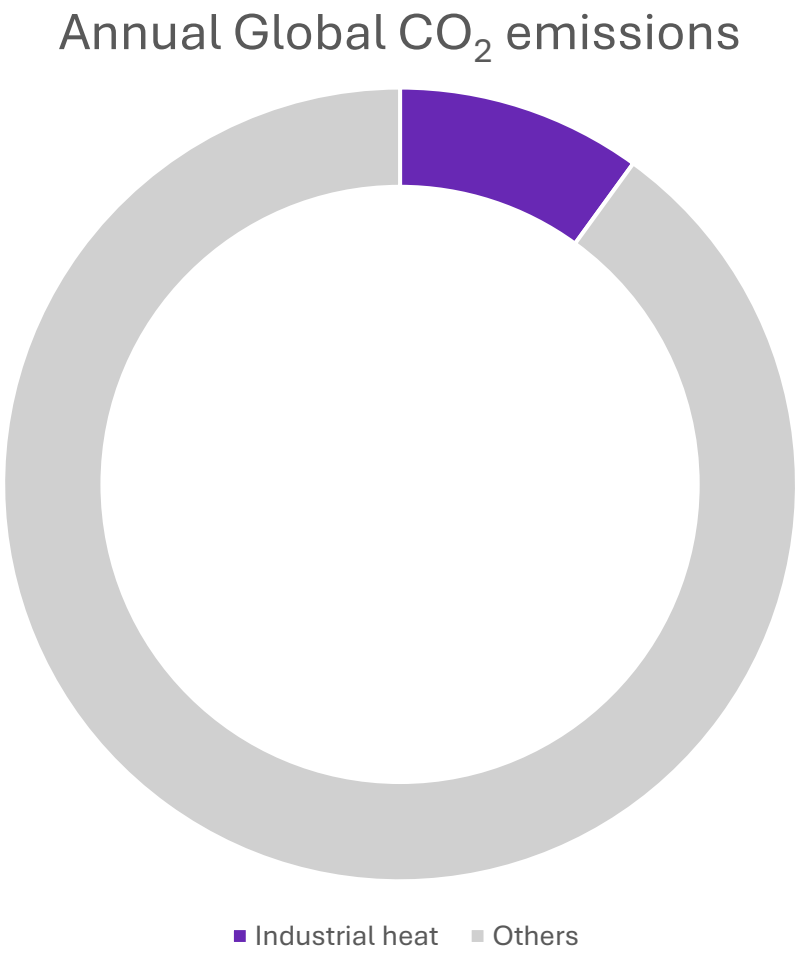
15 people
Team

€50bn
Addressable Market Size in 2025 (€200 bn+ in 2040)

1
Industrial Prototype installed

The **Unsolved Challenge** of Heavy Industries Emissions

Hard-to-abate industries: One of the largest Global CO_2 emitters!



40GT of CO_2
are emitted worldwide every year[1]

of which Hard-to-abate industry represents

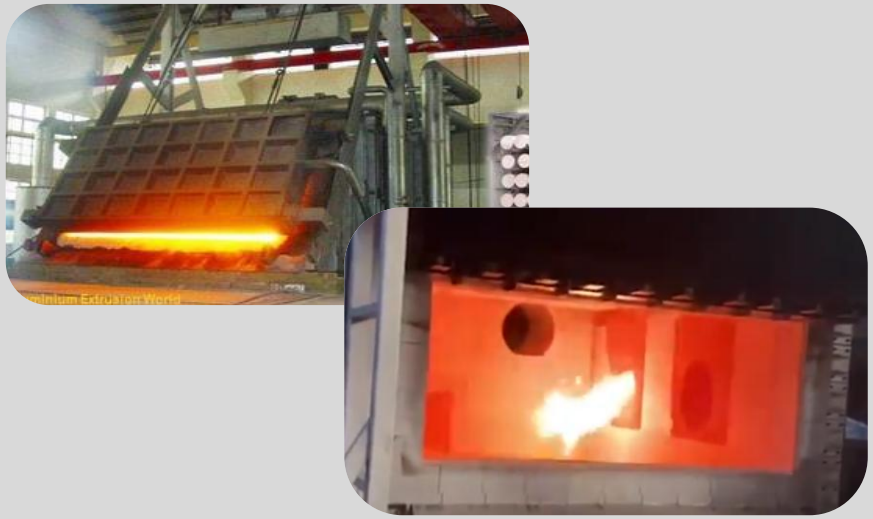
› **10%** due to **high-temperature industrial heat**
(metallurgy, glass, cement…)[2]

1. *Our World in Data – CO_2 emissions from fossil fuels and land-use change, World (link).*
2. *Center on Global Energy Policy – Low-Carbon Heat Solutions for Heavy Industry (link).*
3. *Our World in Data – Cars, planes, trains: where do CO_2 emissions from transport come from? (link).*

The Heat We Can't Decarbonize... Yet

Today

Industrial heat for fossil fuel combustion accounts for **10% of global CO_2 emissions**



Why: These processes require extremely high temperatures (**<1,000°C**)

Challenge

We must develop technologies that **do not emit CO_2** but...

Direct electrification is not a viable answer

70% of industrial heat is not directly electrifiable[1]

Green Hydrogen remains too expensive

4x more costly than fossil gas combustion due to production and transport costs[2]

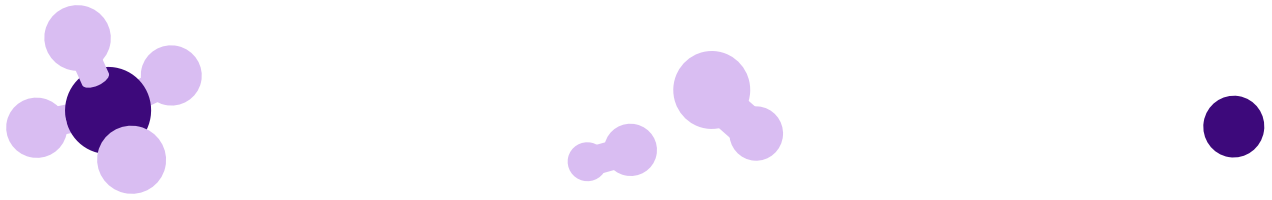
ArcelorMittal

'Green hydrogen is too expensive to use in our EU steel mills, even though we've secured billions in subsidies'
CEO of ArcelorMittal Europe[3]

1. ALLICE Alliance - Electrification potential of industrial thermal processes (link).
2. Hyp: energy cost ratio of 2 (e.g. 70€/MWh$_{elec}$ – 35€/MWh$_{gas}$) → Even more expensive if bigger
3. Hydrogen Insight Feb. 2024 (link).

Our Revolutionizing "Lightning in a Box" Technology

Generating Hydrogen and Valuable Solid Carbon with Zero Emissions



$$CH_4 \rightarrow 2\,H_2 + \text{solid carbon}$$

Our patented plasma technology **transforms methane into two valuable products**—clean hydrogen and solid carbon—

- **Zero CO_2** emissions
- **Cost Parity** products
- **Unmatched** technical edge

4 tons of methane processed can generate up to **1 ton of hydrogen** and **3 tons of solid carbon**.

Today’s situation: the Industries in need for Change

Fossil fuel-based Industries

Natural gas

Hard-to-abate industry

Combustion of conventional fuels

CO2

Fossil Fuel Combustion:

- Industrial heat / Industrial thermal processes

Specific products depending on the industry

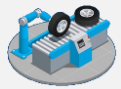
Metallurgy, cement, glass etc…

Solid Carbon Production

Fossil Fuels

- Gas
- Oil

Carbon off-takers



Heavy oil-based solid carbon

CO2

Solid Carbon Production:

- By burning oil

Carbon-based products:

Tires, Batteries, Construction materials…

Breaking the Carbon cycle for Clean Industrial Production

Electricity

On-site Hydrogen

Natural gas
Or Biomethane

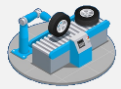
spark

Clean Solid Carbon

Hard-to-abate industry

Replaces fossil fuels combustion with clean hydrogen as energy

Carbon off-takers



Clean solid carbon as a substitute to traditional one

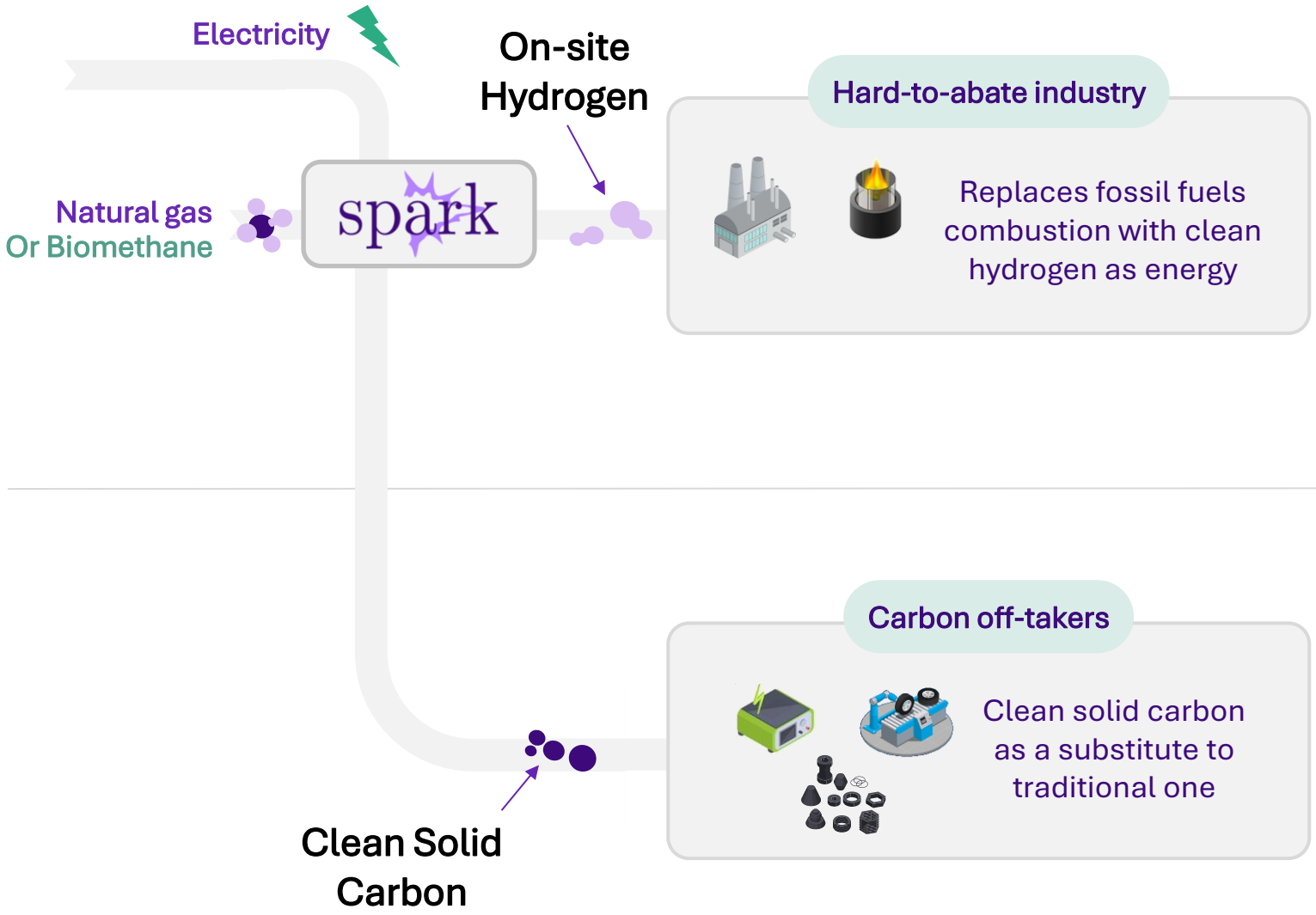
Eliminates CO_2 Emissions
due to fossil fuel combustion

Specific products depending on the industry Metallurgy, cement, glass etc...

Eliminates CO_2 Emissions
due to traditional solid carbon produced from oil

Carbon-based products:
Tires, Batteries, Construction materials...

Spark's Measurable Impact on hard-to-abate industries



Our value proposition

Environmental
-85% CO_2 emissions

Economical
Cost parity products

Technical
Cutting-edge advantages

Double Decarbonation Powered by Spark's Technology

Clean Hydrogen

spark

On-site production
No H_2 logistics

Power existing/ upgraded burner

Distribute heat to furnace

Clean energy
- Zero CO_2 for H_2 production
- Eliminates hard-to-abate emissions

Cost parity
- 1-3$/kg$H_2$ (20-90$/MWh)
- At par with natural gas

Asset-Light
- Clean-Energy-as-a-Service
- Reuse existing infrastructures

Clean Solid Carbon

Logistics and resale managed by Spark

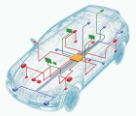
Specialty Carbons and Technical Rubbers

Industrial Seals

Ink and coating

Thermal and Electrical Conductive Carbons

Batteries



Embedded electronics

Semiconductors

Clean carbon materials
- Zero CO_2 for carbon production vs. 3tCO_2/ton conventional carbon

Cost parity
- Secured supply
- At par with conventional products

High-value products
- High performance carbon materials
- Easier integration into processes

The Management Team Driving Spark Forward

Erwan Pannier

Co-founder & CTO

Education

CentraleSupélec — Master of Engineering

Experience

Université Paris-Saclay — Ph.D Plasma Physics (PhD)

Stanford University — Invited Researcher

Achievements

- Developed **Pulsed Plasma tech.** for energy applications for **+10y**.
- Quoted in **+250 scientific papers**
- Won French **Innovation iLab Prize**

Patrick Peters

Co-founder & CEO

Education

IÉSEG School of Management — Master in Management

Experience

SUEZ — CEO @SUEZ BioEnergies

Adionics — CEO @Adionics

Achievements

- Managed **+150 people** teams
- Deployed **+400m€** green energy production contract
- Repositioned Adionics (Raised **+12m€** and deployed **3 pilots**)

Alban Reboul Salze

Chief Operating Officer

Education

École Polytechnique — Master of Engineering

Colorado School of Mines — M. Petroleum Economics

Experience

TotalEnergies — Project Director @Total

Haffner Energy (Making Hydrogen Super Green) — COO @Haffner Energy

Achievements

- Managed Large-Scale Industrial projects (**+225m$** & **+600 people**)
- Worldwide Oil & Gas experience

Marco Venturini

Head of Sales

Education

Dauphine Université Paris — Master in Energy Finance

INSEAD — Master Financial Strategy

Experience

VEOLIA — Director @Veolia Water

waga energy — VP Sales & Marketing

Achievements

- Deployed Clean Technologies internationally (**+10 Countries**)
- Led IPO of Waga Energy (**+110m€**)

From Prototype to Production: Speeding Up Industrialization

Demonstrator installed on an agro-industrial site

Delivered 1 year after first funding round – *far ahead of industry standards*

Production Capacity: 5kgH_2/day – 15kgC/day | **Operation time:** +300 hours

Partnership with evergaz

créateur d'énergies circulaires

- Financial contribution : **€250k**
- Current Pipeline Opportunity: **€3m**
- Provision of the Industrial Site
- Connection work coverage

✓ Integrated balance-of-plant (e.g. carbon separation, etc.)

✓ Automated process

✓ REX operations & team training for future operations

✓ Production capacity

✓ Production time

Business case - Constellium x Hutchinson

Electricity

On-site Hydrogen

spark

Natural gas Or Biomethane

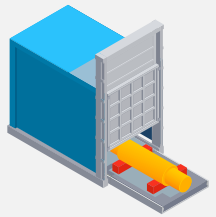
Clean Solid Carbon

Constellium

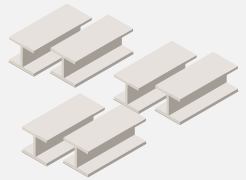
Global leader in the **manufacturing of high value-added aluminum products**

7.2b€ Annual Revenue

30 Manufacturing facilities



Aluminum furnace



Green Aluminum

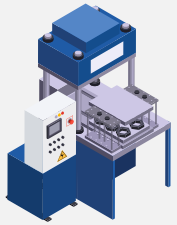
HUTCHINSON®

Subsidiary of TotalEnergies

Global leader in **vibration control, fluid management and sealing system**

4-5b€ Annual Revenue

+100 sites worldwide



Carbon processing

Polymers, sealing...

AIRBUS

BOEING

DASSAULT AVIATION

Ford SIEMENS

STELLANTIS

Continental

SAFRAN

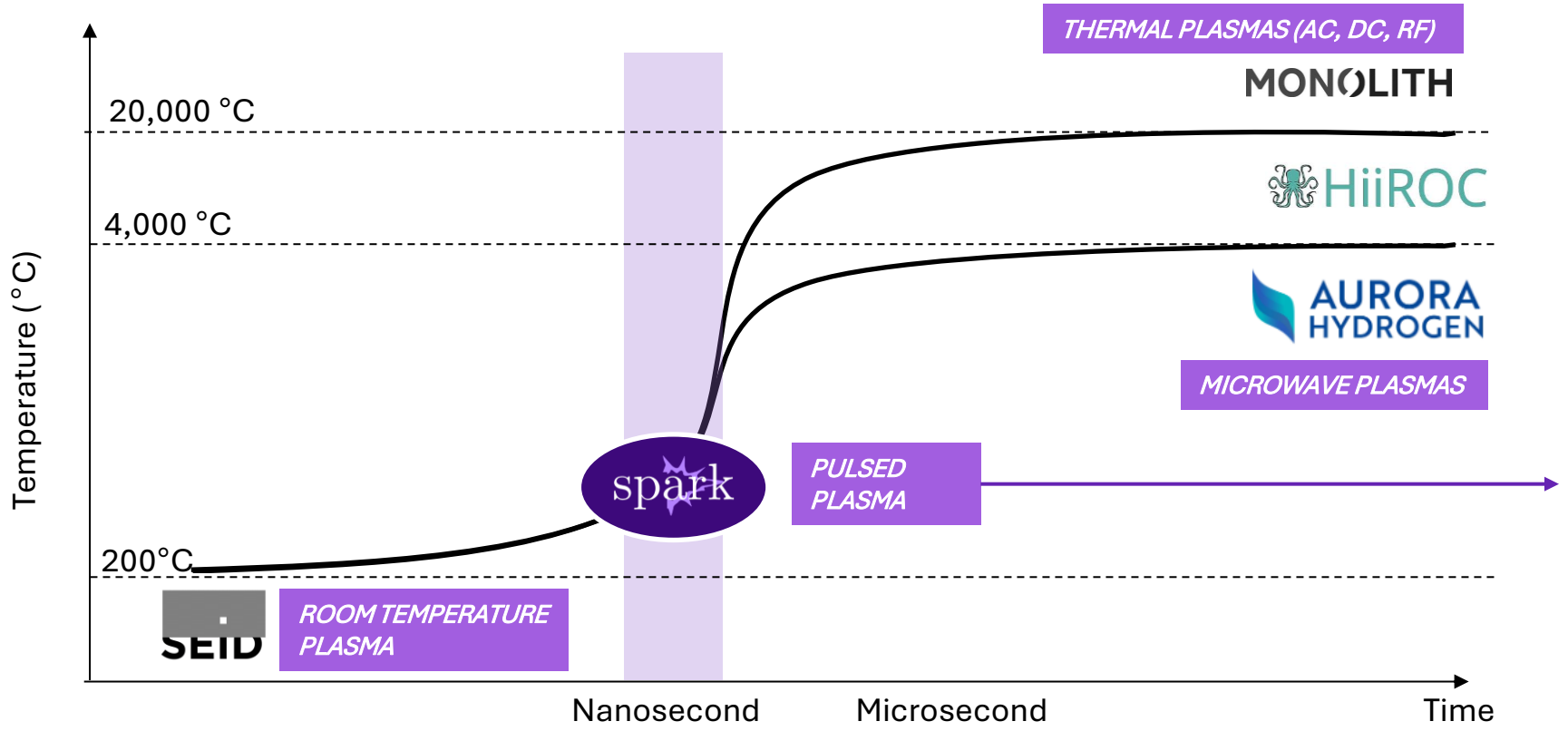
THALES

NAVAL GROUP

ALSTOM

Plasma Temperature Control optimizes Reactions & Carbon Value

The transition between a cold gas and a thermal plasma (e.g. lightning) spans over merely few nanoseconds.



spark

Spark Pulsed Plasma allows **fine temperature control**

Minimize energy loss

Maximize carbon quality

Temperature too low = slow reactions, low productions, low carbon quality.

Optimal temperature for **efficient** reaction & good carbon quality

Temperature too high = inefficient reaction **extremely high =** no solid carbon

Pulsed Plasmalysis: a Scalable & Efficient Solution

	Direct Electrification	Electrolysis	Thermal Plasmalysis	Pulsed Plasmalysis
				spark
			MONOLITH (US)	
Environmental Value	? High dependence on the CO_2 content of electricity	? High dependence on the CO_2 content of electricity	✓? Medium dependence on the CO_2 content of electricity	✓ Decarbonized in all circumstances
Economical Value	✗ 2x more expensive	✗ 4x more expensive	✓✗ >1.5x more expensive	✓ Cost parity with gas
Technical Value	✗ No valuable co-product	✗ No valuable co-product	✓✗ Standard value carbon black	✓ High Value specialty carbons
	✗ 70% not electrifiable	✗ Electric capacity to deploy (>10 MW per typical site)	✗ High CAPEX ($100m+)	✓ Scalability at any level

A Highly Dynamic Ecosystem

Company	spark	MONOLITH	HiiROC	ModernHydrogen	EKONA	C|ZERO
Inception Date	2022	2012	2019	2015	2017	2018
Country	France	USA	UK	USA	Canada	USA
Technology	Pulsed Plasmalysis	Thermal Plasmalysis	Thermal Plasmalysis	Thermal (non-plasma) pyrolysis	Thermal (non-plasma) pyrolysis	Liquid metal pyrolysis
Last Fundraising Date	Oct.2023	Sep.2024	Dec.2023	Mar.2023	Aug.2022	Aug.2024
Total Fundraising	€4m	$593m	$49.9m	$62.8m	$69.9m	$50.5m
Main Investors	asterion	Warburg Pincus Decarbonization Partners, BlackRock, Temasek	CEMEX ventures, Kia, Hyundai Motor Group	Intellectual Ventures, metaplanet, BA: Bill Gates	bdc, ConocoPhillips, Mitsui & Co.	ENGIE, Breakthrough Energy, APVentures

Spark Cleantech isn't just a technology — it's a revolution in industrial sustainability

Decarbonizing two industries by converting **4t of methane into 1t of hydrogen and 3t of solid carbon**.

Addressing a +€200bn market with a scalable and cost-efficient technology.

1st demonstrator deployed, backed by strong interest from 40+ key industry players.

Immediate ROI with **5x less energy and 3.5x lower costs** than electrolysiss.

Building The Leading European Player In Heavy Industry Decarbonization