CRITICAL RAW MATERIALS MADE FROM CO_2

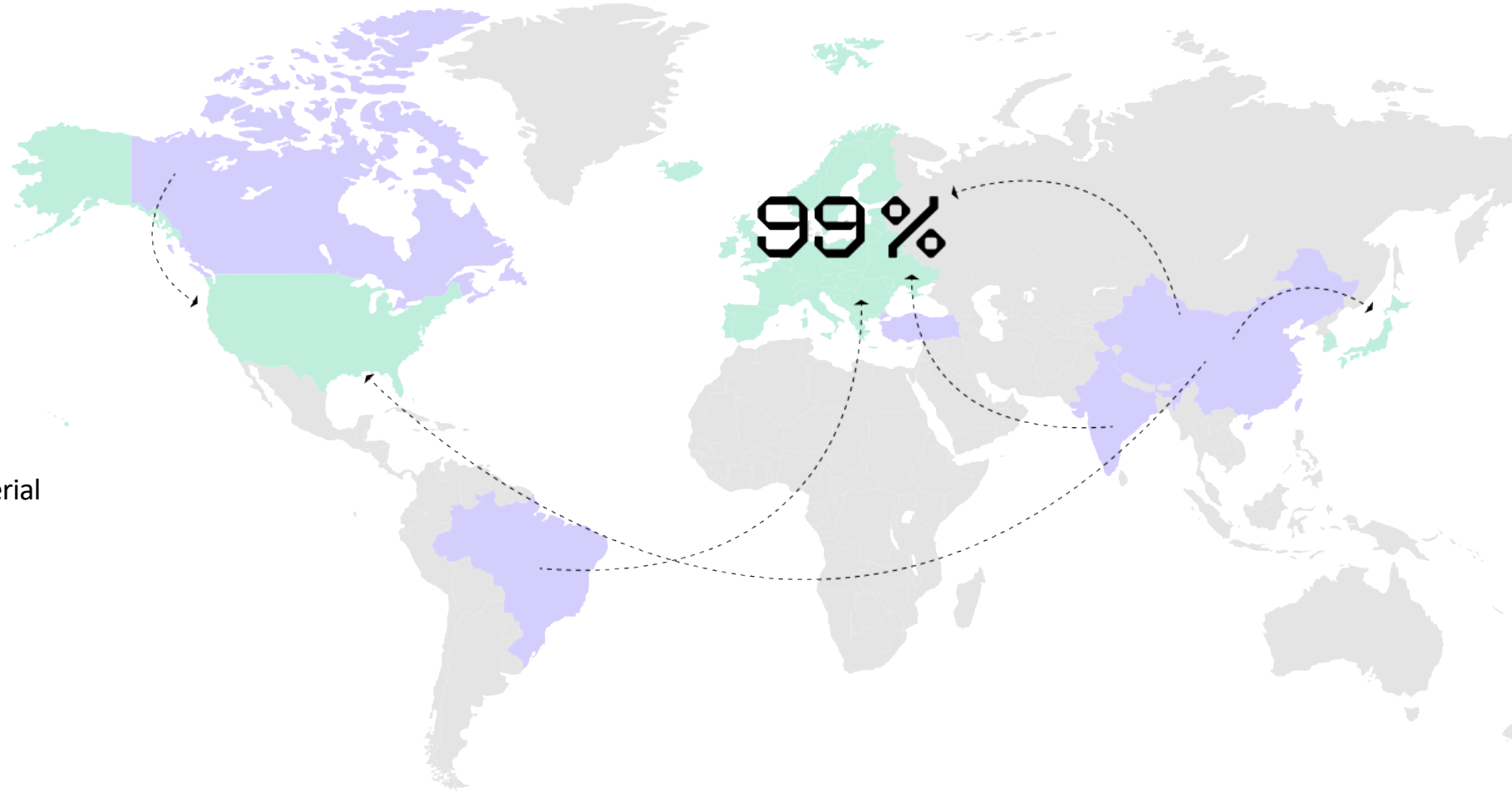
The most energy and cost efficient production of **carbon nanotubes and graphite**

Gary Urb, PhD

Local Challenge

No supply chain security for graphite in the EU and the US

- → **77%** of the global graphite comes from China
- → **99%** of the EU graphite is imported
- → The EU, the US, Japan and Korea have declared graphite as a critical raw material
- → China curbed graphite exports from 1st of December 2023



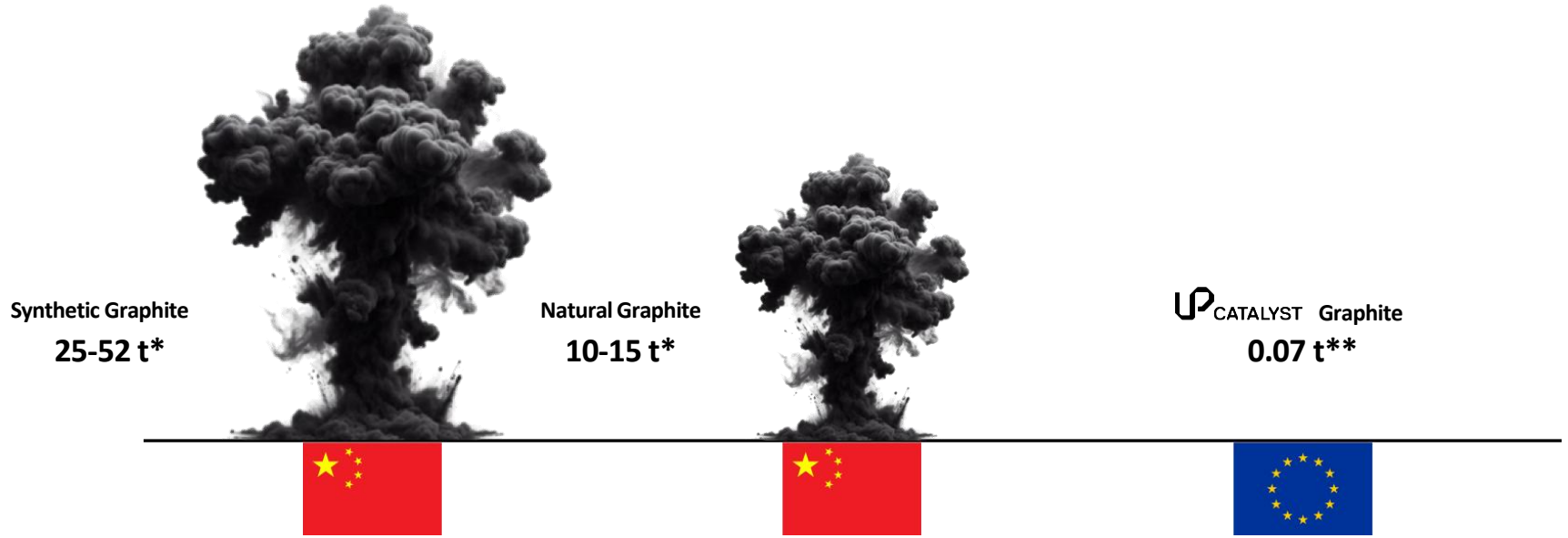
WORLDWIDE GRAPHITE PRODUCTION

Emission Avoidance

Graphite produced and imported from China emits millions of tons of CO_2

Europe imports fossil-based graphite from China to support its clean energy transition, yet this introduces new CO_2 emissions into the atmosphere

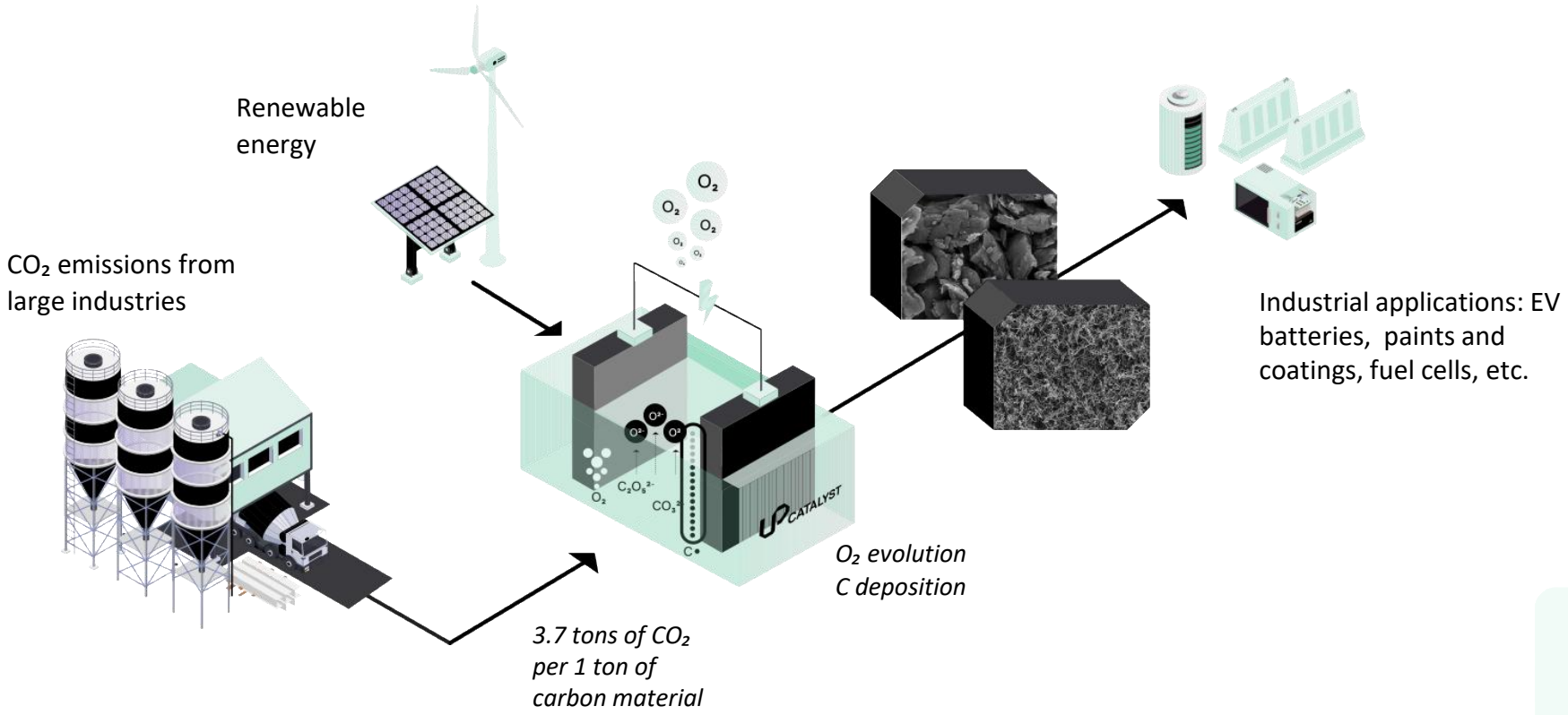
***Tons of CO_2 per ton of material produced** Carrère, et. al, (2024). https://doi.org/10.1016/j.est.2024.112356



**LCA validated by Research Institutes of Sweden (RISE) and Bureau Veritas (2024)

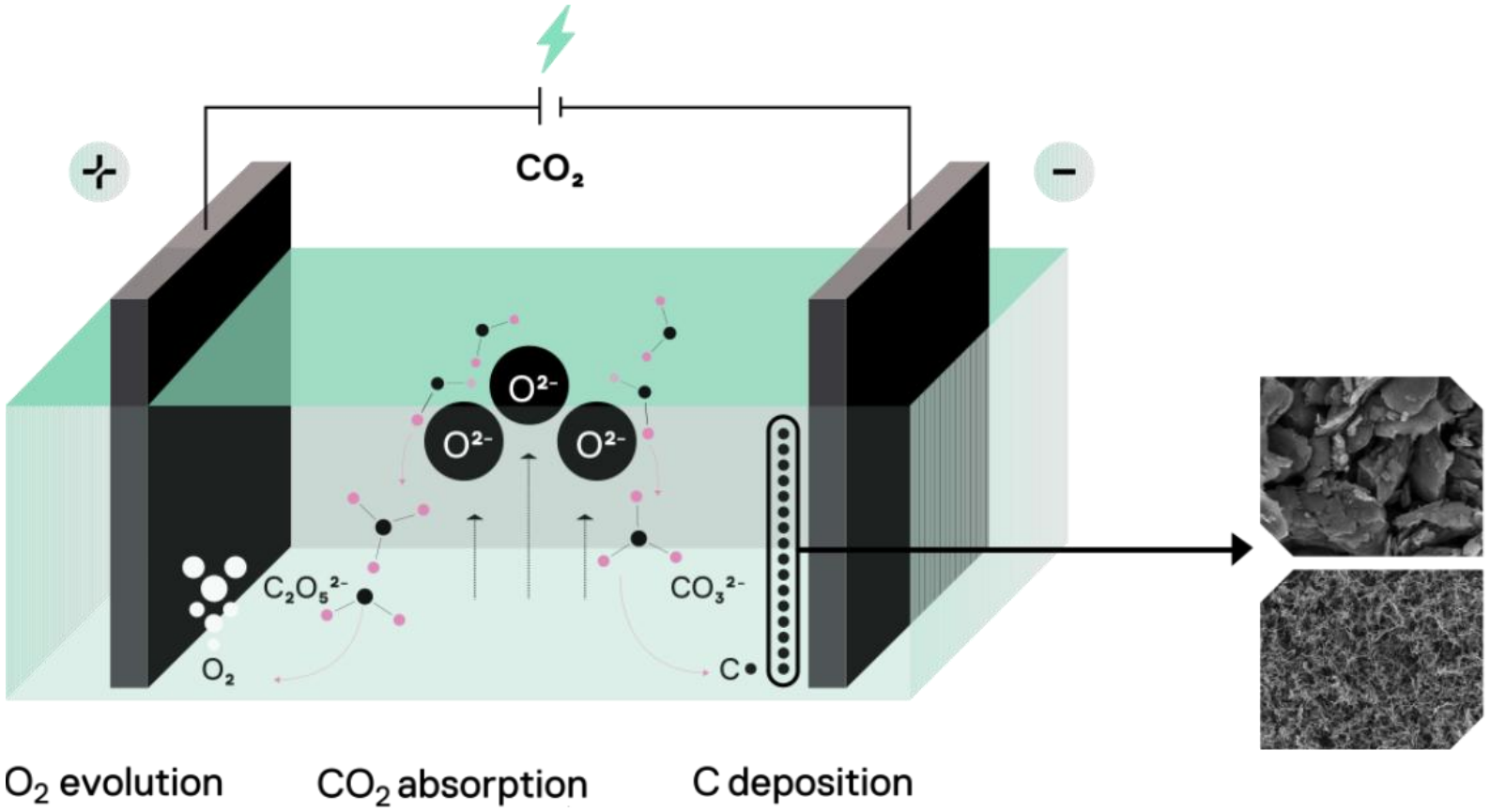
Solution

Our technology turns CO_2 emissions back into carbon



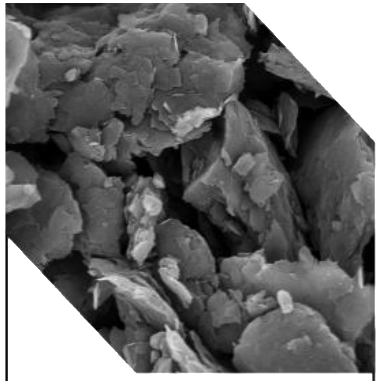
Technology

Revolutionary Molten Salt Carbon Capture Electro-Transformation (MSCC-ET) based synthesis method



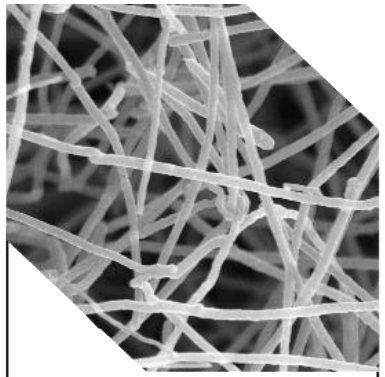
Portfolio

Our products from CO_2 emissions



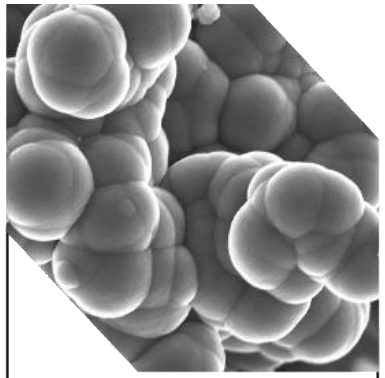
GRAPHITE

The most widely used anode material in batteries, with 66 kg needed per electric vehicle.



CARBON NANOTUBES (MWCNTs)

Conductive additives for enhancing battery performance. Up to 1 kg needed per electric vehicle.



CARBON BLACK

A key component in batteries, paints and coatings, enhancing the properties and performance.

USE CASE IN SEVERAL INDUSTRIES

ENERGY STORAGE

- Conductive additive replacement for faster charging
- Green graphite with high purity

PAINTS AND COATINGS

- Sustainable carbons with high tinting strength
- Functional additives for electrical and thermal conductivity

COMPOSITE MATERIALS

- Carbon nanotubes for high-strength composite materials
- Sustainable carbon materials for advanced functions in composite materials

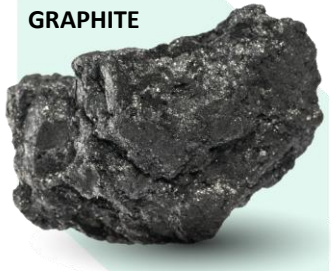
CONCRETE

- Strengthening additive for up to 50% higher strength
- Carbon capture, utilization and storage (CCUS)

Impact

Over 3.5 tons of avoided CO_2 emissions per electric car

GRAPHITE



66 kg

For an average EV battery

3425* kg of CO_2

CONVENTIONAL

4.62 kg

MWCNTs

0.5-1 kg

CNTs for an average EV battery

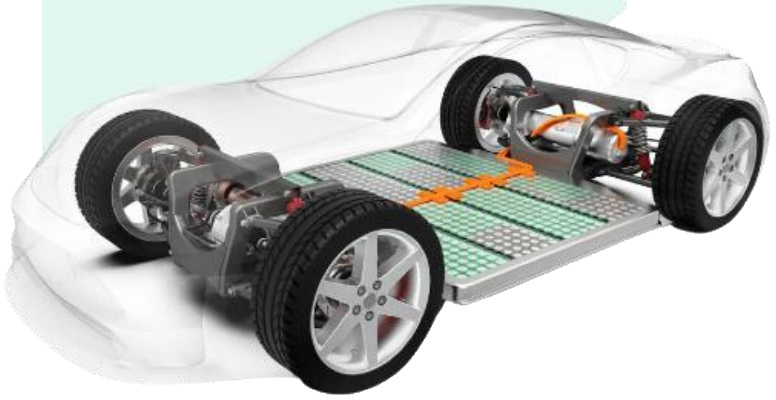
120** kg of CO_2

CONVENTIONAL

0.49 kg

160 million tons

of CO_2 emissions could be avoided by 2030



UP CATALYST

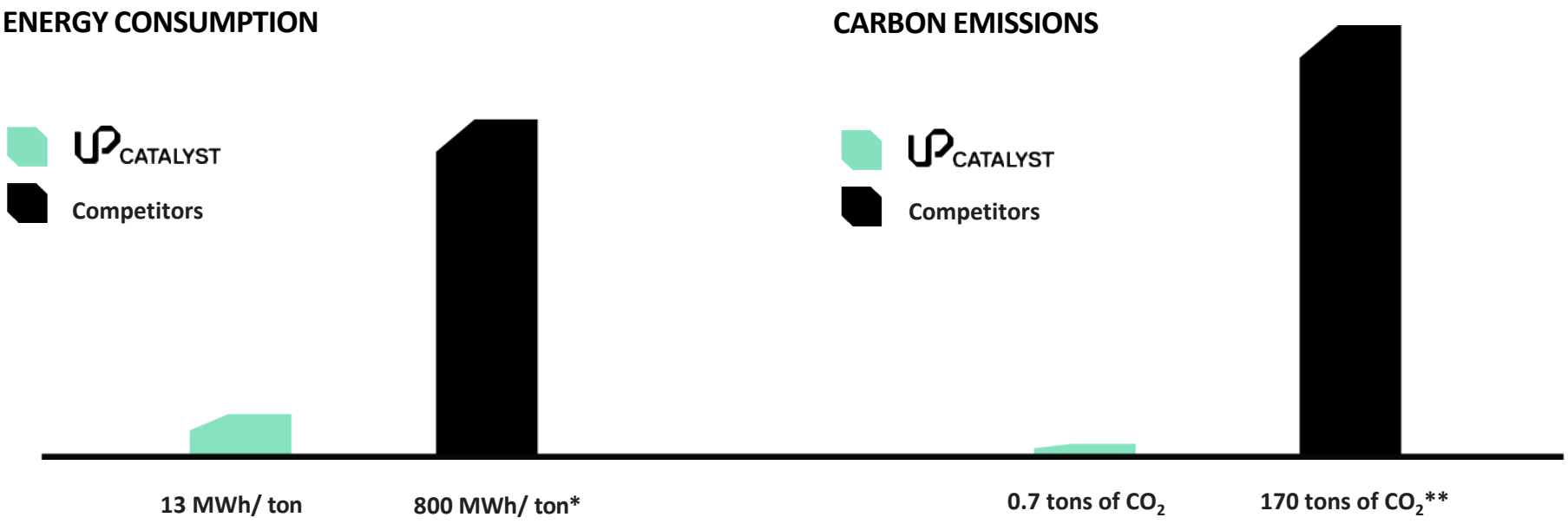
*Carrère, et. al, (2024). https://doi.org/10.1016/j.est.2024.112356

** Temizel-Sekeryan, Wu & Hicks (2021)


P100
P100

How We Are Different From Competitors?

Carbon nanotubes



UP Catalyst is 60 times more energy-efficient than competitors

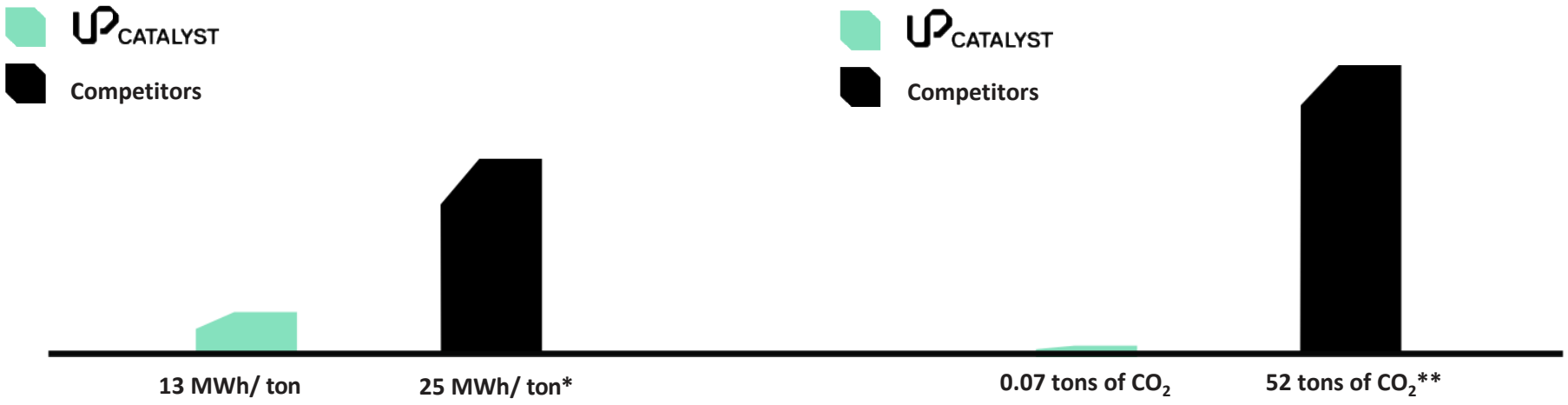
Competitors emit 170 tons of CO_2 per each ton of material produced, UP Catalyst emits **0.7 tons of CO_2** per each ton of material

*Handbook of Carbon Nanotubes (2022)
** Temizel-Sekeryan, Wu & Hicks (2021)

How We Are Different From Competitors?

Graphite

ENERGY CONSUMPTION



UP Catalyst is 2 times more energy-efficient than competitors

CARBON EMISSIONS

Competitors emit 52 tons of CO_2 per each ton of material produced, UP Catalyst emits **0.07 tons of CO_2** per each ton of material

*Dai, Q et. al, (2019) https://doi.org/10.3390/batteries5020048
**Carrère, et. al, (2024). https://doi.org/10.1016/j.est.2024.112356

Top Firms That Gain From Us

Customer traction in multiple industries

ECHION TECHNOLOGIES

TEKNOS

PCC SE

BASF
We create chemistry

BeFC
Bioenzymatic Fuel Cells

HOLCIM

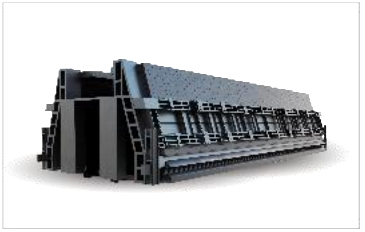
Pomega

UniverCell

EVONIK
Leading Beyond Chemistry

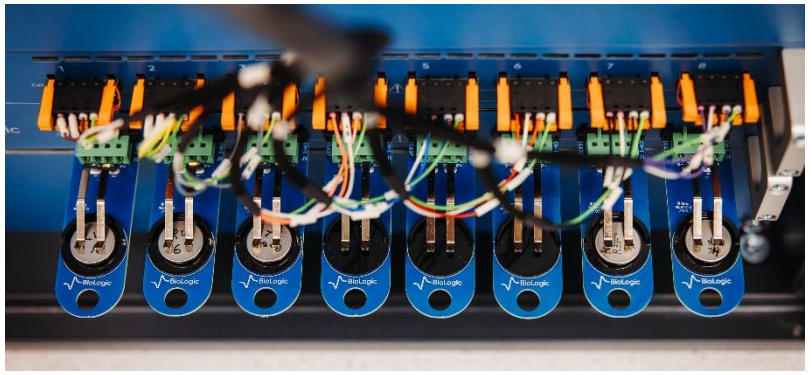
Plan

Technology deployment and scale-up

Generation 1 Reactor	Generation 2 Reactor	Generation 3 Reactor	Generation 4 Reactor	Industrial Pilot Facility	Large-scale Industrial Facility
					
2022 (Finished)	2023 (Finished)	2025 (In process)	2027 (Not started)	2028 (Not started)	2029-2030 (Not started)
Production: **270 kg/yr** CO_2 extraction: 1 t/yr	**2.7 t/yr** 10 t/yr	**27 t/yr** 100 t/yr	**270 t/yr** 1 kt/yr	**1.6 kt/yr** 6 kt/yr	**60 kt/yr** 222 kt/yr

Planned Facilities

Facilities




UP CATALYST

Leading the world to green carbon