QAPTIS

CO_2 Capture Technology

Masoud Talebi Amiri | CEO

Mobile CO_2 capture for accelerating the decarbonization of logistics

ECTA annual meeting | 14.11.2024

(1) Carbon capture technology (DAC vs. PSC)

(2) Decarbonization of freight transportation

(3) Mobile Carbon Capture for freight transportation

Background – Direct Air Capture

- **Direct Air Capture (DAC)** - 1999.

- **Concept:**
  Material, Swing, Treatments (Post/Pre).

- **Performance:**
  Feed quality, Material efficiency, Energy demand.

Background – Direct Air Capture

- **Captured CO_2:**
  Long-term storage (DACS), Carbon-neutral feed, EOR.

- **Challenges:**
  Concentration, Energy demand, Costs, Impact, Operational details.

- **Cost:**
  Profitable: 100 €/ton(1) vs. Current: >200 €/ton.

(1) Climeworks (B): Business modeling – creating new market opportunities, IMD Business school

Background – Point Source Capture

- 1920s.
- **Concept:**
  Concentration, Combustion techniques, Chemical reaction, Cryogenic.
- **Carbon Capture and Utilization + Carbon Capture and Storage (CCUS)**
- **Challenges:**
  Scalability, Feed impurities, Economic Feasibility (incentives).

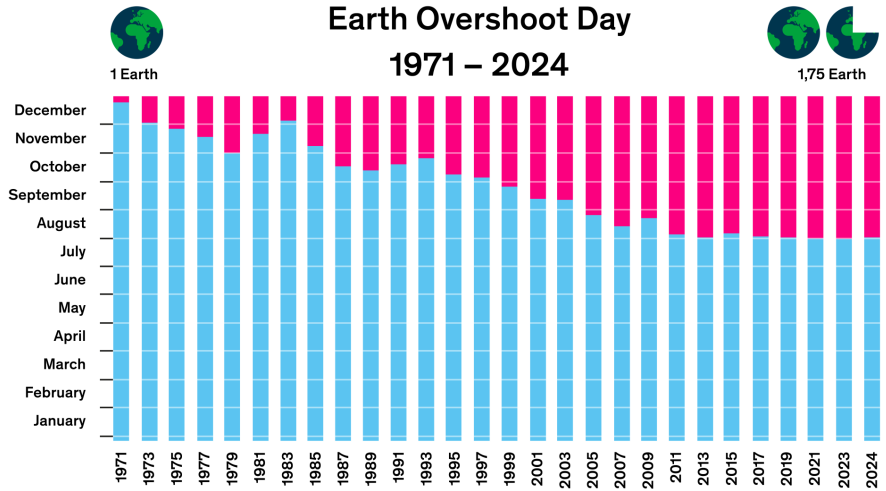
Background – Why DAC or CCUS?

- **Challenges** of low(zero) – emission technologies.
- **What is the plan B?**

Background – Why DAC or CCUS?

- **Challenges** of low(zero) – emission technologies.
- **What is the plan B?**
- **Earth Overshoot Day (EOD)**

  The date that humanity's resource consumption for the year exceeds Earth's capacity to regenerate those resources that year.



https://www.overshootday.org

Background – Why DAC or CCUS?

- **Challenges** of low(zero) – emission technologies.
- **What is the plan B?** (risk mitigation, compliances, stakeholders' interests)
- **Competitive advantage.**
- **Brand and reputation.**
- **Long-term viability.**

Background – Traction

Climate & Energy | Environment | Sustainable Markets | Exploration & Production | Climate Change

US awards $1.2 billion to Oxy, Climeworks-led carbon air capture hubs

By **Valerie Volcovici**

August 11, 2023 6:40 PM GMT+2

A view of a computer-rendered image of Climeworks' Mammoth direct air capture plant, is seen in this Reuters June 28, 2022. Climeworks/Handout via REUTERS/File photo *Acquire Licensing Rights*

Business | A giant sucking sound

Can carbon removal become a trillion-dollar business?

Quite possibly—and not before time

Exxon Mobil to invest $3 billion in carbon capture and other projects to lower emissions.

Share full article

Environmentalists have long criticized Exxon Mobil for not doing enough about climate change. Ben Torres for The New York Times

Feb. 1, 2021

Exxon to buy Denbury for $4.9 billion in carbon storage bet

By **Sabrina Valle** and **Arunima Kumar**

July 13, 2023 9:19 PM GMT+2 · Updated 2 months ago

Signage is seen at an Exxon gas station in Brooklyn, New York City, U.S., November 23, 2021. REUTERS/Andrew Kelly/File Photo *Acquire Licensing Rights*

(1) Carbon capture technology (DAC vs. PSC)

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Challenges

- **10%** of global emissions.
- Road HDVs: **41%** of fuel consumption.[1]
- **Maturity** of the available green alternatives.
- **Impact** on the economy and policies.

(1) FVV Fuel Study IVb - Transformation of European mobility to the GHG-neutral post-fossil age - FVV H1313 / 2022

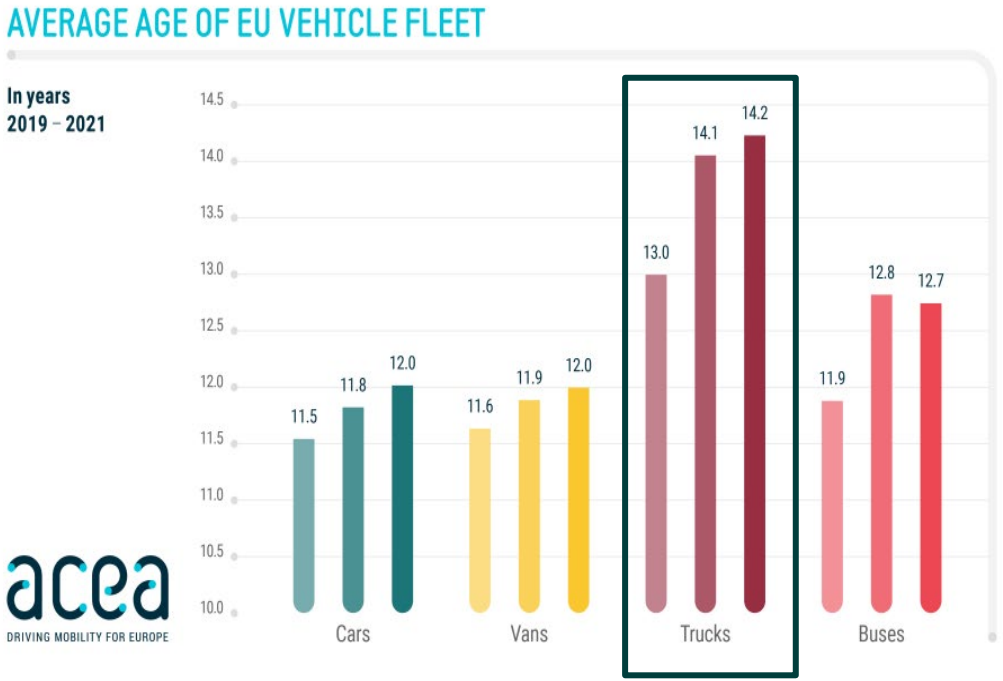
(1) Substitution products – No retrofitting

Trucks decarbonization – Takes at least 25 years

6’400’000
Trucks on the road.
77% of all freight transportation.

274’058
New trucks registered in 2022.

2%
Annual growth.



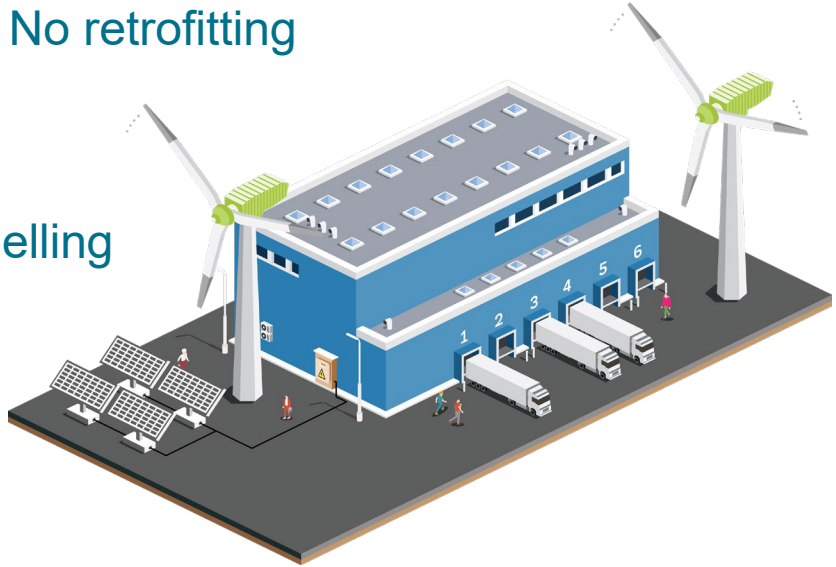
European Automobile Manufacturers' Association: ACEA (2023)

Trucks decarbonization – Current solutions

(1) Substitution products – No retrofitting

(2) New infrastructure – for fuelling

(3) Cost – more than 3x diesel trucks



Implementation challenges – Underestimating the scale up

Hyundai to put 1,600 hydrogen trucks on the road over the next 5 years

Commercial Motor
October 8, 2019

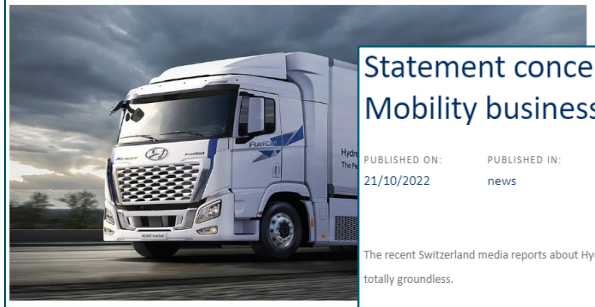
Hyundai H2 trucks in Switzerland: Complaints about capricious prices for green hydrogen

H2 Tankstellen in der Schweiz

The promise by Hyundai and partners that a vehicle fleet of 1,600 Hyundai XCIENT Fuel Cell 36-ton trailers should be built in Switzerland by 2025 is currently under pressure. Reports circulated in the specialist media that the project had been or would be stopped. The CEO of the partner company H2 Energy Rolf

Hyundai fuel cell trucks won't be using green hydrogen after all

Posted November 17, 2022 by Charles Morris & filed under Fleets and Infrastructure, Newswire, The Infrastructure.



Statement concerning Hyundai Hydrogen Mobility business case in Switzerland

PUBLISHED ON: 21/10/2022

PUBLISHED IN: news

The recent Switzerland media reports about Hyundai and its partners might discontinue its initiatives for hydrogen ecosystem are totally groundless.

Hyundai Hydrogen Mobility will further execute and develop its business case of heavy duty fuel cell transportation with the existing network of partners in Switzerland.

Hyundai firmly believes that fuel cell mobility will play an essential role in decarbonizing the mobility sector, in which the trucks have already covered more than 5 million kilometers.

Switzerland to restrict use of electric vehicles

16/12/2022 BY LE NEWS

Switzerland's federal government plans to restrict the use of electric vehicles if there is a serious shortage of electricity, reported RTS.

Photo by Mike B on Pexels.com

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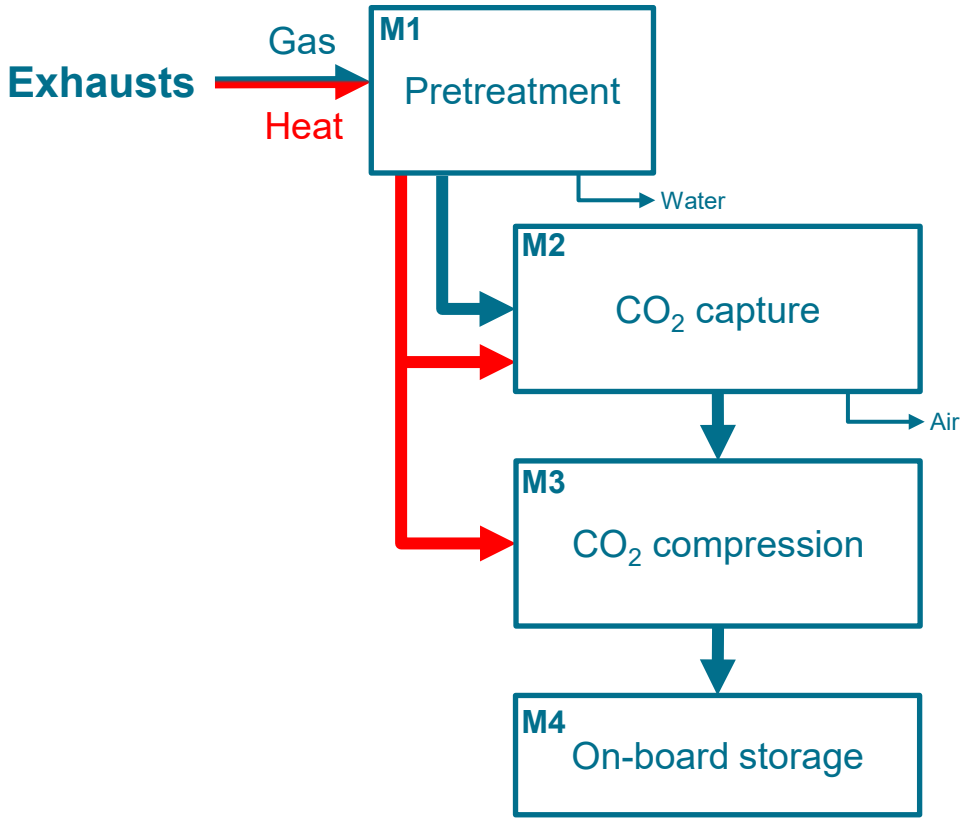
Benefits

- **Retrofit** (accelerate the decarbonization).
- **Existing infrastructure** for fuel.
- **Less expensive** (compatible with current manufacturing supply chain).

Mobile CO_2 Capture (MCC) Technology

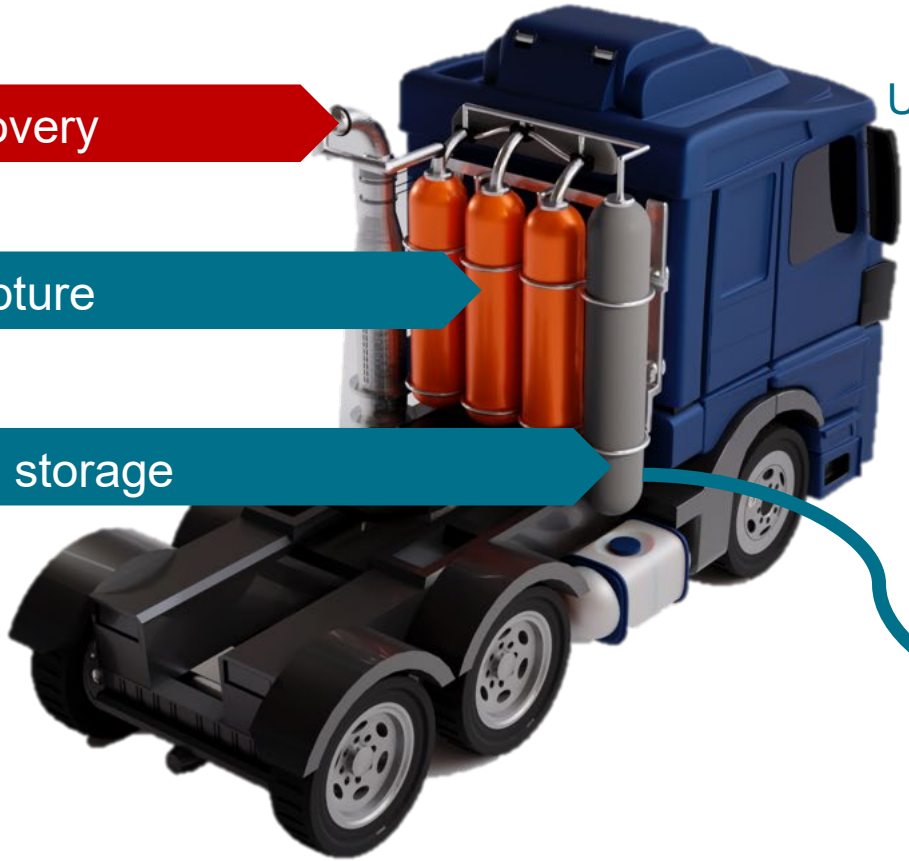


Mobile CO_2 Capture (MCC) kit – Truck retrofit

1 Efficient heat recovery

2 Selective CO_2 capture

3 Compression and storage



Up to **90%** of emissions

Ground Storage

Captured CO_2

Third parties (CO_2 Collection, Logistics & Valorization)

- **Permanent storage** (Tax refund, carbon credit)
- **CO_2 market** (Chemical industry, **E-fuels**)

Cost of capture <100 €/ton

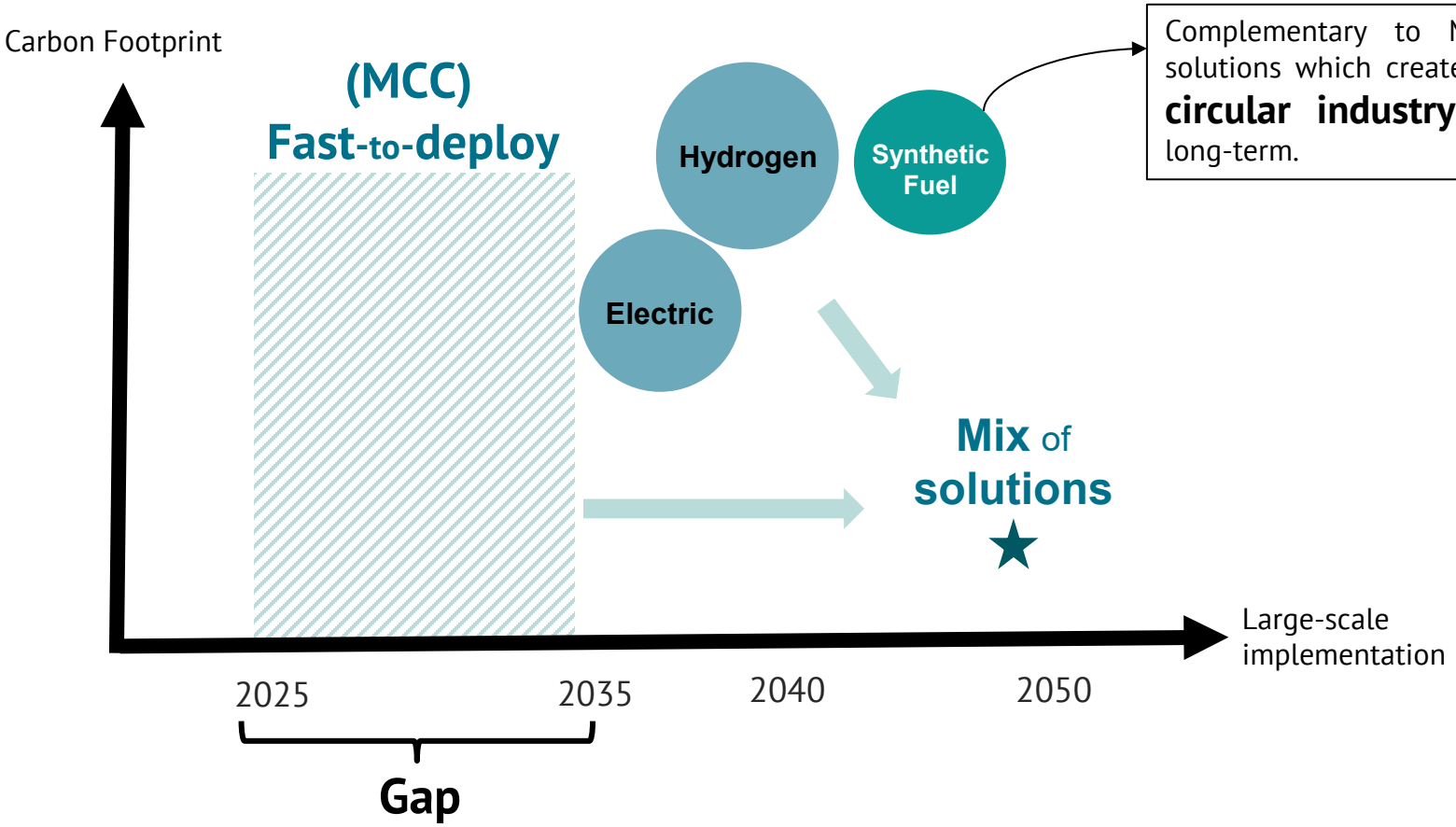
Challenges

- **Captured CO_2** (supply will be much higher than the current demand).
- **CO_2 valorization** is still under development.
- **CO_2 cost** & **pricing** (prices might drop with increase in supply).
- **Incentives** (carbon tax).
- **Policy** models.

Product design

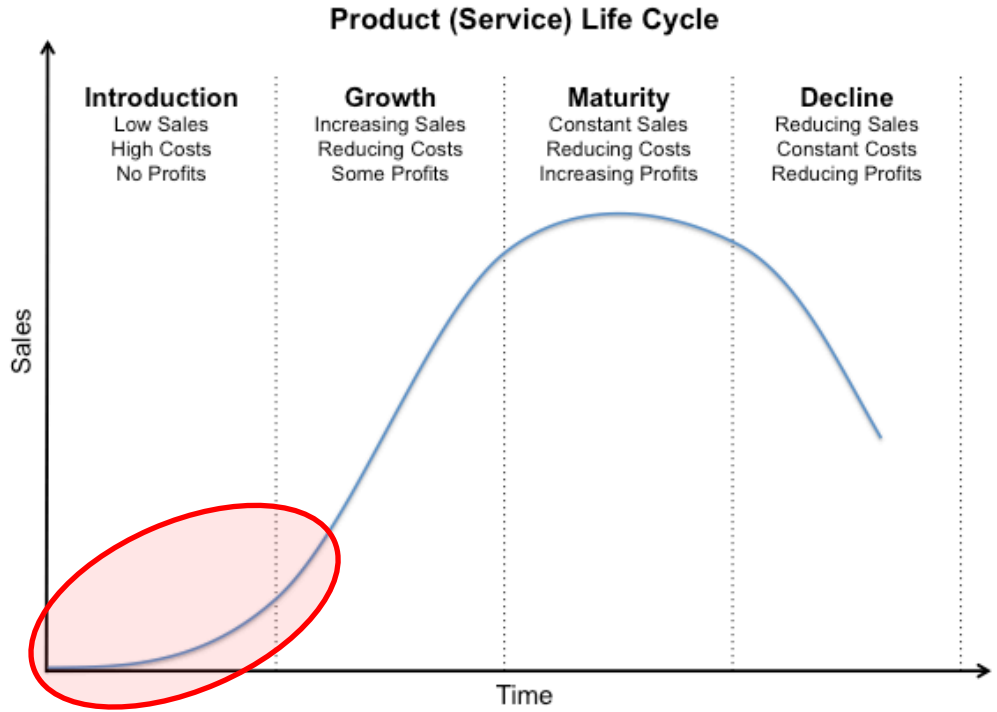
- **Back pressure** on the engine (**Extra fuel consumption**).
- **Modular** product.
- **Volume** vs. **Weight** limitations (product configuration).
- **Exhaust gas pretreatment** (using current available equipment).
- **CO_2 capture rate** (between 25%-50%).
- **Operational** (run time, discharge time, maintenance, training, etc.).

Future landscape



Decarbonization Technologies – Transition from innovation phase

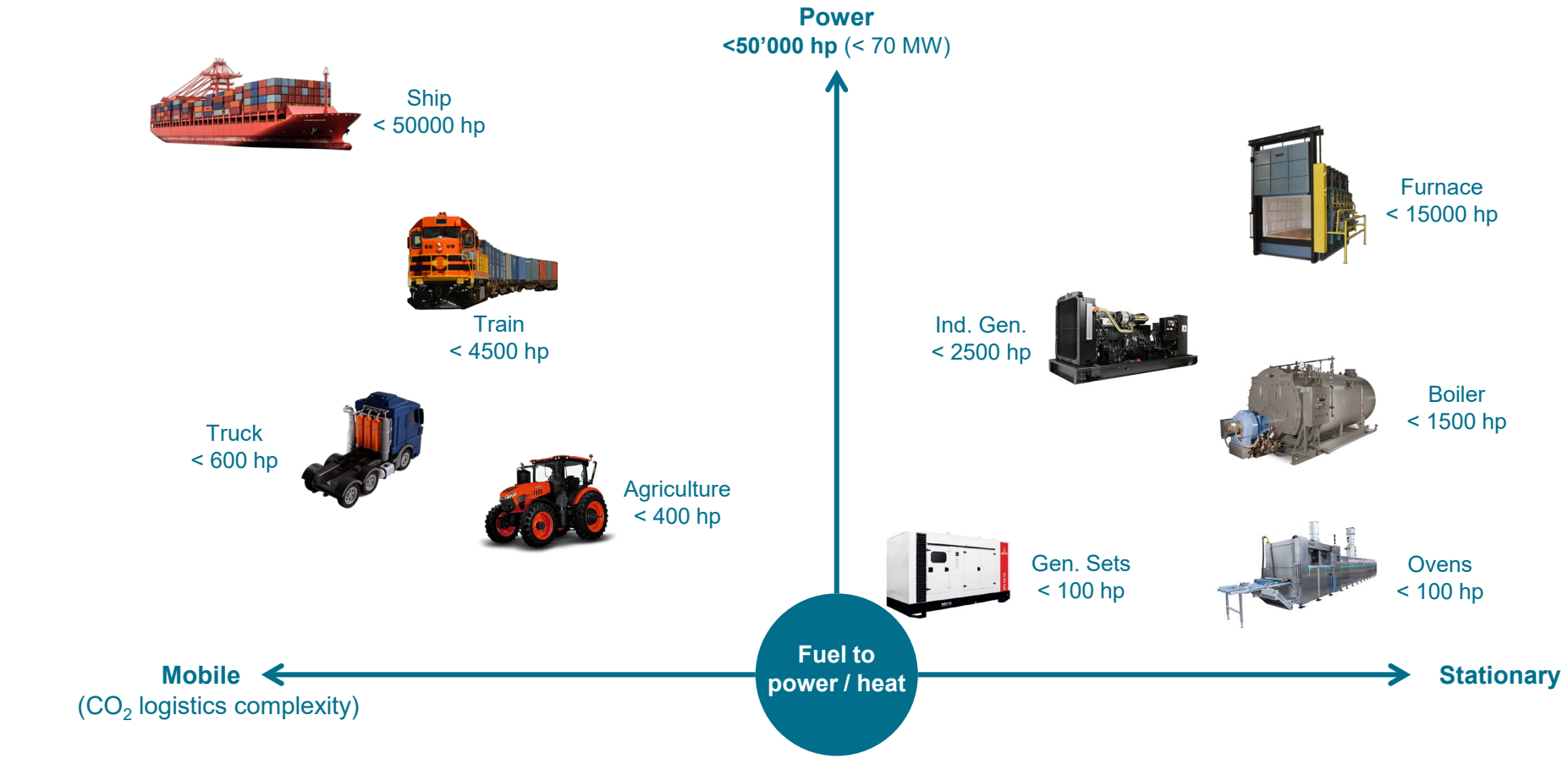
- **Preparation for growth:** Value delivery system is the key.



Driving forces

- **Consumer** (eco-consciousness)
- **Clean tech technologies** (Strategy and Business model innovation)
- **Government** (regulations)

CO_2 capture technology applications – Strategy innovation



Qaptis strategy

- Partnership with leading manufacturers.

(1) Joint Development Project

(2) Commercialization Partner

} Financing

- Market associated risks

- Commercialization risks

Qaptis – Joint Development Projects

Truck

Tractor

€ 1.5m in Revenue.

€ 1.2m-1.5m per follow up project.

Industrial Boiler

€ 600k

Q4 2024

Generator Sets

TBD

2025 (Q2)

Train

TBD

2025 (Q2)

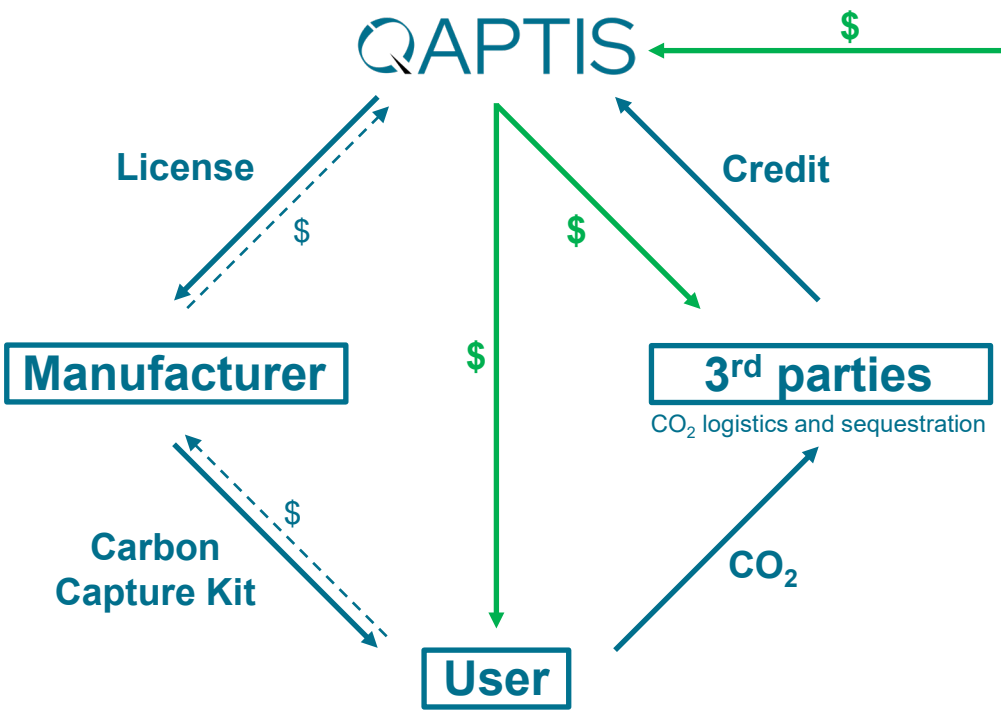
Capture the culprit !

QAPTIS

CO_2 CAPTURE TECHNOLOGY

Annexes

Business model (Innovation) – Carbon Credit



Return on Investment

User: 3-5 years

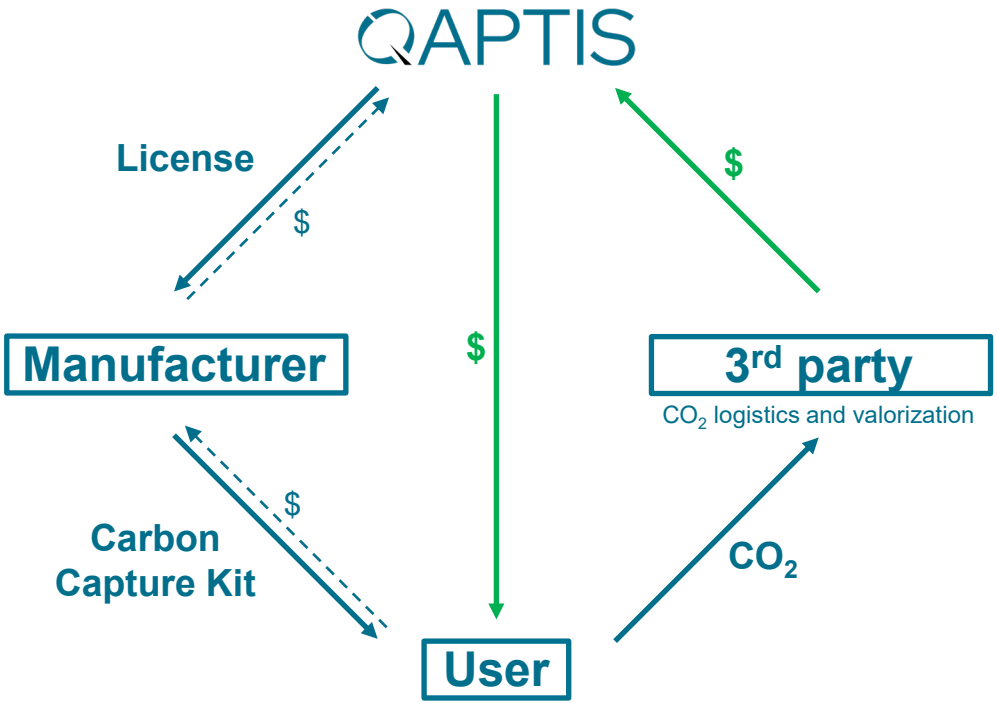
3rd parties: 3-5 years

Qaptis revenue streams

Licensing

CO_2 valorization (<5%)

Business model (Innovation) – CO_2 market



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Qaptis revenue streams

Licensing

CO_2 valorization (<5%)

Core Team

Masoud Talebi Amiri, **CEO**

PhD in chemical Engineering (EPFL).
Serial entrepreneur (5 active startups).
10 years of experience in sustainability.

Théodore Caby, **COO**

MSc in Energy systems (EPFL).
5 years of experience in green tech.
Specialized in CO_2 valorization.

Marie Tournant, **CFO**

28 years of experience

Crédit Agricole, SWAROVSKI, Barry Callebaut

Ed Green, **CTO**

36 years of experience

Design, prototyping, and scaling for carbon capture & hydrogen prod.

Mitulkumar Suthar, **Lead Engineering**

17 years of experience

GE Aviation, Rolls-Royce, National Aerospace Laboratories