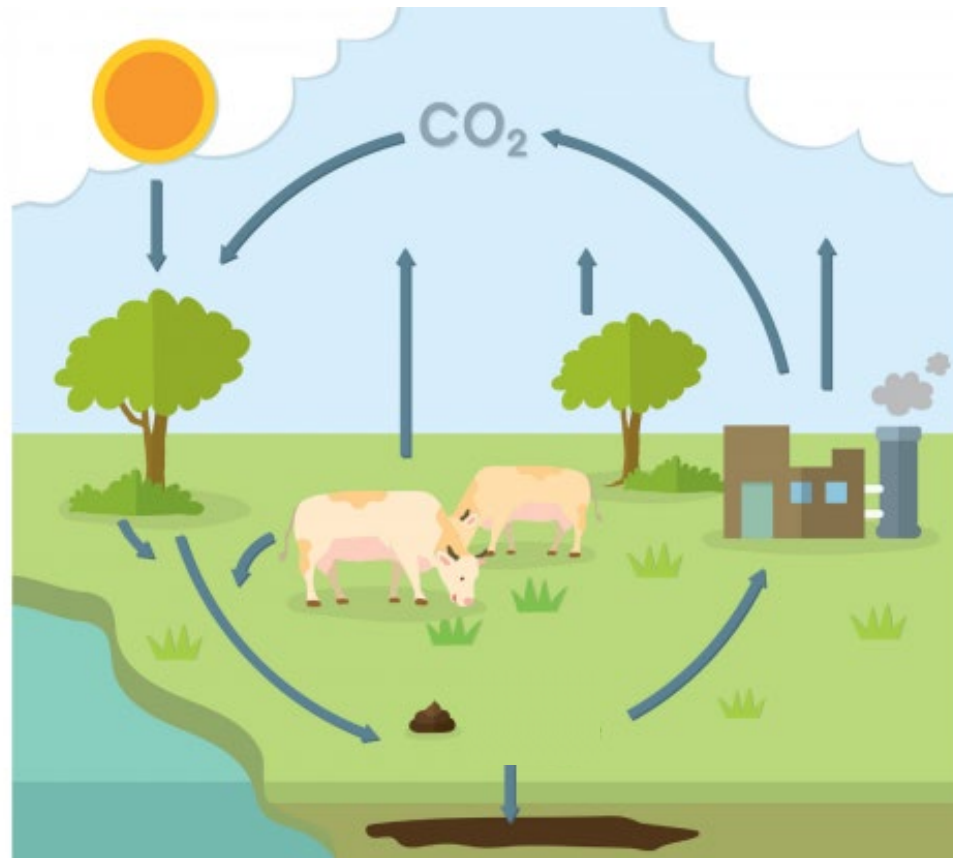




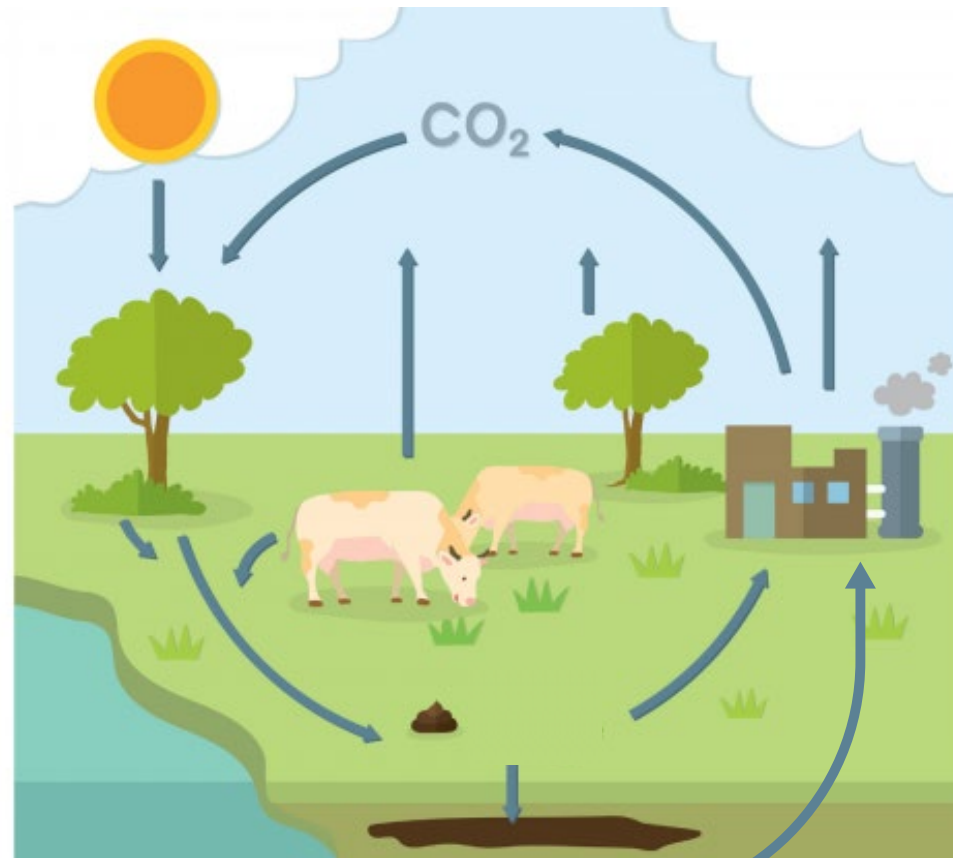
Carbon that drives back climate change

Pierre-Yves MOCAER  
Salon Bio360 - Nantes  
25/01/24

# Carbon cycle and fossil energy



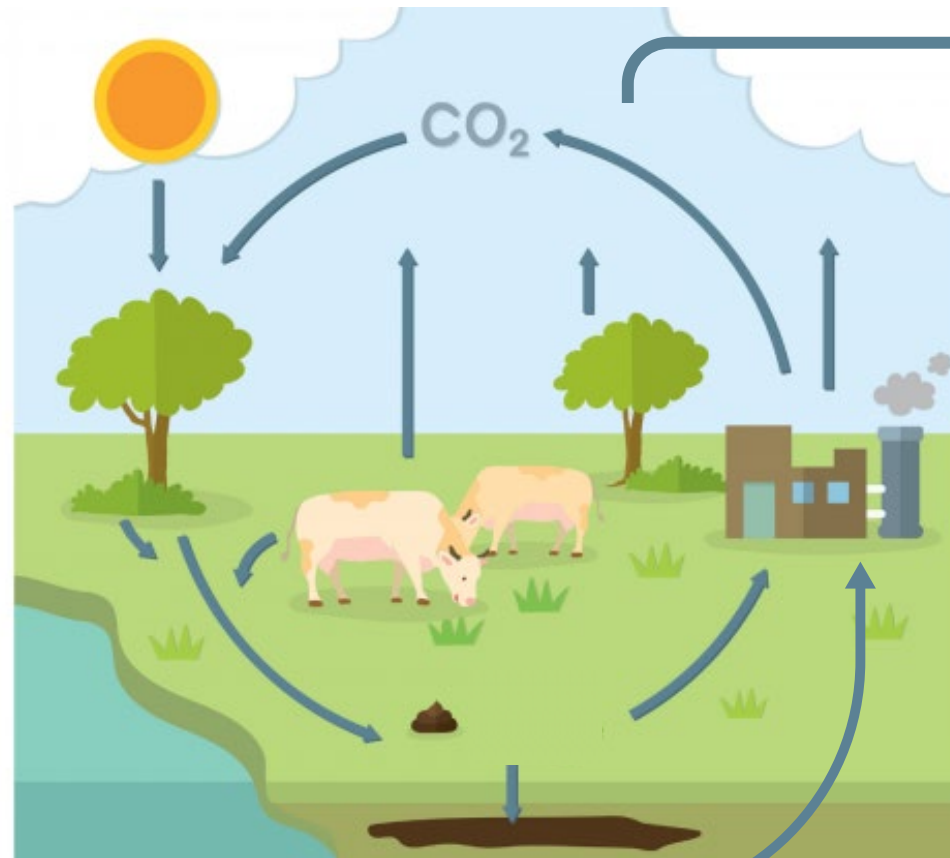
# Carbon cycle and fossil energy



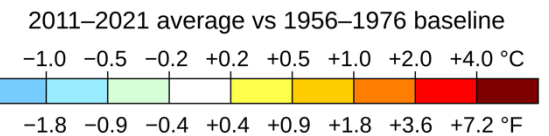
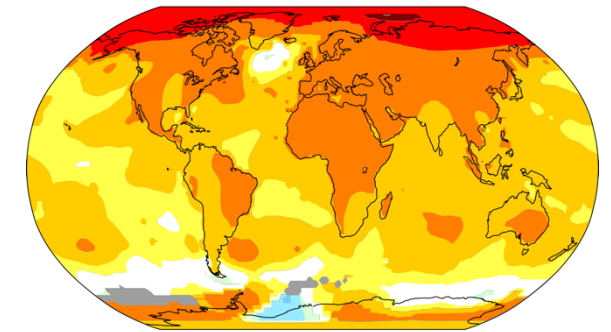
Fossil energy

# Carbon cycle and fossil energy

High concentration of CO<sub>2</sub>  
in the atmosphere



Temperature change in the last 50 years



Fossil energy



# How can we invert climate change?

- ✓ Producing **biochar**,  
To **capture** carbon and CO<sub>2</sub> in soils



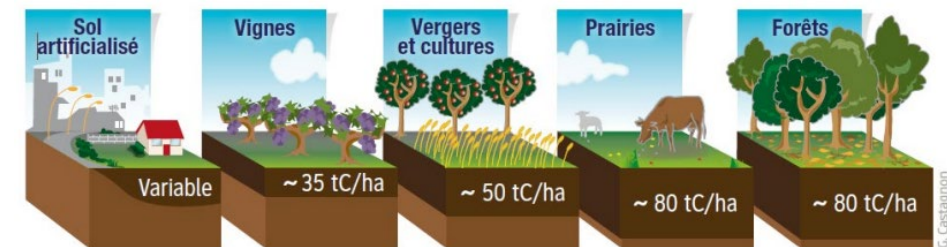


# How can we invert climate change?

- ✓ Producing **biochar**,  
To **capture** carbon and CO<sub>2</sub> in soils
- ✓ Producing **organic amendment**,  
To **increase** carbon storage in soils



## Carbon storage capacity in soils



source GIS sol

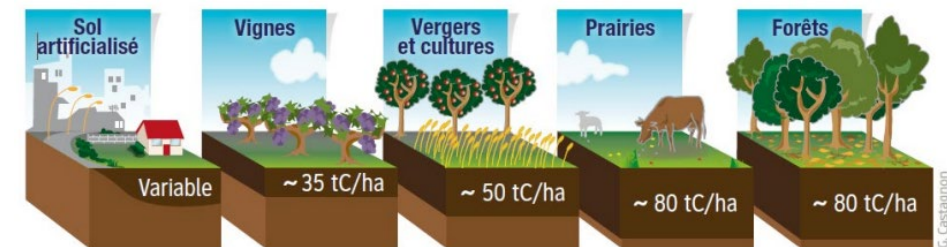
Estimation du stock de carbone dans les 30 premiers centimètres du sol  
Source GIS Sol / ADEME, Carbone organique des sols, l'énergie de l'agro-écologie, une solution pour le climat

# How can we invert climate change?

- ✓ Producing **biochar**,  
To **capture** carbon and CO<sub>2</sub> in soils
- ✓ Producing **organic amendment**,  
To **increase** carbon storage in soils
- ✓ Producing **renewables fuels**,  
To **substitute** fossil fuels in everyday life



## Carbon storage capacity in soils



source GIS sol

Estimation du stock de carbone dans les 30 premiers centimètres du sol  
Source GIS Sol / ADEME, Carbone organique des sols, l'énergie de l'agro-écologie, une solution pour le climat

# TerraWatt's Process

BIOMASS AS AN INTRANT



**Green Waste from collectivities**

Currently poorly valued



**Agricultural Waste non-fermentescible**

Must be valued today

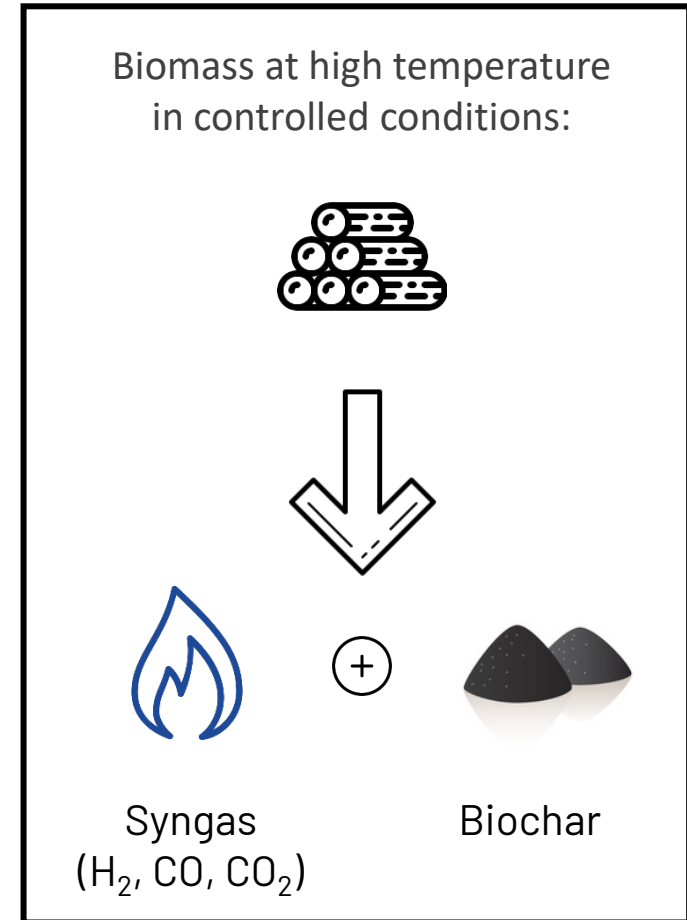
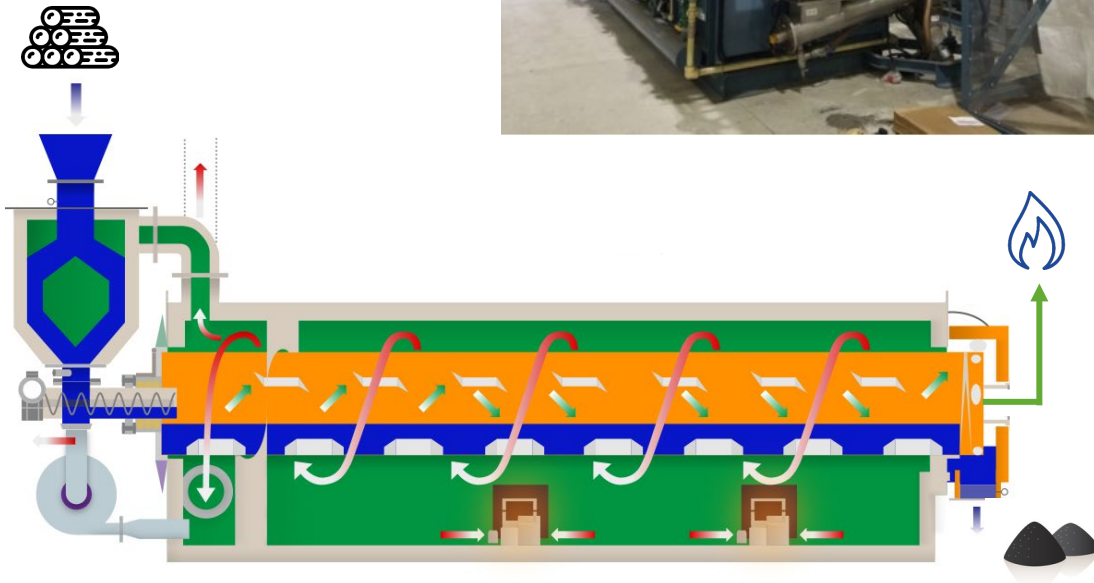


**Reservoir under study: 800 tons/year to 10.000 tons/year**



# TerraWatt's Process

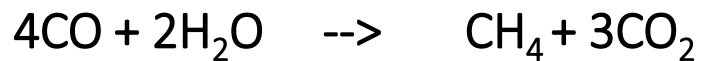
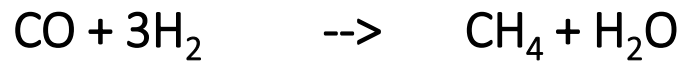
HIGH TEMPERATURE PYROLYSIS



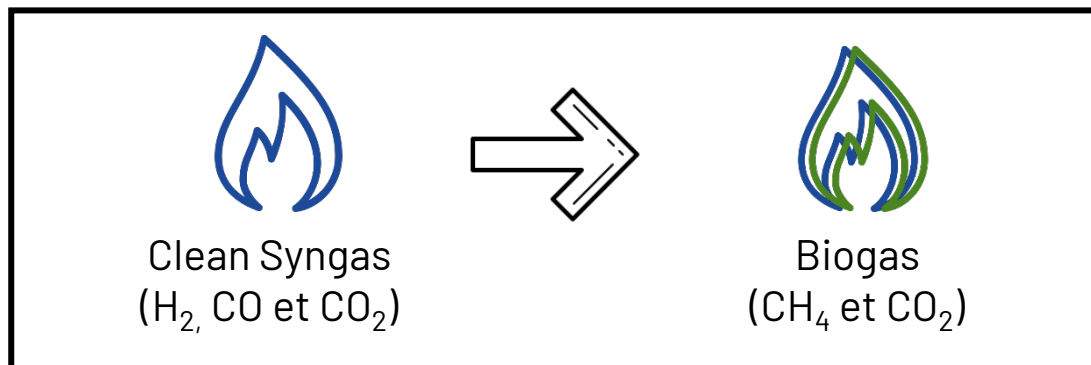
# TerraWatt's Process

## BIOLOGICAL METHANATION

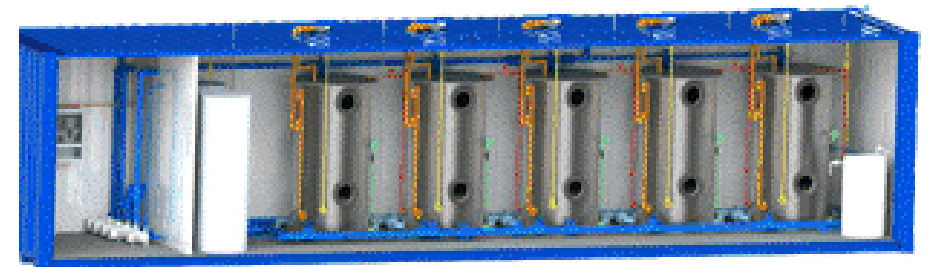
Methanogens micro-organisms can transform Syngas (pyrolysis gases) into biomethane in bioreactors.



Then :



Patents:  
PCT WO 2017/158024  
PCT WO 2018/210960



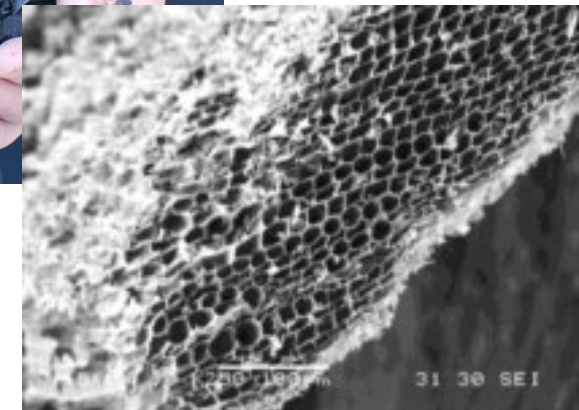
TitanV Biomethanation unit

# Biochar

A HIGH POTENTIAL TO RESTORE SOILS

**Biochar produced by pyrolysis is a strong organic amendment acknowledged by worldwide agronomic institutes (CIRAD, INRA, DTU, ELGO...):**

- It **captures** and **fix** micronutrients in soils,  
**avoiding washout** by rain events (nutrients, humus..)
- **Retain water** in agricultural soils  
Enhancing **soil resistance to drought**
- Help the growth of **microbial flora** in soils  
Enhancing **bioavailability of nutrients**
- Reduce **acidity** in soils,  
Allowing restoration of fertility in degraded soils





# Who are we.

## OUR TEAM



**Yann Mercier**

*Co-founder – CEO*

- Inventor, developer and author of several patents on biological processes
- Multi-entrepreneur, co-founder of 2 other bioenergy companies



**Eric Suñol, PhD**

*Co-founder – COO/CFO*

- 20+ years of experience in energy and environment, investment banking, the Oil & Gas industry, strategic consulting and technology transfer.
- PhD in Economics



**Pierre-Yves Möcaer, PhD**

*CTO*

- Several years of experience in academic research and industrial R+D
- Self-taught in renewable energy
- PhD in Life Sciences and Biotechnology Engineer



**Marie André, PhD**

*R&D Manager*

- Several years of experience between academic research and industrial R+D in the fields of plant sciences and agronomy
- PhD in Plant Biology



**Frank Boucheron**

*Plant manager*

- 20 years of experience in farm management
- Expertise in Agricultural Tools and Automation
- Experienced agent in methanation operation and maintenance



## KEY ADVISORS



**Benito Vera**

*Strategy & Funding*



**Irini Angelidaki, PhD**

*Bioprocess & Bioindustry*



**Andrés Ponce**

*Thermochemistry & industrial pyrogasification*



**Clément Georget**

*Carbon Market and LifeCycle Analysis*



**Arthur Lacaine**

*Carbon and Biochar Market*  
10 years experience in consulting and start-up development  
Masters in law and Business management

## EXTERNAL



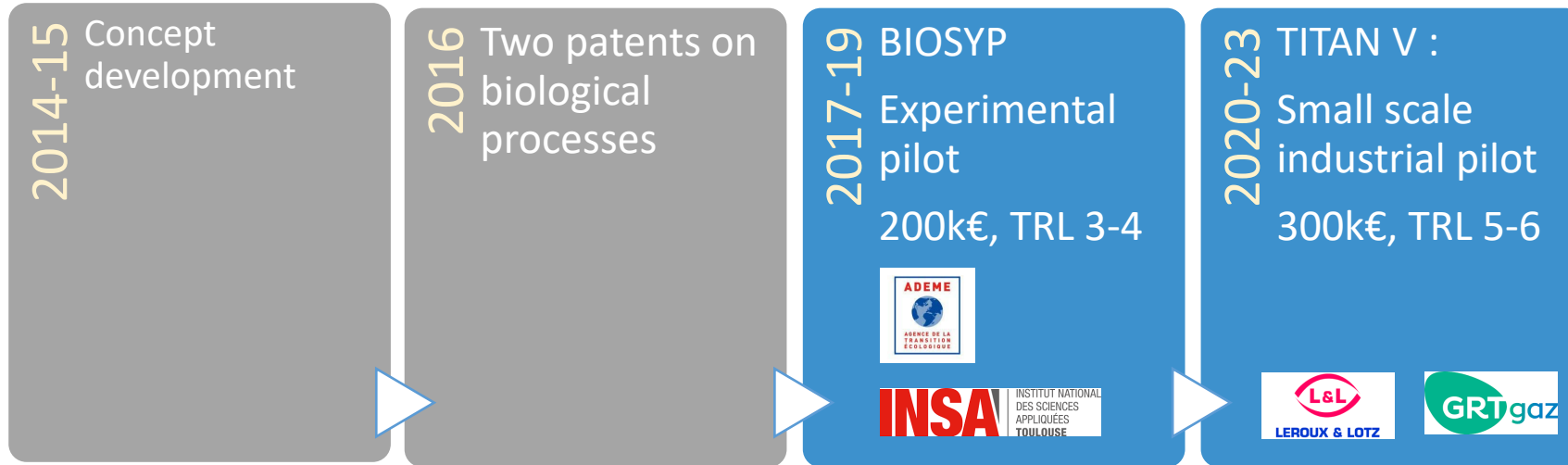


# Who are we.

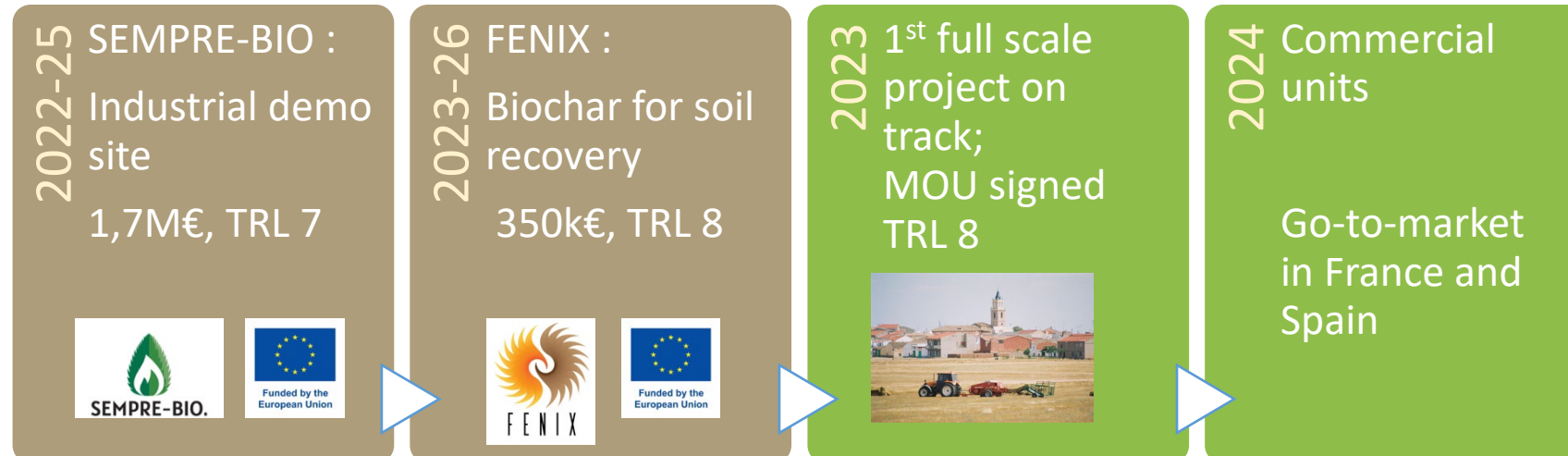
## OUR STORY



### Research & Development



### Industrial Demo Site & Go-to-market





# EU Funded Project

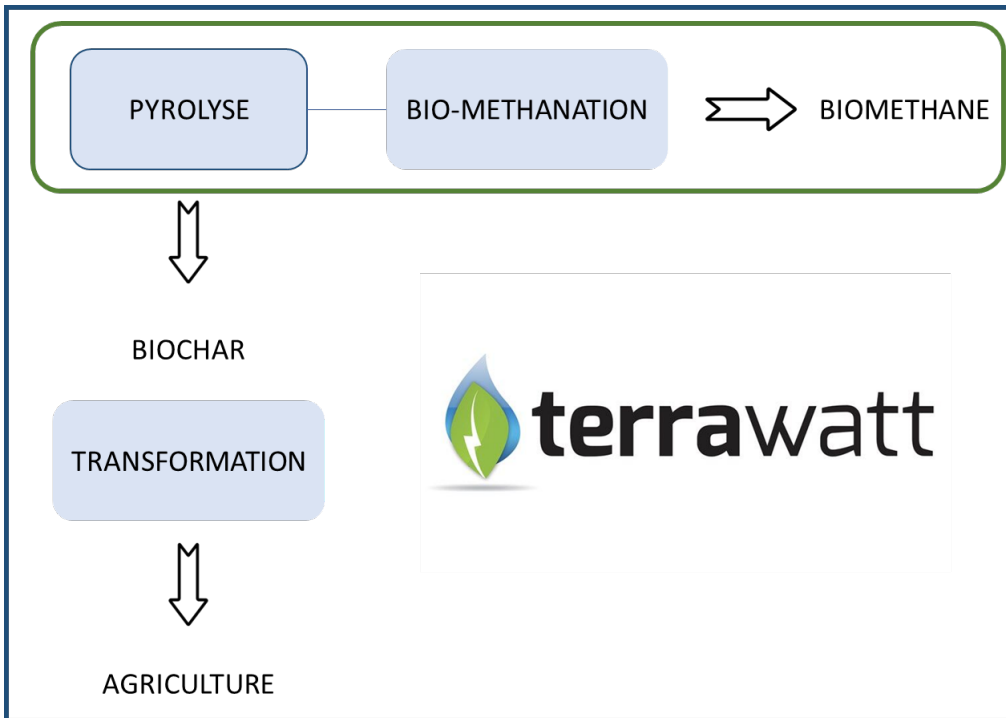
SEMPRE-BIO



European partners:	16
Including academics:	12
Global cost :	12 M€
To Terrawatt unit :	1,7 M€

**Objective** : To produce Biomethane from Green Waste

**Construction of a pre-industrial pilote on Marmagne Site**



**Use of green waste from the city of Bourges**  
800 t/y, potential of 10 000 t/y

**Ordering of a 150 kg/h pyrolysis kiln**



**Ordering of 200m3 bioreactors**





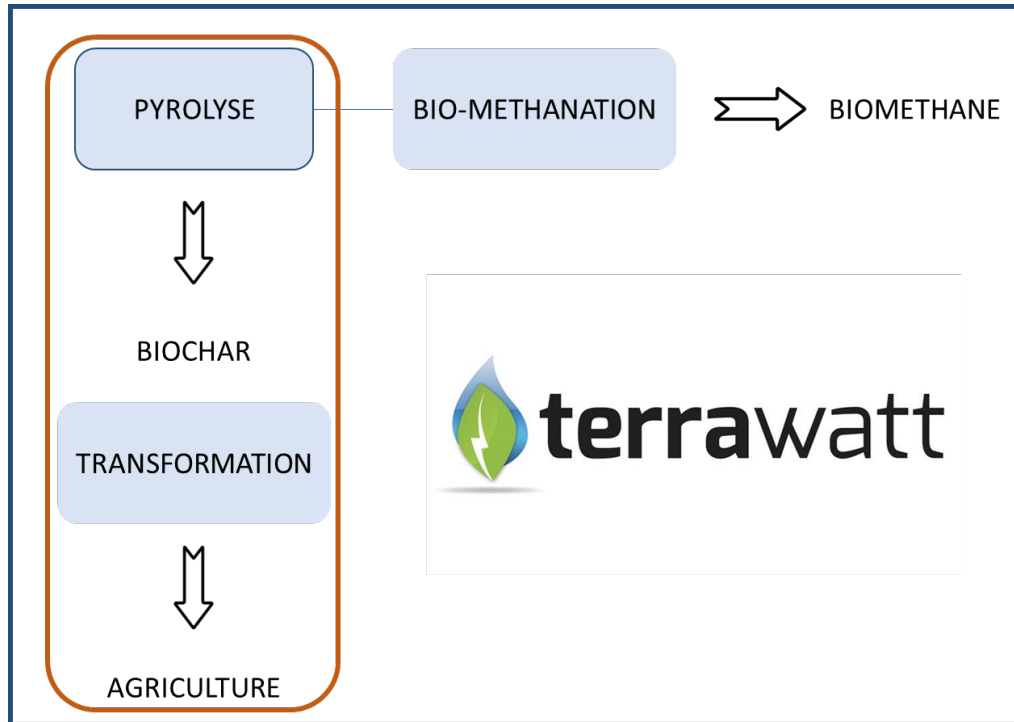
# EU Funded Project

FENIX



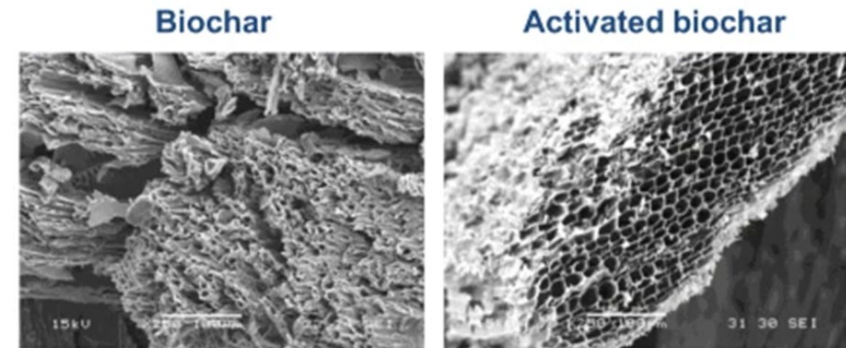
European partners:	9
Including academics:	7
Global cost :	2.6 M€
To TerraWatt :	348 k€

**Objective** : To produce a Biofertilizer from Green Waste for soil recovery



**Enhancement of biochar capabilities from SEMPRE-BIO project**

**Activation of Biochar by thermal treatment**  
Specific surface: from 5-30 m<sup>2</sup>/g to 500m<sup>2</sup>/g



**1 gram of activated biochar = 500m<sup>2</sup> of exchange surface**



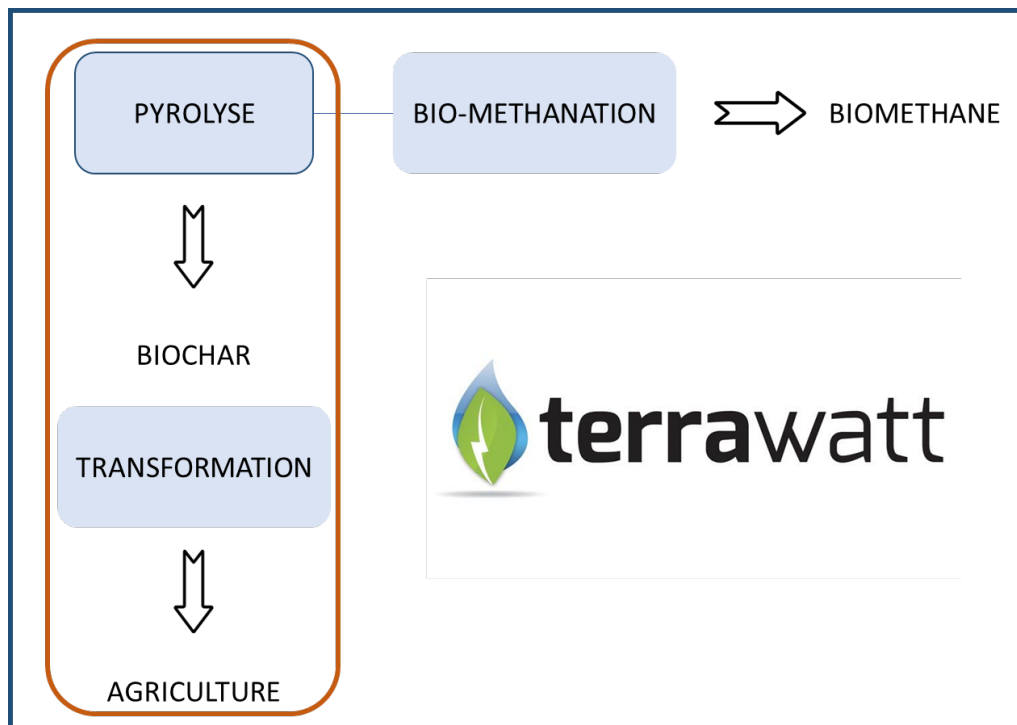
# EU Funded Project

FENIX



European partners:	9
Including academics:	7
Global cost :	2.6 M€
To TerraWatt :	348 k€

**Objective** : To produce a Biofertilizer from Green Waste for soil recovery



**Enhancement of biochar capabilities from SEMPRES-BIO project**

### Impregnation of biochar with AD plant digestate

Saturation of nutrients within biochar

Avoiding of « siphon effect » when spreading on crops

### Greenhouse study of biofertilizing effect

Growth measure of plants in several conditions

### Study of biofertilizing effect on agricultural crops

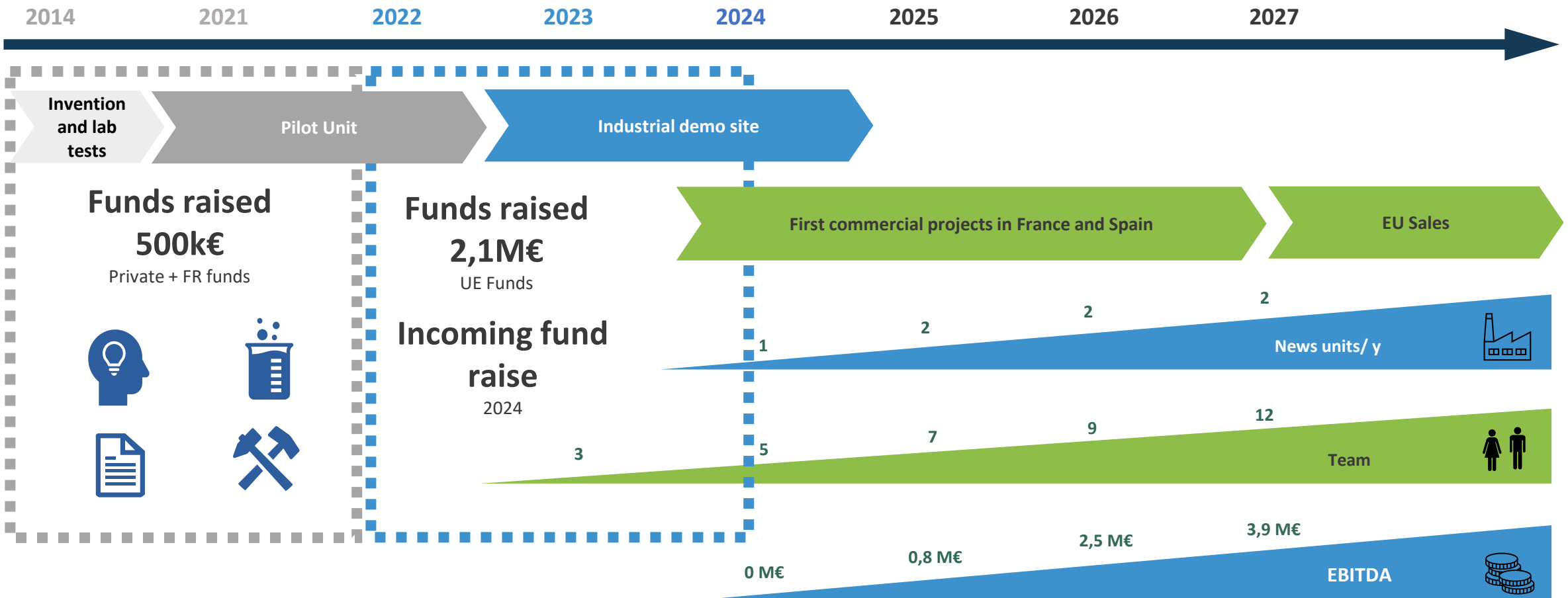
Trials on degraded crops within the Mediterranean perimeter (Spain, Greece, France,...)



# Development plan



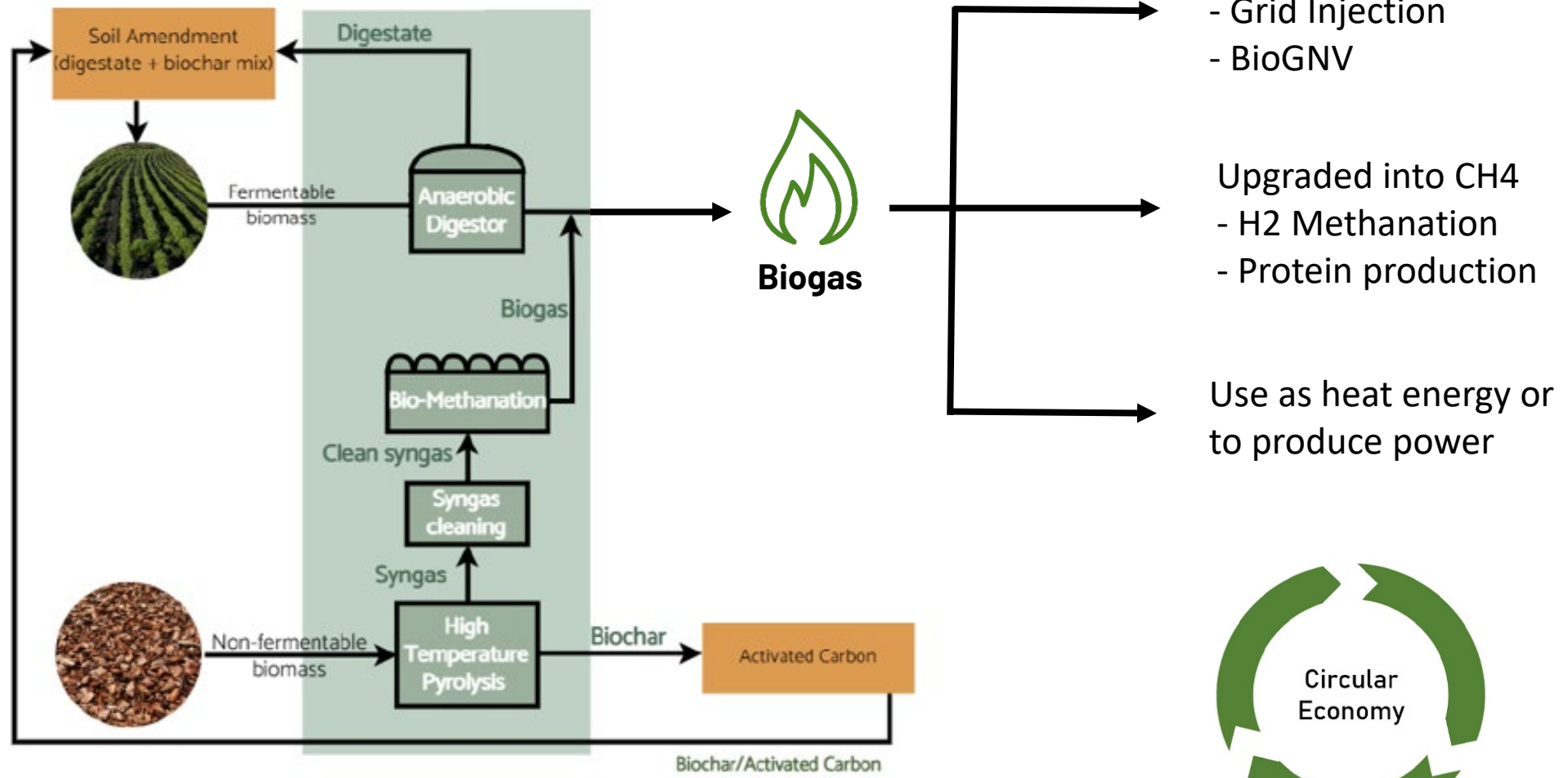
After reducing the technological risks with the launch of an industrial demonstrator, TerraWatt will launch its first commercial unit in 2025. TerraWatt has already received expressions of interest in financing its commercial projects from 2 European infrastructure funds committed to the environment and a low-carbon future.



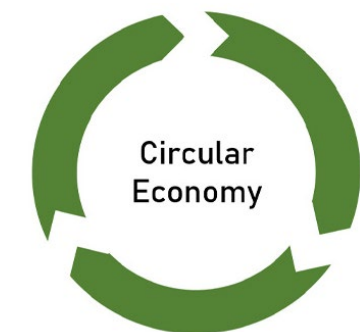


# Coupling Terrawatt's technology with AD plants

INCOMING PROJECTS



- Purified in Biomethane
  - Grid Injection
  - BioGNV
- Upgraded into CH4
  - H2 Methanation
  - Protein production
- Use as heat energy or to produce power





# terrawatt

Carbon that drives back climate change



**Pierre-Yves Mocaër**

Technical Director

py.mocaer@terrawatt.fr

Visit [www.terrawatt.earth](http://www.terrawatt.earth) !