

The SUNERGY logo consists of the word "SUNERGY" in a bold, white, sans-serif font. The letters are set against a horizontal rectangular background that features a color gradient from blue on the left to yellow on the right. The logo is positioned at the top center of the slide, partially overlapping a large, light blue, brush-stroke-like arc that curves across the top and left sides of the page.

SUNERGY

Fossil-free fuels & chemicals for a climate-neutral Europe

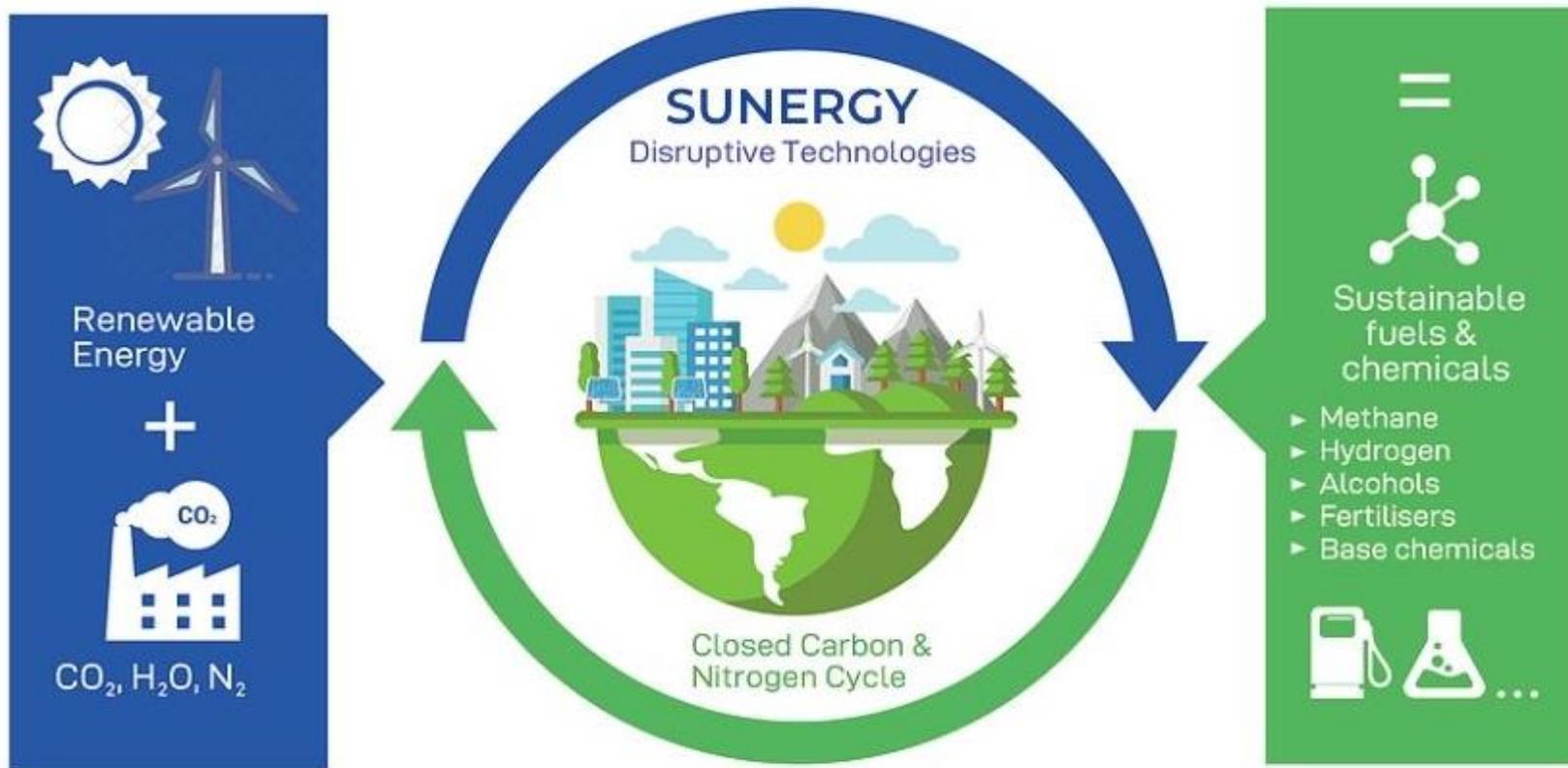
Bert Weckhuysen, Utrecht University, SUNERGY Coordinator

April 29, 2021

SUNERGY Vision



To enable a **circular economy** by making **fossil-free fuels, base chemicals for industry and agriculture**, and developing **negative CO₂ emission technologies** using **resources that are abundant in Europe** (renewable energies + CO₂, H₂O and N₂)



- ❖ Storage of renewable energy as liquid fuels
- ❖ Production of fossil-free base chemicals for industry and agriculture
- ❖ Development of technologies with a negative CO₂ footprint

SUNERGY S&T focus



Two main routes to convert renewable energy (sun, wind) to chemical form:

- **Renewable power conversion to fuels & chemicals:** electrochemical and thermochemical processes
- **Direct conversion of solar energy into fuels & chemicals:** photoelectrochemical approach, biological and bio-hybrid processes

Three key reactions

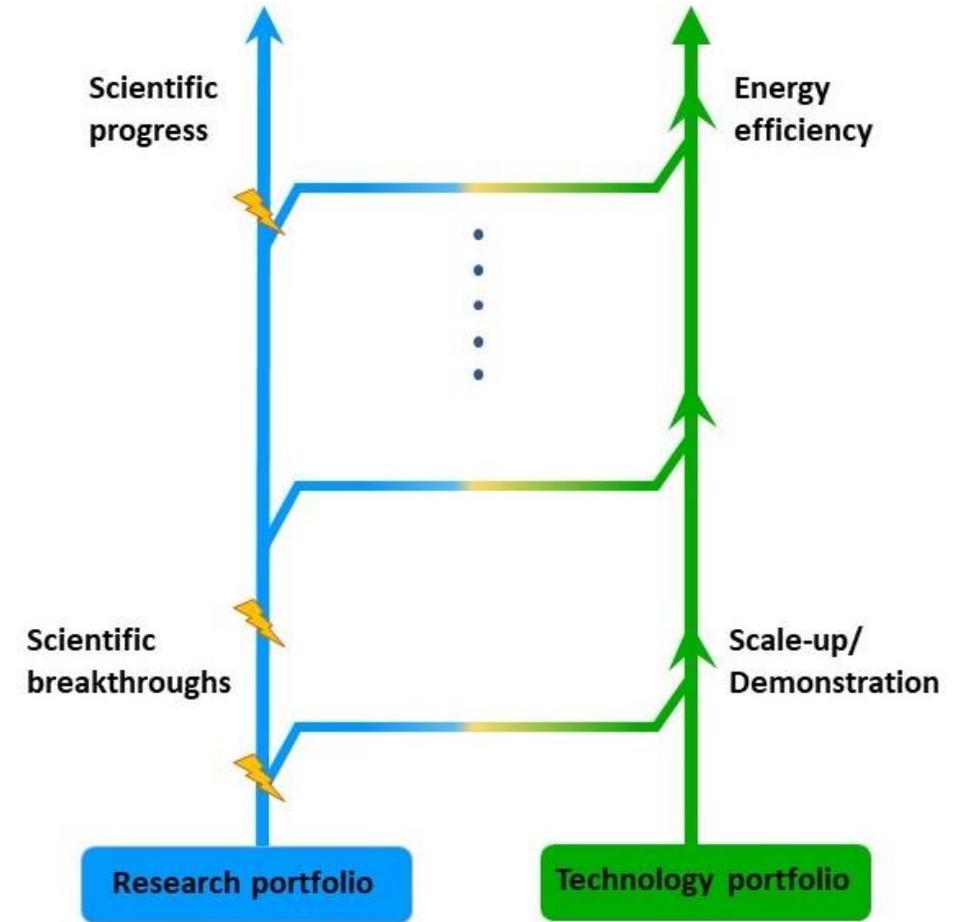
- Water splitting: $\text{H}_2\text{O} + \text{energy} \rightarrow \text{H}_2 + 1/2 \text{O}_2$
- CO_2 reduction: $\text{CO}_2 + \text{H}_2\text{O} + \text{energy} \rightarrow \text{CH}_x\text{O}_y + \text{O}_2$
- N_2 reduction: $\text{N}_2 + \text{H}_2\text{O} + \text{energy} \rightarrow \text{NH}_3 + \text{O}_2$

- **Science:** more efficient & durable materials based on abundant raw materials; more efficiently engineered bio-molecules and bio-organisms for light conversion; accelerated development of materials with tools of the numerical transition (HPC, AI and machine learning)
- **Scale-up:** efficient academic & industry collaboration and demonstration projects (fossil-free airport, decentralised production of fertilisers)

The need for a large-scale R&I initiative



- **Scientific breakthroughs** tightly coupled to **scale-up**
- **Multipronged attack**
 - We need to employ a vast array of scientific tools and approaches
 - We need to link academia, industry, society & policy
- Sustainable and coherent framework to support large-scale collaboration along the whole value-chain, leading to a **pan-European platform** for sustainable fuels & chemicals, to the benefit of Europe's industry and citizens alike



The path to a large-scale R&I initiative



Ramp-up phase:

- Coordination, community building, roadmapping
- Implementing the SUNERGY roadmap
- Portfolio of projects (RIAs + IAs), CSA as a 'glue' (Green Deal 2020 call, Horizon Europe)

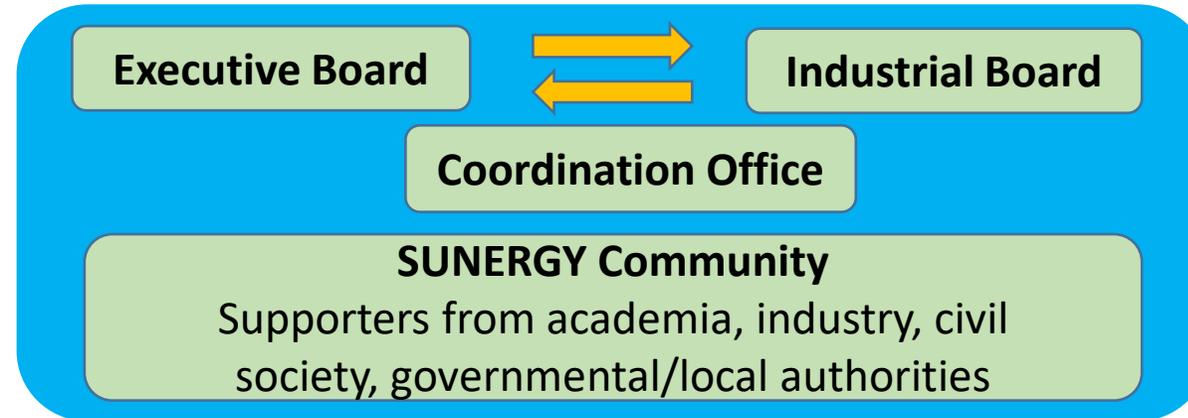
Large-scale R&I initiative



Current organisation



Coordinator:
Bert Weckhuysen
(Utrecht University)



Deputy Coordinator:
Frédéric Chandezon (CEA)

Chair, Industry Board:
Maximilian Fleischer
(Siemens)

+ **Advocacy Working Group, Advocacy network at national level, Strategic Research & Innovation Agenda (SRIA) Working Group** (working on SUNERGY SRIA outline)

Events



- National workshops
- Industry webinars
- Brokerage events for Horizon Europe
- A policy event by end 2021 (hopefully a physical event in Brussels)



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