

SUSTAFUELS

THREE EUROPEAN SOLUTIONS WORKING ON ALGAL AND RENEWABLE FUELS

JOINT WEBINAR RECORDING

MAY 21, 2024 | 12:00 – 13:00 (CET)



These projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements No. 861960, 101122101 and 101122151. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.





CONCEPT

Sustafuels is a cluster to promote eu projects in the framework of algal and renewable fuels

AMBITION

The idea behind the cluster is to explore synergies and collaborations to maximise efforts and impacts

EU PROJECTS



alfafuels



COCPIT



Fuølgae

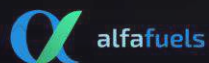
WEBINAR AGENDA AND NOTICES

SUSTAFUELS

THREE EUROPEAN SOLUTIONS WORKING ON
ALGAL & RENEWABLE FUELS

AGENDA | May 21, 2024 | 12:00 - 13:00 (CET)

TIME	TITLE
12:00 - 12:05	Welcome Pablo Morales Moya, Sustainable Innovations
12:05 - 12:15	The role of CINEA Agency Javier Sánchez López, Project Officer, CINEA
12:15 - 12:30	ALFAFUELS Charis Xiros, RISE
12:30 - 12:45	COCPIT Sary Awad, IMT Atlantique
12:45 - 13:00	FUELGAE Silvia Morales de la Rosa, CSIC
13:00 - 13:05	Q&A



ONLINE WEBINAR

SUSTAFUELS:

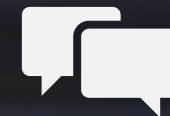
THREE EUROPEAN SOLUTIONS WORKING ON ALGAL AND RENEWABLE FUELS



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recorded



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microphone is muted



Use the chat function to
enter your questions



SUSTAFUELS, three European solutions working on algal & renewable fuels

The role of CINEA

Online webinar

21 May 2024

Javier SANCHEZ LOPEZ

Project adviser- Unit C.2 – Horizon Europe Energy

C2.1 – Bioenergy, Fuels and CCUS

European Climate, Infrastructure and Environment Executive Agency

Outline

1

General overview on EC / CINEA / Horizon Europe

2

HE algal fuels-related projects

3

Interesting resources

European Green Deal



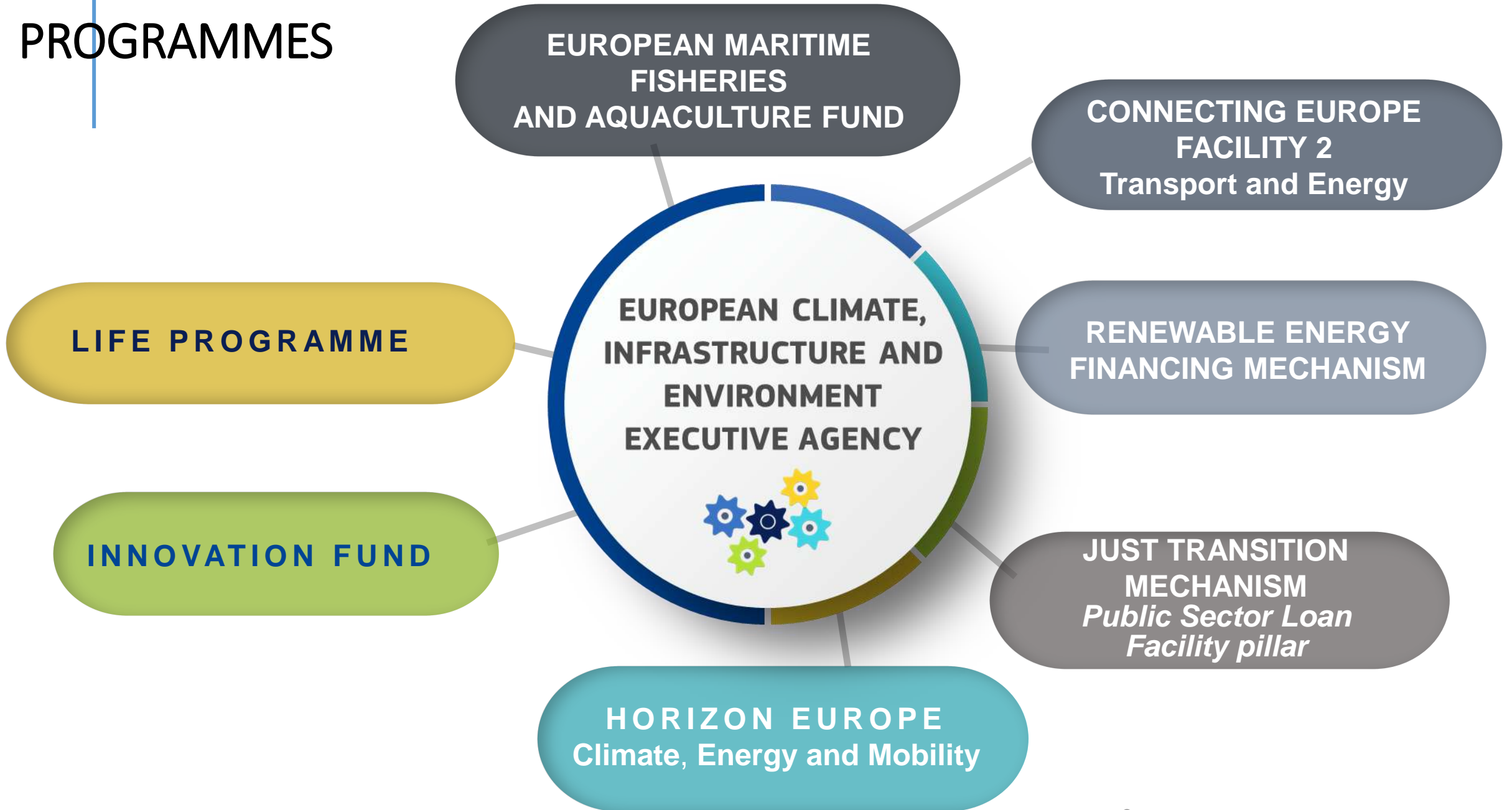
- Implementing the new portfolio will support the **European Green Deal** - the roadmap for making the EU's economy **sustainable**
- Aiming to boost the efficient use of resources by moving to a clean circular economy, restore biodiversity, cut pollution, and achieve **climate neutrality by 2050**

CINEA - Making implementation happen



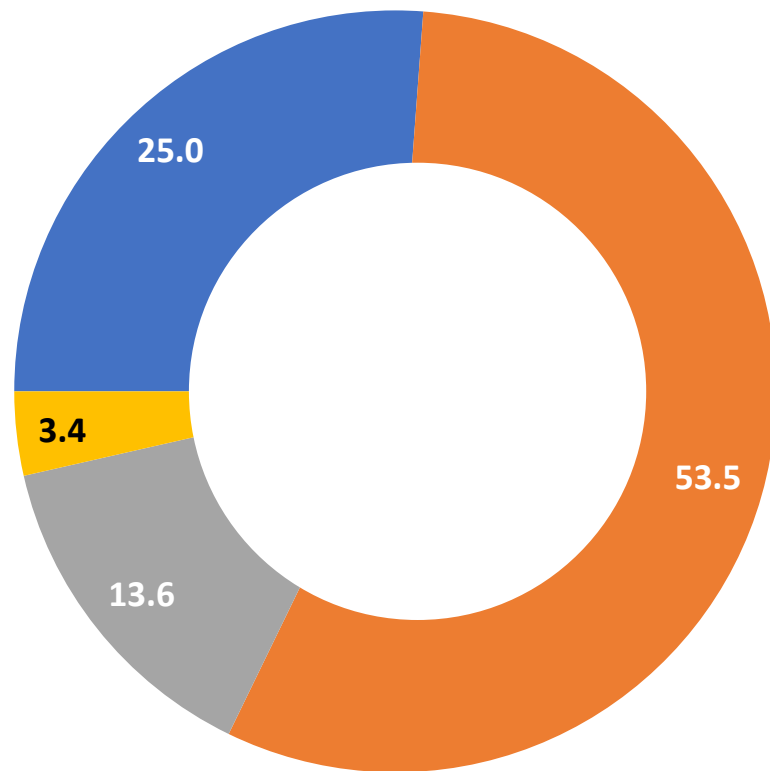
- Implementing EU funding for **transport, energy, climate**
- **8+ years of experience: managing calls, financing/monitoring projects**
- Now managing around 1,200 projects
- With around **500 expert staff** of 28 different nationalities
- **Striving to: support applicants, improve/speed-up procedures, use high-quality evaluators, follow up implementation, create partnerships with beneficiaries, increase visibility, give feedback for policymaking**
- **Ensuring 100% respect of deadlines**

PROGRAMMES



Horizon Europe budget: €95.5 billion (2021-2027)

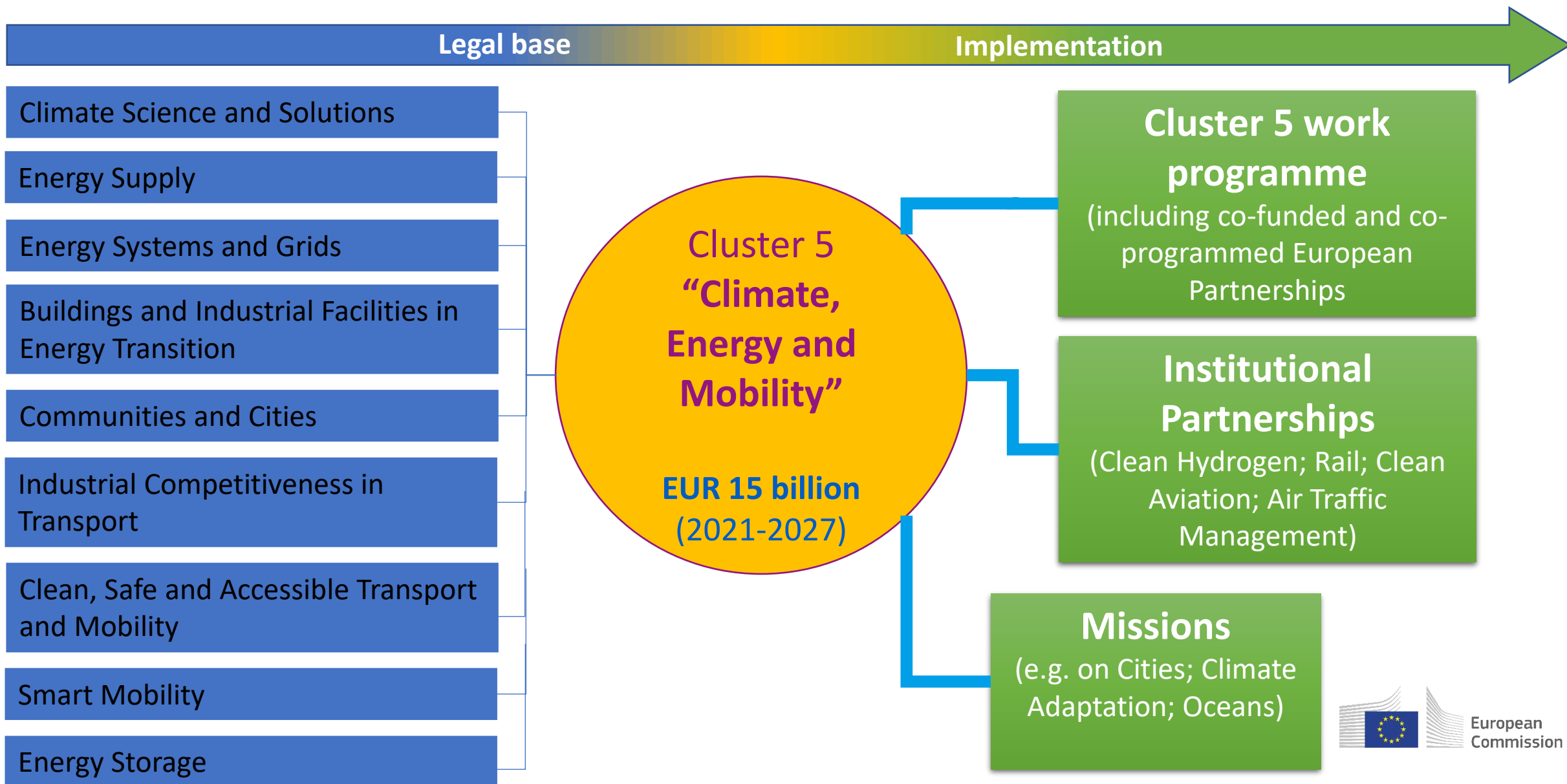
(Including €5.4 billion from NGEU – Next Generation Europe – programme of EU for Recovery from COVID-19 crisis)



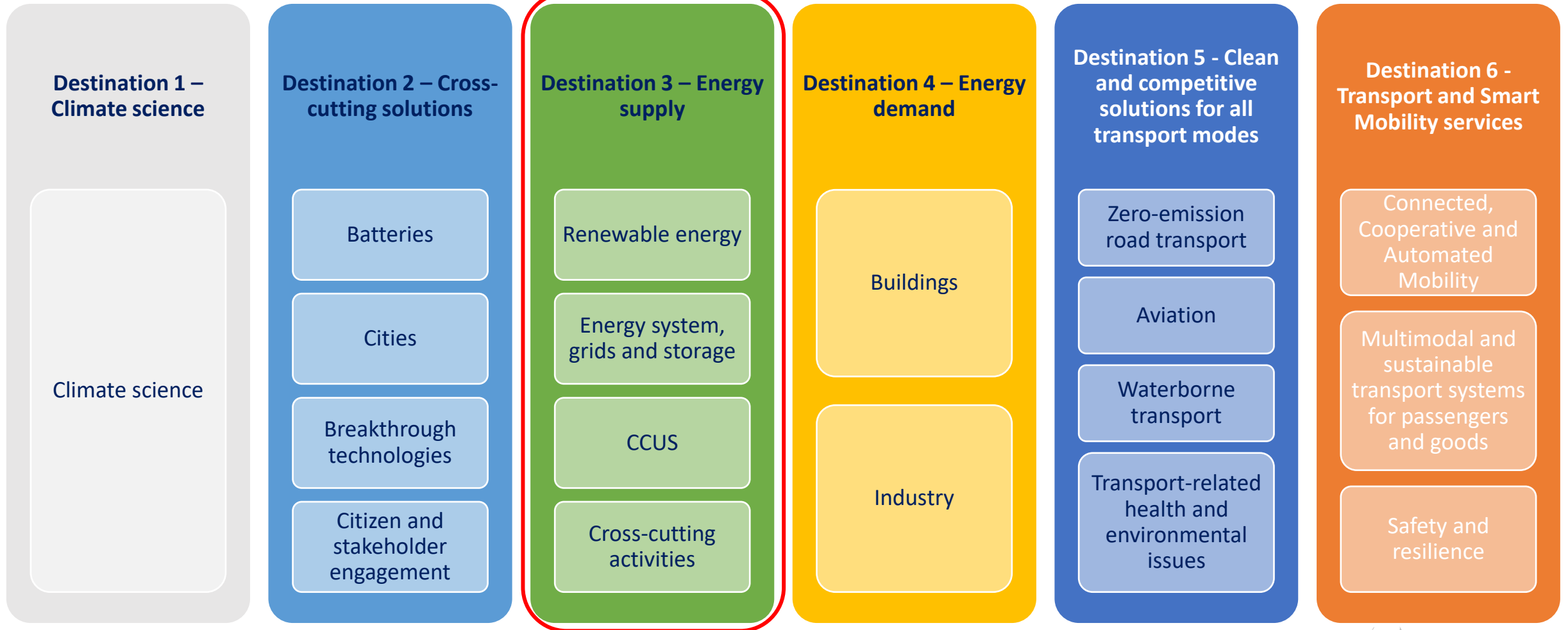
Political agreement December 2020 *€ billion in current prices*

- Excellent Science
- Global challenges and European Industrial Competitiveness
- Innovative Europe
- Widening Participation & Strengthening the European Research Area

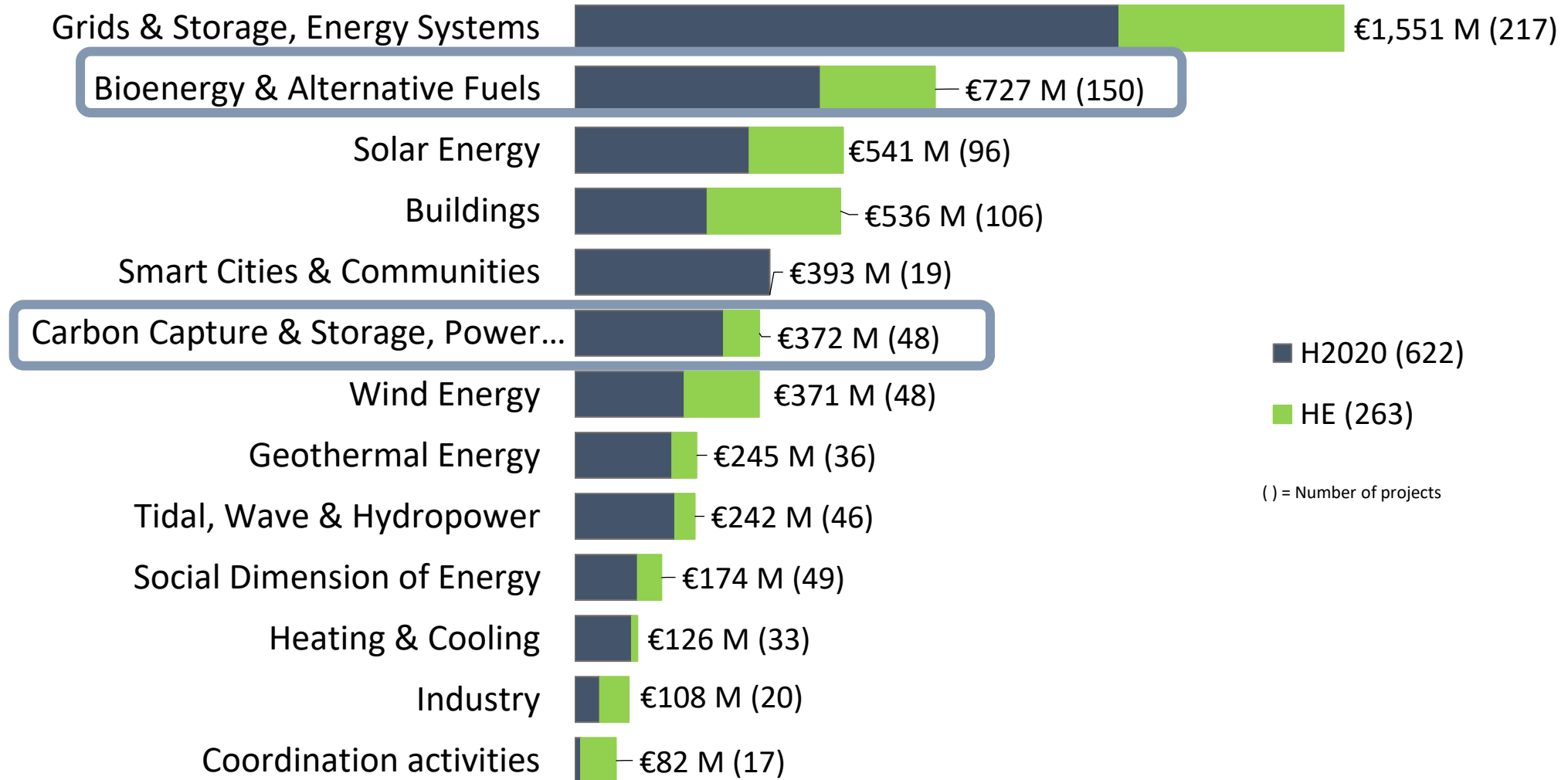
Cluster 5 - Overview



Cluster 5 Work programme – overview



Horizon Energy Projects (885 projects, € 5.47 billion)



HORIZON EUROPE – ALGAE

ALFAFUELS: SUSTAINABLE JET FUELS FROM CO₂ BY MICRO-ALGAL CELL FACTORIES IN A ZERO WASTE APPROACH

HORIZON-CL5-2022-D3-03-07 (RIA)

Development of algal and renewable fuels of non-biological origin

Start date: 01/01/2024 - 31/12/2027

Budget: € 4,799,457

<https://alfafuels.eu/>



HORIZON EUROPE – ALGAE

COCPIT: sCalable solutions Optimisation and decision tool Creation for low impact SAF Production chain from a lipid-rich microalgae sTrain

HORIZON-CL5-2022-D3-03-07 (RIA)

Development of algal and renewable fuels of non-biological origin

Start date: 01/10/2023 – 30/09/2027

Budget: € 4,999,497

<https://www.cocpit-horizon.eu/>



HORIZON EUROPE – ALGAE

FuelGae: Sustainable On-site and Innovative Technologies for Advanced Transport BioFuels from MicroalGae

HORIZON-CL5-2022-D3-03-07 (RIA)

Development of algal and renewable fuels of non-biological origin

Start date: 01/10/2023 – 30/09/2027

Budget: € 4,990,123

<https://fuelgae.eu/>



HORIZON 2020 – ALGAE

PRODIGIO: Developing early-warning systems for improved microalgae PROduction and anaerobic DIGestION

LC-SC3-RES-1-2019-2020 (RIA)

Developing the next generation of renewable energy technologies

Start date: 01/01/2021 - 30/06/2024

Budget: € 2,452,941.25

<https://prodigio-project.eu/>



HORIZON EUROPE – ALGAE

SUSTEPS: Sustainable, secure and competitive energy through scaling up advanced biofuels generation

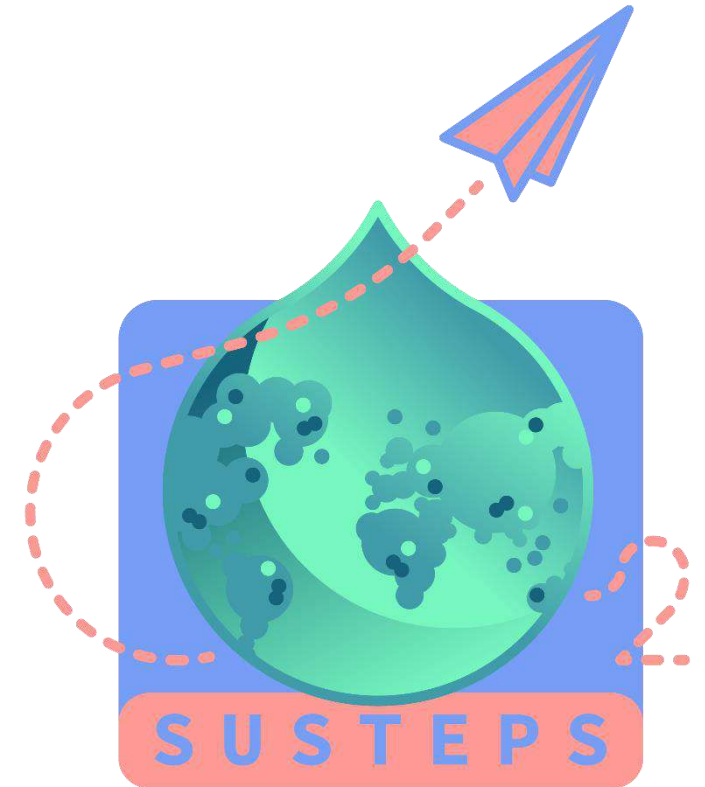
HORIZON-CL5-2022-D3-03-02: (RIA)

Best international practice for scaling up sustainable biofuels

Start date: 01/09/2023 - 31/08/2027

Budget: € 2,999,536

<https://susteps.eu/>



HORIZON EUROPE – ALGAE

FLEXBY: Flexible and advanced Biofuel technology through an innovative microwave pYrolysis & hydrogen-free hydrodeoxygenation process

HORIZON-CL5-2023-D3-02-07: (RIA)

Development of next generation advanced biofuel technologies

Start date: 01/05/2024 - 30/04/2028

Budget: € 3,993,682

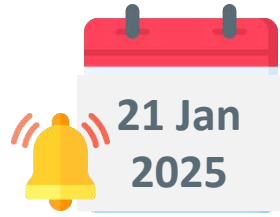
EU4Algae

EU4Algae

- February 2022-January 2025
- European algae stakeholder forum (> 800 members)
- Website and online community
- Business corner – funding calls
- Knowledge corner
- Projects repository
- Events, jobs etc

The image shows a screenshot of the EU4Algae website interface. At the top, there is the European Commission logo and the text 'MARITIME FORUM'. Below this is a navigation bar with the breadcrumb 'European Commission > Maritime Forum > Blue economy > Blue Bioeconomy > EU4Algae'. The main content area features a large banner image of seaweed with the text 'EU4Algae' overlaid. Below the banner is a grid of six icons representing different themes: Macroalgae Production, Microalgae production, Algae for Food, Algae for Feed, Ecosystem Services & Bioremediation, and Materials, Chemicals, Bioactives & Algae Biorefining. To the right of the bottom row of icons is a link for 'Youth & Entrepreneurship'. Below the website screenshot is a map of Europe with numerous blue location pins indicating the presence of stakeholders or projects across various countries.

Funding opportunities



[HORIZON-CL5-2024-D3-02-03](#) Development of smart concepts of integrated energy driven bio-refineries for co-production of advanced biofuels, bio-chemicals and biomaterials

*“Conversion of biogenic wastes and residues as well as **algae and aquatic biomass** through chemical, biochemical, electrochemical, biological, thermochemical pathways or combinations of them in highly circular processes **are in scope**”*

Planned opening date
17 September 2024

Deadline date
21 January 2025

Thank you



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ALFAFUELS

SUSTAINABLE JET FUELS FROM CO₂ BY MICRO-ALGAL CELL FACTORIES IN A
ZERO-WASTE APPROACH

Charis Xiros

21-05-2024

Sustafuels Webinar



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101122224



The ALFAFUELS team

14 participants, 8 RTDs, 5 SMEs, 1 IND, 8 Countries

Organization

RISE Processum

Uppsala University

Uppsala University

Uppsala University

University of Potsdam

Sustainable Innovation

Idener Research and Development A.I.E.

Technical University of Denmark

KU Leuven

Fotosintetica & Microbiologica S.r.l.

University of Florence

University of Copenhagen

AddScience

E3M

ENI SpA

SKYNRG

Field/expertise

Biotech & Chemistry, Product recover Upscaling

Cyanobacteria

Microalgae, Hydrogen & Starch production

Photochemistry

Metabolic modelling

Communication, exploitation

Process modelling, TEA

Microalgae, extractions

Process modelling, bioreactor design

Bioreactor design & manufacturing

Photobioreactors design, microalgae research

Sustainability assessments

Products recovery, Analytics

Modelling, Market, Exploitation

Industrial integration

Quality evaluation, Exploitation

Responsible

Charis Xiros, Tomas Gustafsson

Pia Lindberg, Karin Stensjö

Dimitris Petroutsos

Henrik Ottosson, Haining Tian

Zoran Nikoloski

Pablo Morales, Miguel Galardo

Maria Lopez Abelairas

Charlotte Jacobssen

Jan Van Impe

Fillipo Bacci

Liliana Rodolfi

Marianne Thomsen

Johan Engelbretsson

Giannis Giannelos, Panagiotis Fragkos

Andrea Lainati

Oskar Meijerink

The ALFAFUELS concept

The problem

- Need for commercialisation of renewable and sustainable aviation fuels with zero GHG emissions
 - Liquid biofuels seem the only viable solution, but availability and cost of biomass feedstock are barriers
 - Scaling-up of biological conversion of CO₂ to fuels is challenged by microbial growth, harvesting, DSP
-

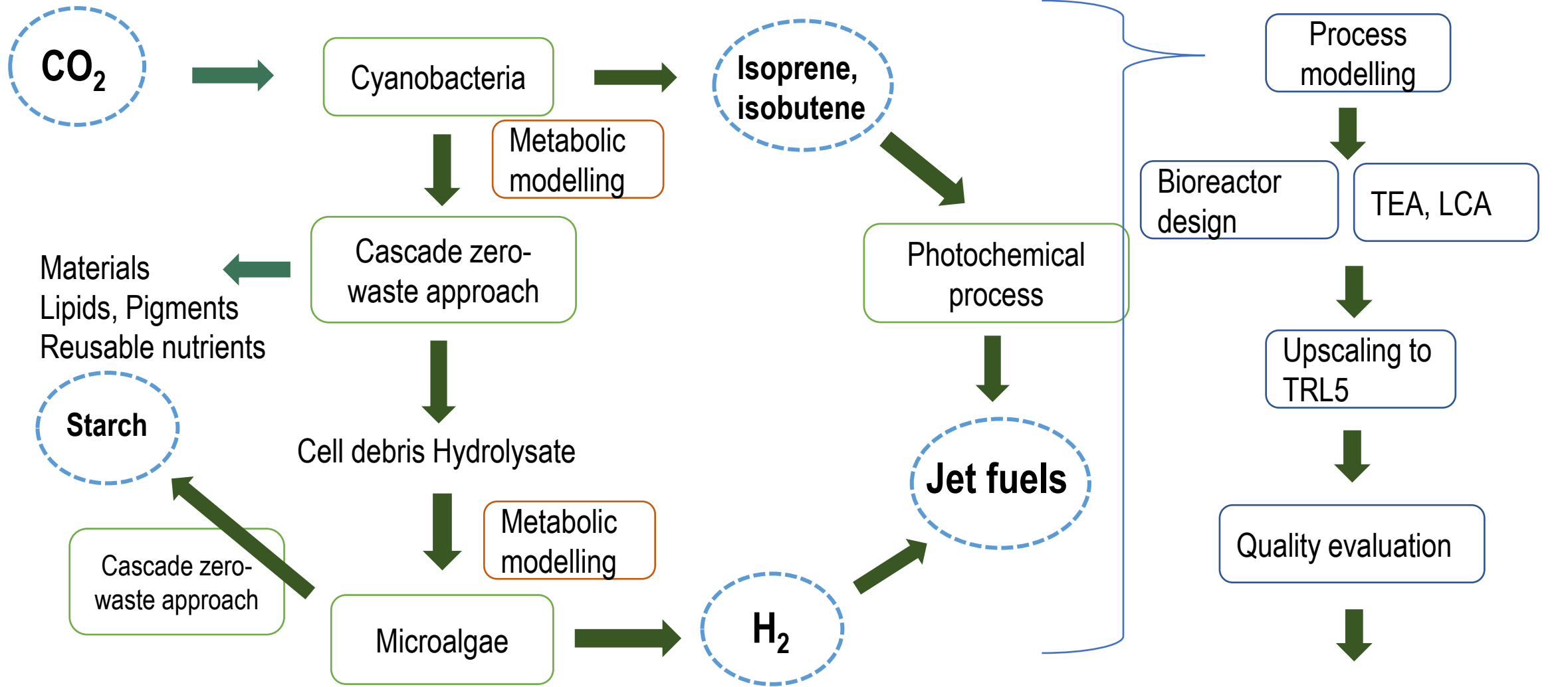
The ALFAFUELS solution

- Volatile hydrocarbons could enable microalgae and cyanobacteria as fuel producers
 - Circularity
 - Co-production of added value products
 - CO₂ as the unique carbon source
 - Process modelling and Bioreactor design to optimise (regarding yields, costs and sustainability) & upscale the process
-

The outcome:

- Production of new knowledge/microbial hosts/models
- Technology upscaled to TRL5
- Proof of concept for the developed value chains demonstrating a “zero-waste” process
- Market uptake analysis/ CO₂ mapping/ implementation roadmap

The solution: ALFAFUELS Project concept



Market uptake analysis, Balance demand and supply of carbon dioxide, geolocation of CO2 storage facilities, Roadmap to implementation

Technical developments, modelling & evaluations

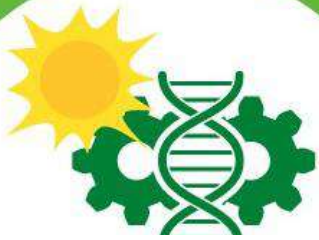


Photo-bioconversion of CO₂ to Volatile hydrocarbons

- Metabolic modelling
- Strain development
- Photo-bioconversion of CO₂ to isoprene

Co-production of Hydrogen, starch and value added products

- Zero-waste cascading valorisation of cell components
- Hydrolysis of cell debris
- Bioconversion of the hydrolysate to Hydrogen and Starch by microalgae



Hydrocarbons recovery & Photochemical dimerization

- Separation and quantification of isoprene
- Development of energy-transfer photocatalysts
- Isoprene dimerization and hydrogenation

Model based process optimization and upscaling

- Process modelling
- Bioreactor design and optimisation
- Combined LCA-TEA
- Upscaling to TRL5
- Product evaluation
- Market uptake
- CO₂ mapping
- Implementation



Key points to lift the technology readiness level (TRL)

Unique selling points

- Jet fuels produced from CO₂ as the only carbon feedstock
- Photobiological production of a volatile hydrocarbon
- Cascade valorisation

Breakthroughs

- Novel cyanobacteria cell factories to produce isoprene
- Upgrade isoprene to jetfuels using novel energy-transfer photocatalysts
- Novel microalgae cell factories to produce H₂ and starch

Sustainability

- Cost effective DSP based on volatile precursor
- Novel reactor design
- Combined LCA and TEA
- Cheap, available feedstock
- Climate neutrality
- Circular, zero-waste co-production of added value products

Scaling up

- Up-scaling at TRL5
- Market uptake analysis
- Balance demand and supply of CO₂ emissions (challenges and opportunities)
- CO₂ storage model
- Full balancing of carbon (economy & energy system)
- Roadmap to implementation

Website

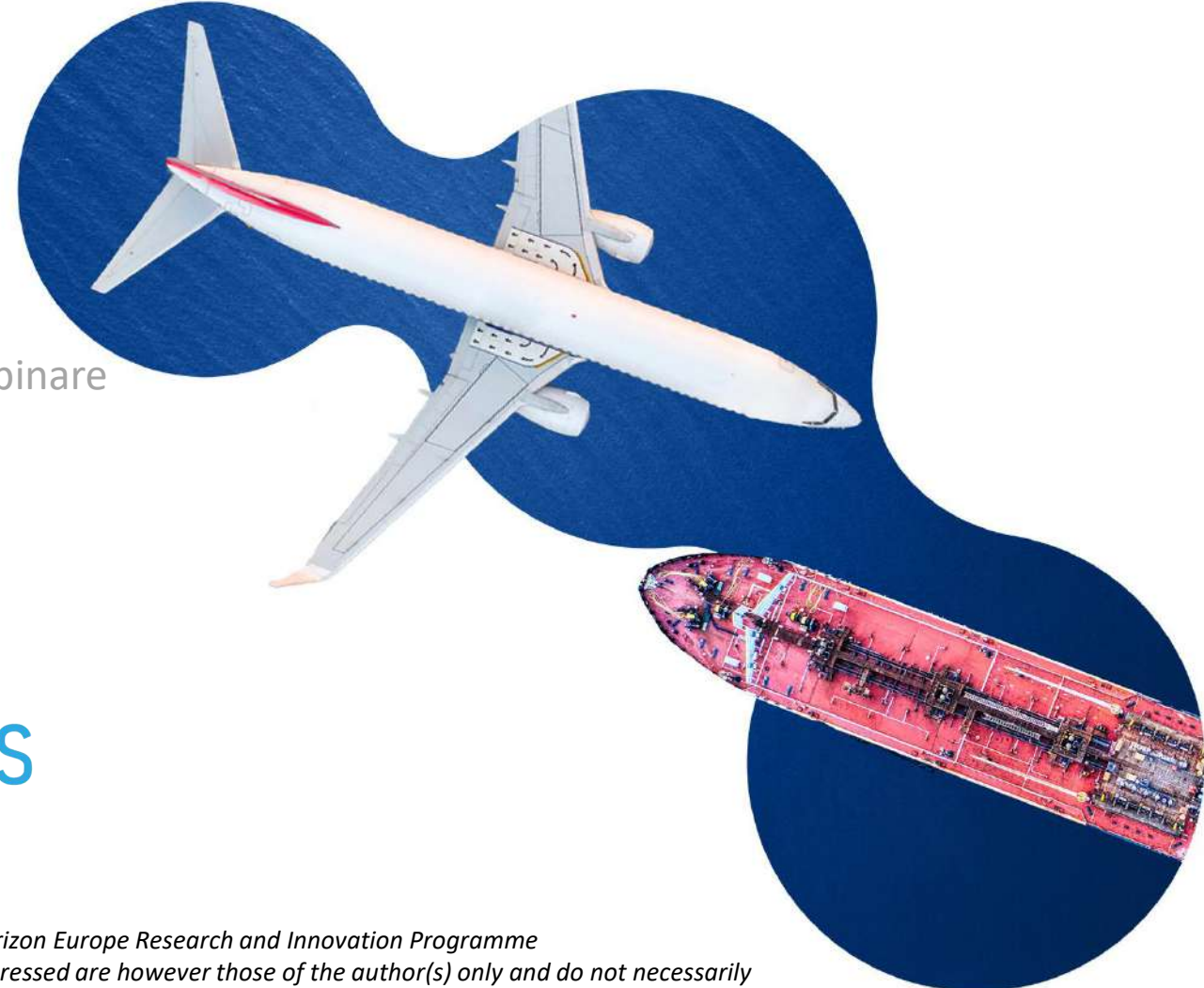
The screenshot shows the homepage of the website <https://alfafuels.eu/>. The page features a large, stylized logo consisting of a blue Greek letter alpha (α) with a green leaf-like shape integrated into its right side. Below the logo, the word "alfafuels" is written in a blue, sans-serif font. Underneath the company name, the text "Sustainable jet fuels from CO₂ by micro-algal cell factories in a zero-waste approach" is displayed in a white, sans-serif font. The background of the page is a photograph of a blue sky with white clouds and the top edge of an airplane wing.

The screenshot shows the LinkedIn profile page for ALFAFUELS. The profile header includes the company name "ALFAFUELS" and the tagline "Sustainable jet fuels from CO₂ by micro-algal cell factories in a zero-waste approach." Below the header, it indicates that the company has 203 followers and 11-50 employees. A section titled "Marie-Louise & 23 other connections follow this page" is visible, along with a "Following" button. The navigation menu includes "Home", "About", "Posts", "Jobs", and "People". The "Overview" section provides a detailed description of the company's mission and funding, stating that it is a Horizon Europe project funded by the European Union under grant agreement N° 101122224. The "Website" field lists www.alfafuels.eu, and the "Industry" is listed as "Environmental Services". The "Company size" is noted as "11-50 employees".

COCPIT Project

Prepared by:
Sary AWAD

May 21st 2024
SUSTAFUELS First Webinare



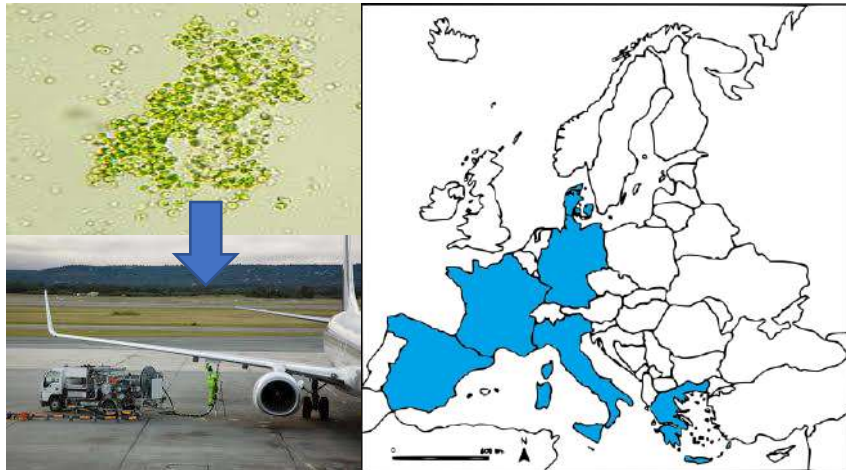
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COCPIT in a glance



48 Months (01/10/2023 – 30/09/2027)

Scalable solutions optimisation and decision tool creation for low impact SAF production chain from lipid-rich microalgae strain



11 Partners

6 EU Countries

5 M€

cocpit-horizon.eu

 COCPIT_Project

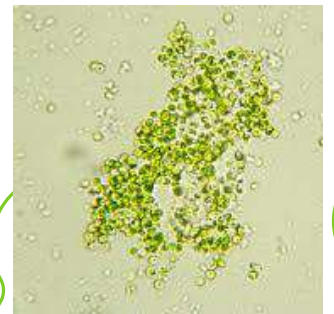
 COCPIT Project



Challenges Tackled by COCPIT



- **Feedstock limitation**
- **SAF blending limitations**
- **Production costs and Process circularity**
- **System robustness and versatility towards SAF & Shipping fuels production**
- **Flexibility and adaptation to different scenarios**
- **Contributing to SAF uptake through decision making tools**



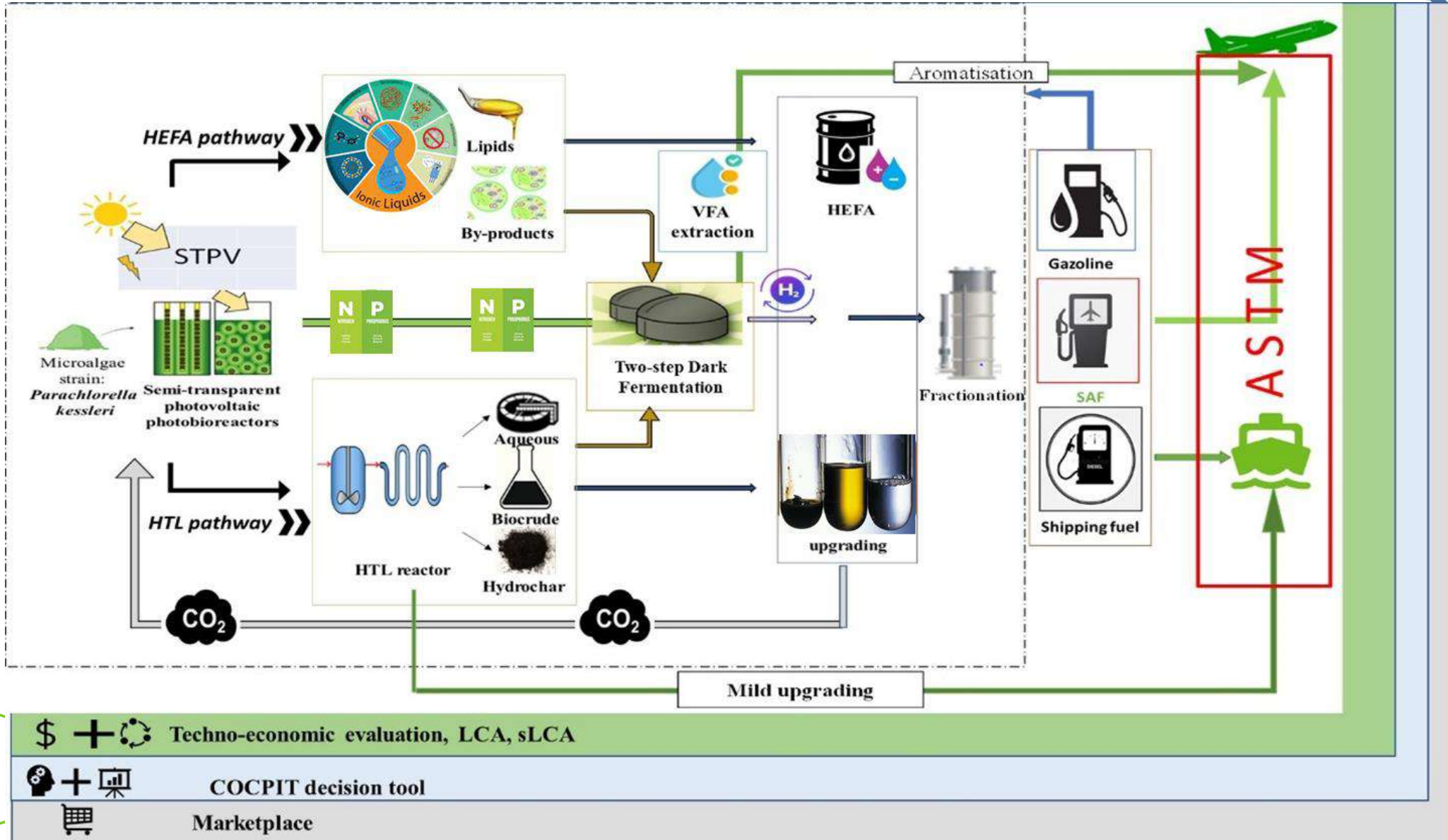
COCPIT's Objectives



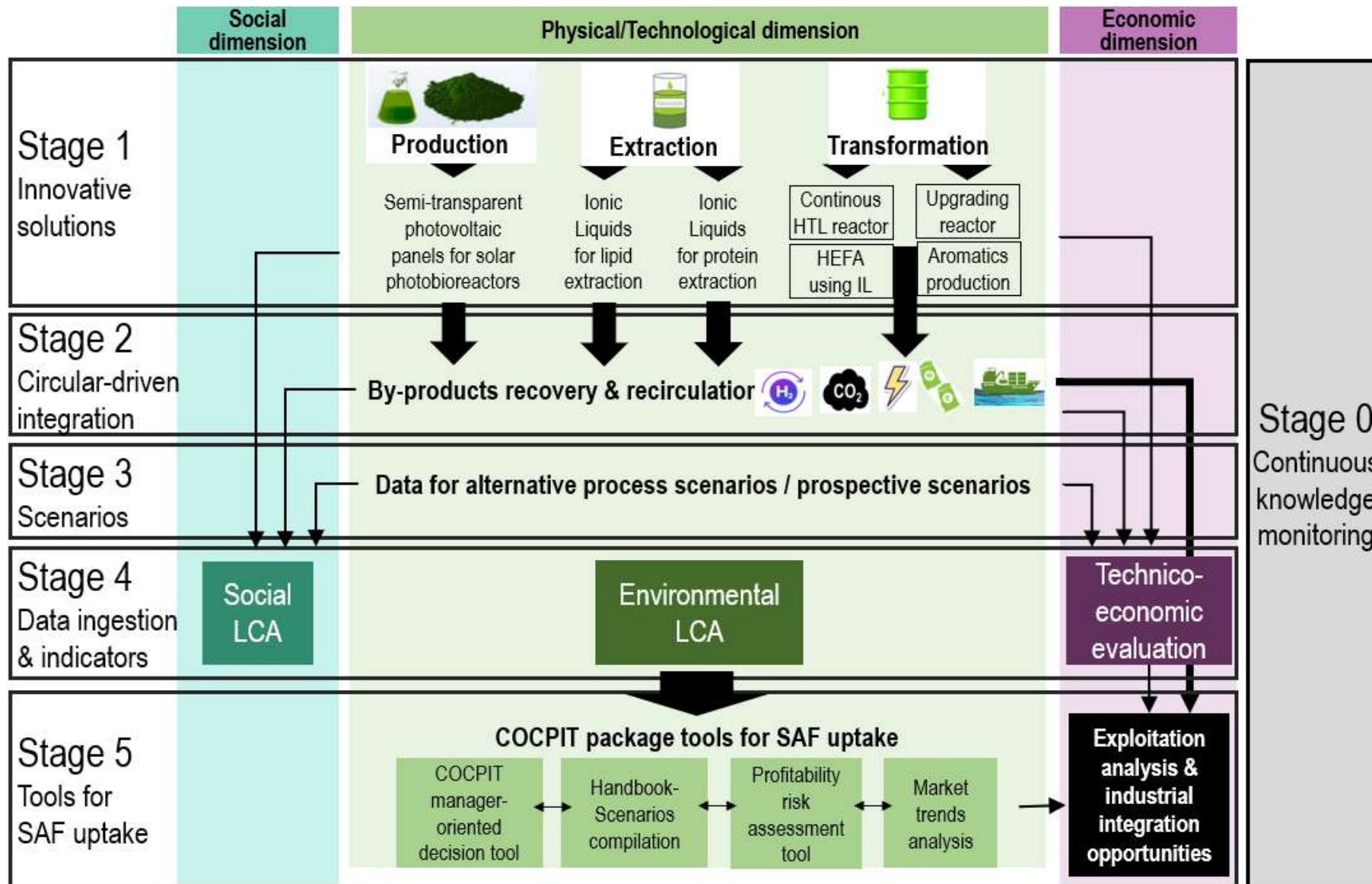
- **Increasing microalgal feedstock and enhancing sunlight conversion efficiency**
- **Applying the biorefinery concept on HEFA and HTL Pathways**
- **Certifying algal HTL-Hydrotreatment pathway**
- **Increasing flexibility between SAF and Shipping fuels production**
- **Providing a fully circular, cost-effective and sustainable design by integrating the process within the installation and within its environment**
- **Testing prospective scenarios covering different possibilities open to investors**
- **Compiling the prospective scenarios and developing the COCPIT decision tool**



COCPIT Concept



COCPIT Over all methodology



Innovative solutions

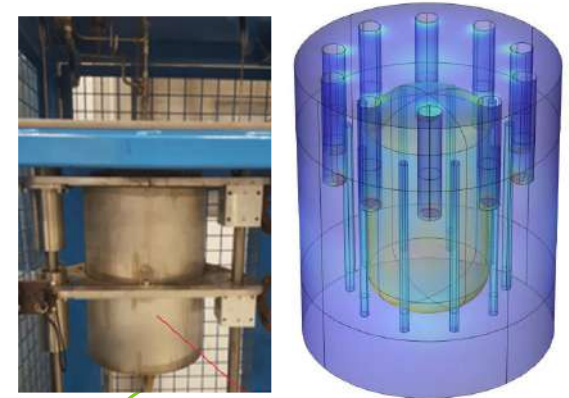
Innovations will be tested at TRL5 at the end of the project

- **80 m² intensified (thin film) photobioreactor (Algofilm) for microalgae production**
- **10 m² of Algofilm coupled to innovative organic photovoltaic films**
- **A semi continuous IL-based extraction unit**
- **HTL reactor fully tailored to microalgae processing**
- **Multiphysics modelling-based design tool**
- **Biocrude hydrotreatment continuous reactor**

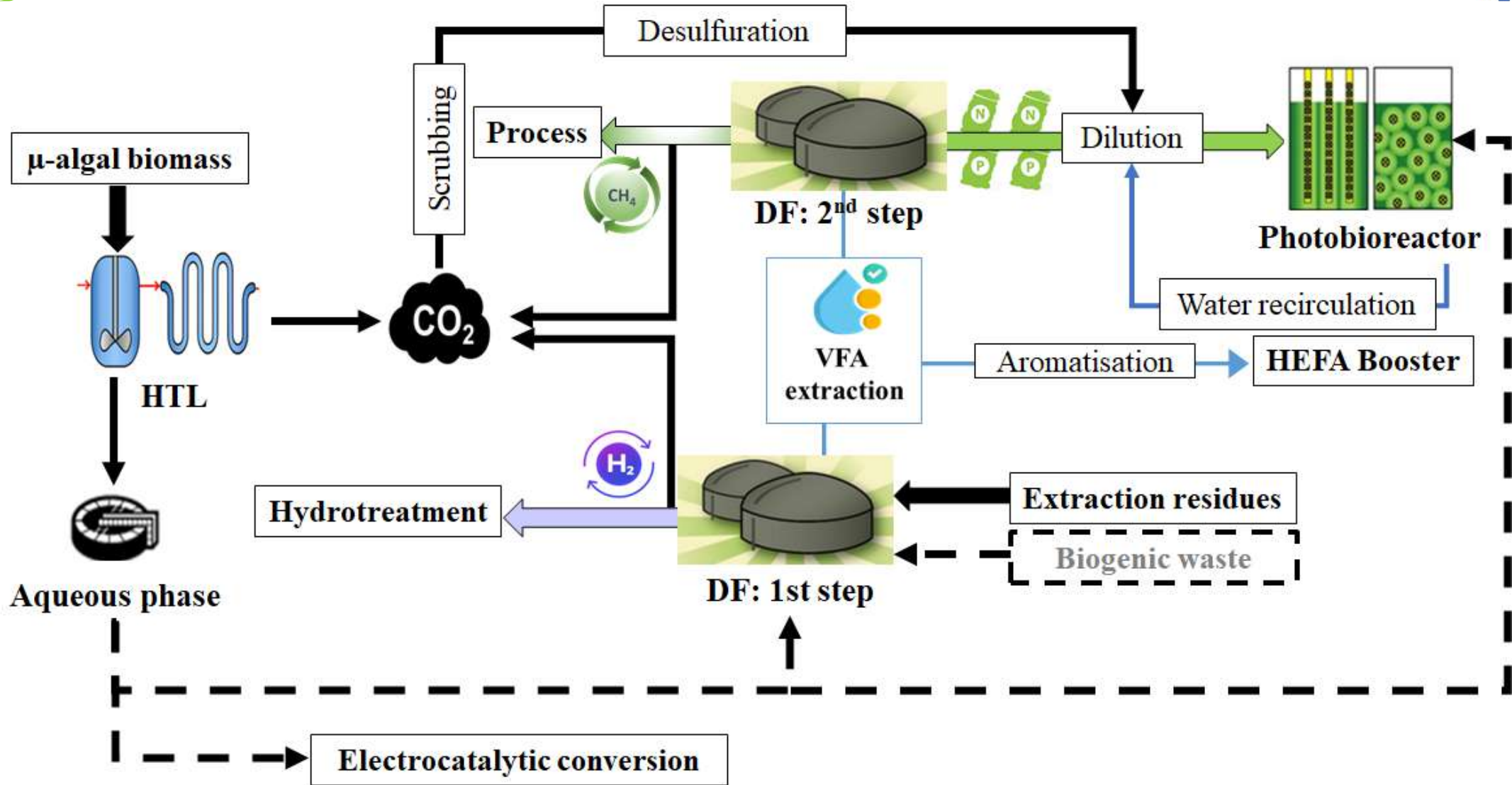


Proof of concept of new technologies

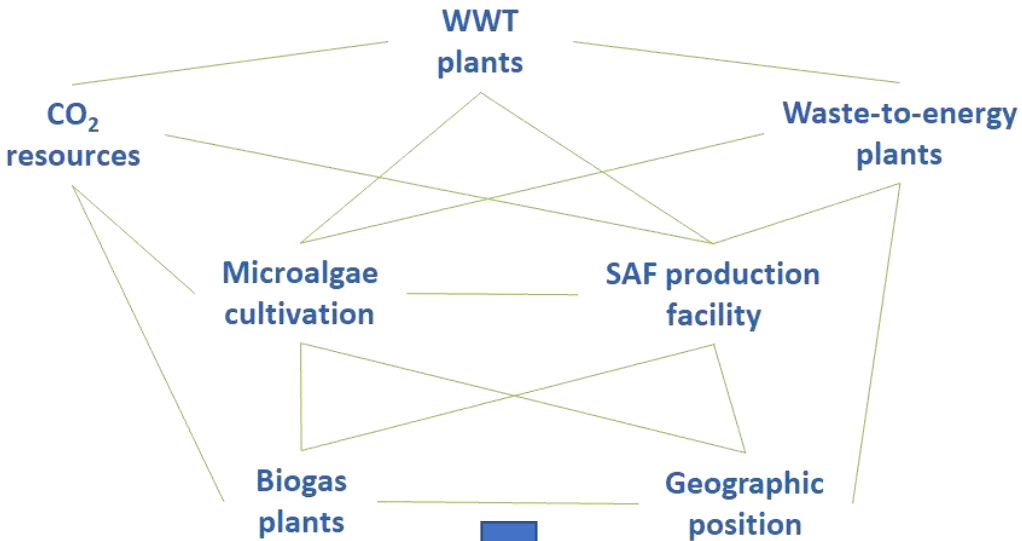
- **Ramified aromatics production from process byproducts**
- **Innovative catalysts for HEFA pathway**



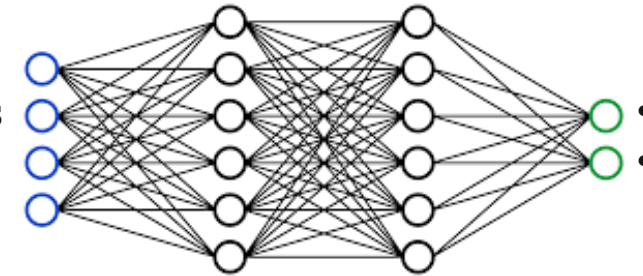
Process circularity



Prospective scenarios & decision tool



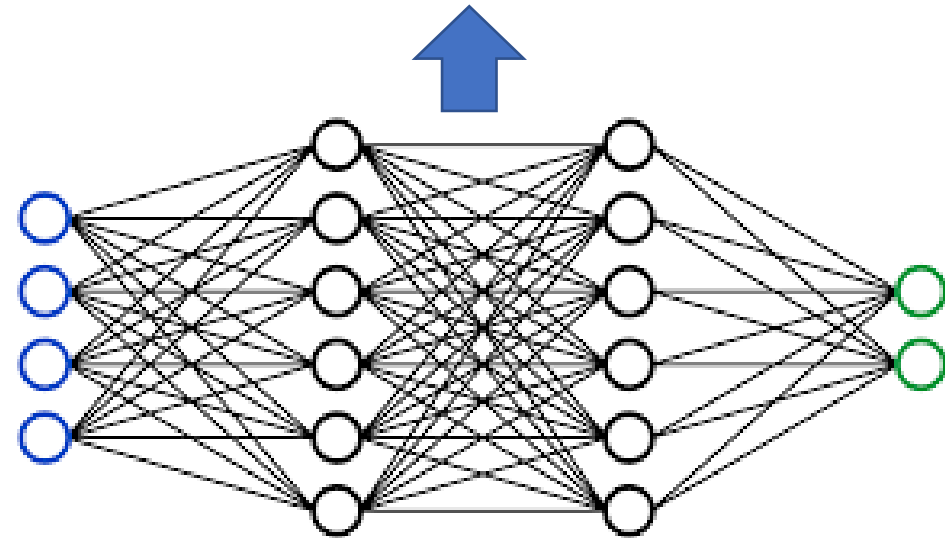
- Specifications
- Targets



- Best pathway
- All indicators

COCPIT decision tool

- 1 Alternative process scenarios
- 2 Process design (mass/energy balances and equipment sizing)
- 3 TEA, LCA and s-LCA methodology
- 4 TEA, LCA and s-LCA indicators





Thank you!



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 [COCPIT_Project](#)

 [COCPIT Project](#)



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FUELGAE

Sustainable On-site and Innovative Technologies
for Advanced Transport BioFuels from Microalgae

SUSTAFUELS Webinar 21.05.2024



Instituto de Catálisis y Petroleoquímica
Coordinator: Silvia Morales de la Rosa

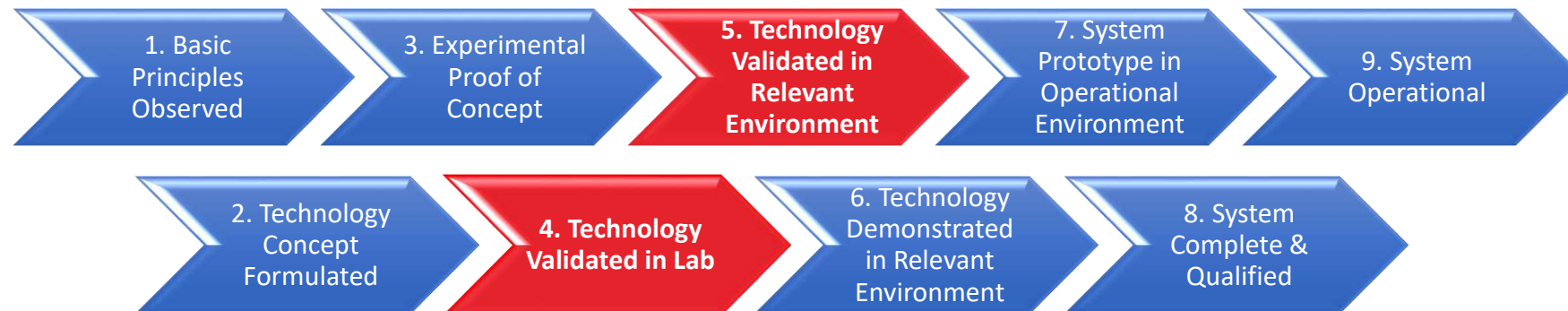


Project Facts

- 🌱 **Funding program:** HORIZON.2.5 - Climate, Energy and Mobility
- 🌱 **Call:** Development of algal and renewable fuels of non-biological origin
- 🌱 **Type:** Research & Innovation Action
- 🌱 **Total budget:** € 4,990,123.81
- 🌱 **Funded costs:** € 4,990,123.81
- 🌱 **Starting date:** 1. October 2023
- 🌱 **End date:** 30. September 2027
- 🌱 **Duration:** 4 years
- 🌱 **Number of partners:** 12 and 1 affiliated entity from 6 countries

Project Nature

- 🌱 **Research & Innovation Action (RIA)** aims to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service or solution.
- 🌱 The **goal** is to **develop** microalgae renewable fuel technologies to **Technology Readiness Levels (TRL) 4-5**



Project Expected Outcomes

Increase the feedstock and technology basis for renewable fuels.

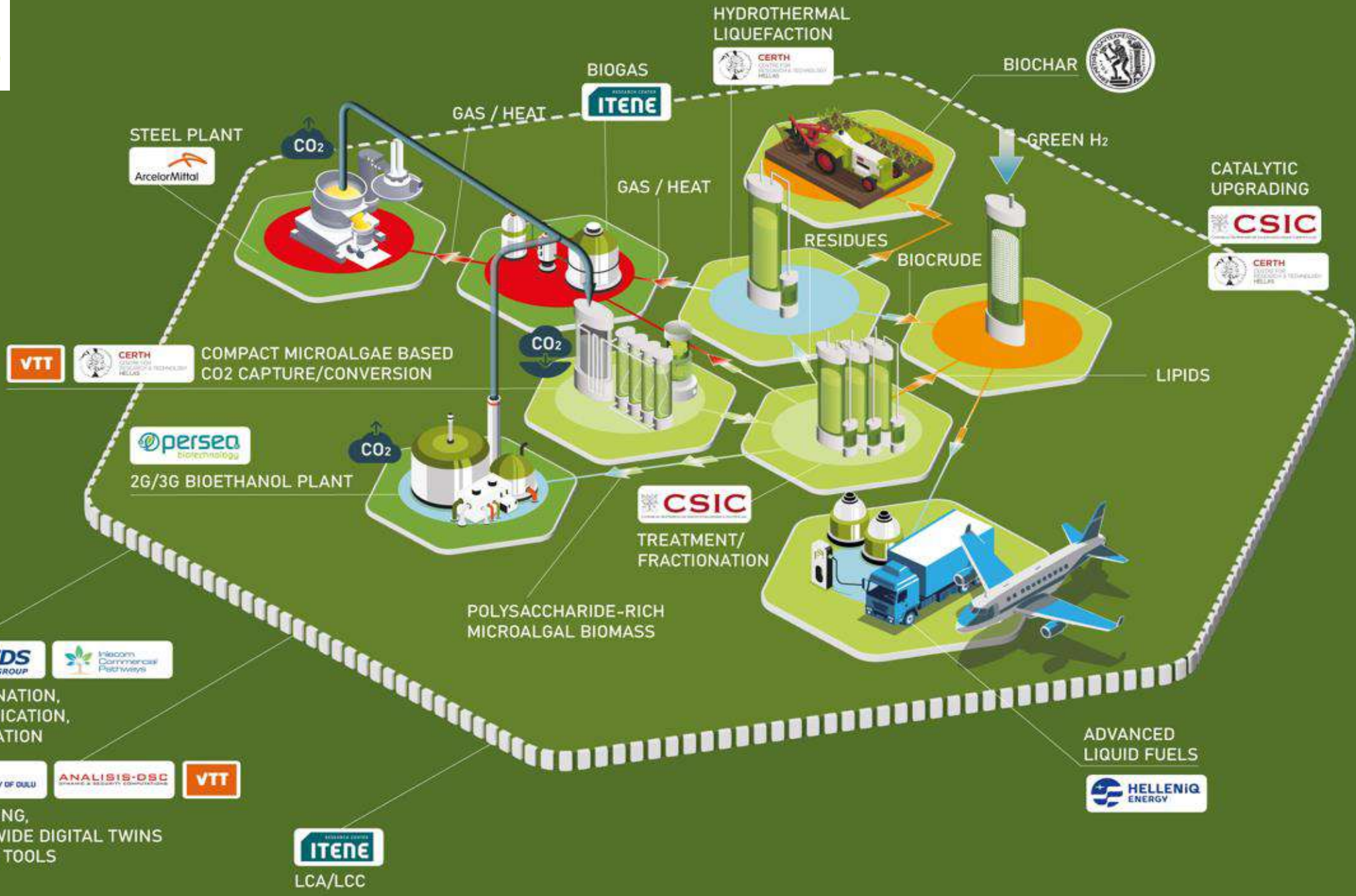
Facilitate the development of advanced and high-quality biofuels from algae vegetable lipids.

Foster the development of technological pathways for algal and non-biological renewable fuel production.

Increase the robustness of conversion processes and sustainability for algal and non-biological renewable fuels.

Contribute to the priorities of EU for achieving zero emissions by 2050.

Deliver technology to meet the longer-term needs for renewable fuels in the energy and transport sectors.



RTDS GROUP | **Intecom Commercial Pathways**

DISSEMINATION,
COMMUNICATION,
EXPLOITATION

UNIVERSITY OF DUBLIN | **ANALISIS-DSC** | **VTT**

MODELLING,
PLANT-WIDE DIGITAL TWINS
AND PAT TOOLS

ITENE
LCA/LCC

HELLENIQ ENERGY

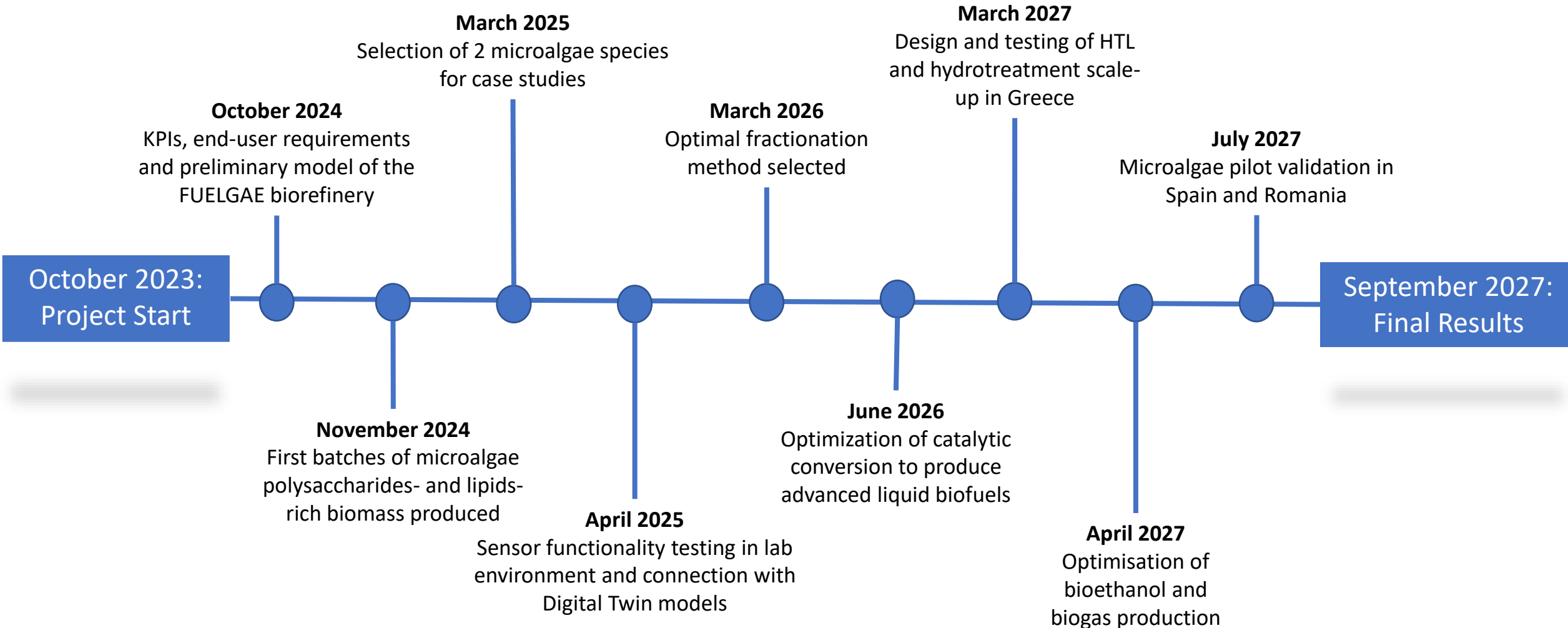
Project Aim

The development of advanced liquid fuels (ALF) from two different CO₂ emission streams (biorefinery and energy-intensive industries) through microalgae.

The ALF production will be addressed by developing various technologies:

- 🌱 Microalgae will be customised based on the needs of each industrial case study.
- 🌱 A pilot photobioreactor plant will be integrated into the existing infrastructure of the two industrial sectors.
- 🌱 Novel treatments for the resulting microalgal biomass will be developed.
- 🌱 An innovative multifunctional catalytic upgrading system for the ALF production will be tested.
- 🌱 Biochar, produced as a side-product, will be tested in agriculture as a soil amendment.
- 🌱 A new family of sensors will be integrated into the Process Analytical Techniques, and a global Digital Twin will be developed.
- 🌱 LCA and TEA will ensure that the final product will achieve reduced GHG emissions and is economically viable.

Project milestones



Project Consortium

Academia/RTOs

Spanish National Research Council (ES)

ITENE Research Centre (ES)

The Centre for Research and Technology-Hellas (EL)

VTT Technical Research Centre of Finland (FI)

University of Oulu (FI)

National Technical University of Athens (EL)

Industry

ArcelorMittal Tubular Products (RO)

Hellenic Petroleum (EL)

SMEs/Associations

Analysis-DSC (ES)

RTDS Association (AT)

Inlecom Commercial Pathways (IE)

PERSEO Biotechnology (ES)



General Assembly
Abril 2024
Espoo - Finlandia



Kick-off Meeting
19 & 20 October 2023
Madrid, Spain





HOME

ABOUT FUELGAE

PUBLICATIONS & MEDIA

FUELGAE NETWORK

CONTACT



Welcome to the FUELGAE Project:

Innovative sustainable on-site technologies
for using microalgae to capture CO₂ and
produce advanced biofuels

About us

Contact

<https://fuelgae.eu/>



FUELGAE_EU
@FUELGAE_EU



<https://www.linkedin.com/showcase/fuelgae/>



The problem:

Reducing CO₂ emissions from
manufacturing &
transport

[Read more](#)



Using Microalgae to capture CO₂

The process:

Using Microalgae to
capture CO₂

[Read more](#)



The technology:

Converting the
Microalgae to Biofuel

[Read more](#)



The impact:

For cleaner, greener
transportation

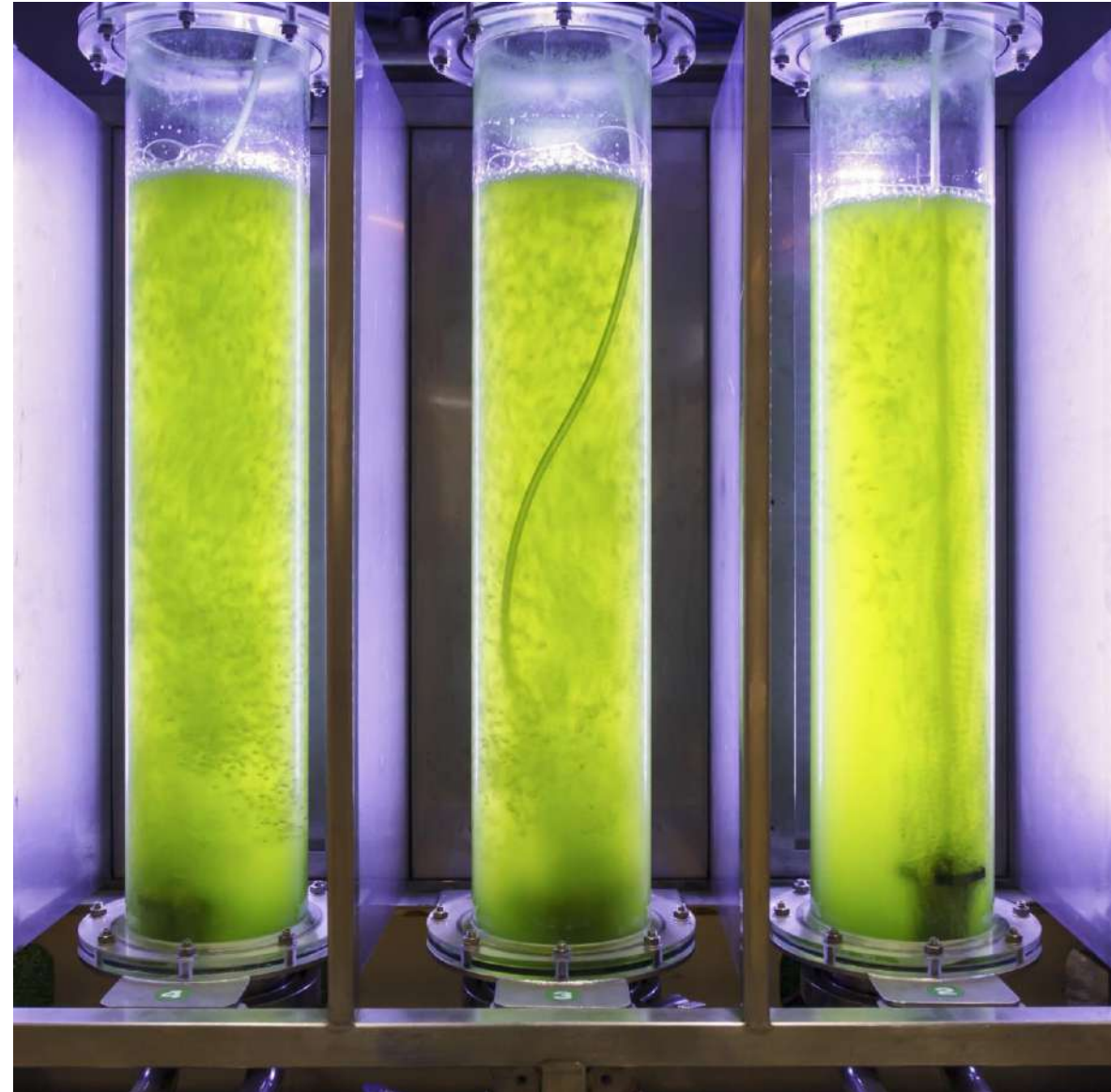
[Read more](#)

Acknowledgements

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Thank you!
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