

**New EU-funded project will study the elimination of CO<sub>2</sub> emissions by transformation into renewable fuels. The FUELGAE project aims to develop innovative, sustainable, on-site technologies for using microalgae to capture CO<sub>2</sub> and produce advanced biofuels.**

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- **The €5 million, 4-year FUELGAE project is coordinated by CSIC (The Spanish National Research Council).**
- **The FUELGAE project seeks to develop a method to produce biofuels out of carbon dioxide emissions.**
- **The objective is to promote the energy transition by demonstrating that CO<sub>2</sub> emissions can be converted into a sustainable energy resource.**

FUELGAE project coordinator, Dr Silvia Morales de la Rosa, of the Institute of Catalysis and Petrochemistry (ICP-CSIC) at the Spanish National Research Council, leads a consortium made up of thirteen partners (among them, two large industrial partners, six research, technological or university centres, and four private companies) from six European countries and backed with 5€ million from the European Union's Horizon Europe research program. Dissemination, Exploitation, and Communication activities for the project will be led by project partner RTDS Group.

### **Advanced Fuels**

Europe's commitment to decarbonizing the economy is clearly stated in the European Green Deal. To achieve climate neutrality by 2050, it will be necessary to develop green technologies, establish sustainable industrial practices, and reduce emissions.

Global CO<sub>2</sub> emissions in 2021 were approximately 37.12 gigatonnes (Gt). The EU managed to reduce its greenhouse gas emissions by 31% between 1990 and 2020; however, this trend is insufficient to meet objectives set for 2030 in the European Green Deal, that is, a reduction of 55% compared to 1990 levels and carbon neutrality by 2050.

Whilst the EU is promoting the electrification of transport, a viable option for small vehicles, that is insufficient for air and maritime transport or heavier vehicles. In these sectors, the reduction of carbon emissions necessitates the development and supply of clean liquid fuels at rates sufficient to meet the needs of airlines and shipping companies in a manner that is economically viable. In addition, technology must be developed to enable the production of biofuels that allow negative emissions conversion pathways to be adopted.

*"This FUELGAE project aims to show that emissions of CO<sub>2</sub>, a gas that contributes to the greenhouse effect, can be eliminated by converting them into products of interest in a sustainable manner and at competitive prices. With this, we seek to reduce CO<sub>2</sub> emissions and replace fossil fuels with renewable fuels." - FUELGAE project coordinator Dr Silvia Morales de la Rosa.*

It is here that the FUELGAE project will play a key role: in contributing to the promotion of scientific understanding in Europe and taking global technological leadership in the field of renewable fuels, increasing Europe's technological competitiveness and its role in the transformation of the energy system free of fossil fuels, while supporting the EU's energy independence goals.

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**Funded by  
the European Union**

## The project

The 4-year FUELGAE project was launched in October 2023 and will study the development of new processes that advance the elimination of CO<sub>2</sub> emissions by transforming them into biofuels and bioproducts with the aim of contributing to the commitment to achieve climate neutrality in 2050.

It seeks to develop a novel method for producing advanced liquid fuels from different streams of CO<sub>2</sub> emissions from two industrial sectors (biorefineries and energy-intensive industries), through a pilot photobioreactor integrated into their infrastructure. The photobioreactor will use selected microalgae strains, whose performance will be improved by adapting them to each industrial case study.

*"The project covers the entire value chain from the emission of greenhouse gases to the advanced fuel produced, with industrial involvement, and includes members strongly interested in the subsequent scaling of the technology for future commercialization upon completion of the project"*  
- FUELGAE project coordinator Dr Silvia Morales de la Rosa.

The production of advanced liquid fuels will be achieved by developing different technologies: selective production of microalgae to obtain polysaccharides or lipids; emerging alternative treatments of microalgae biomass; innovative catalytic improvement systems from lipids and biocrude; and online microalgae sensors.

A microalgae pilot plant will be built and validated at two industrial sites in Romania (steel plant) and Spain (biorefinery). FUELGAE project technologies will be further evaluated through life cycle analysis (LCA/LCC) to confirm their lower environmental impact, resource use, and Greenhouse Gas (GHG) emissions.

In addition, the FUELGAE project includes studies of hydrothermal liquefaction and biogas processes. To minimise by-products, the biochar produced in the hydrothermal process will be tested for use as an agricultural soil enhancer. All technologies will be extended to Technology Readiness Level 5 (TRL5).

One of the biggest obstacles for the commercialization of processes based on microalgae is their large energy consumption, which has traditionally limited their economic viability. In the FUELGAE project, the ICP-CSIC team will use innovative methods that facilitate the treatment of microalgae and the separation of its components for use. These treatment methods will reduce energy consumption, making the process profitable from both an economic and environmental point of view.

The development of chemical technologies using catalysts (materials that facilitate chemical transformations) for the conversion of biocrude (a complex mixture of compounds of biological origin) and lipids into advanced fuels will also be investigated. Such technologies are necessary for the conversion of difficult-to-handle and low-value materials into high-quality advanced fuels, which can be used in heavily polluting and difficult to decarbonize sectors, such as the air and maritime transport sectors.

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