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EERA BIOENERGY NEWSLETTER

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Joint Programme Coordinator's corner

Myrsini Christou
EERA Bioenergy Coordinator

Dear EERA Bioenergy members, dear eebionews readers,

As we are approaching the end of this year, I would like to write a few words on a conference that was held in Athens on 7-8 November 2024 on "Sustainable Aviation Fuels – Time for take-off". It was organised by the Centre of Renewable Energy Sources and Saving, under the auspices and patronage of the Ministry of Environment and Energy of Greece, and sponsored by EERA Bioenergy, the Icarus project (www.icarus-bioject.eu) built within the EERA Bioenergy community, and the oil companies Motor Oil and Helleniq Energy, while Aegean airlines was the Official Air Carrier Sponsor. The conference aimed to inform the stakeholders of the necessary actions that must be undertaken to place the Greek aviation industry on an accelerated FlightPath to achieve the aims and objectives of the ReFuelEU aviation Initiative for Greece. International experts were invited to frame the global and European environment related to the European policy and technology landscape, while Greek experts presented the status of resources, technologies and markets for the EU and Greece.

For EERA Bioenergy, as an Alliance of European universities, technology centres and institutes involved in Excellent Research on sustainable bioenergy, I thought I should start with some messages on the technology acceleration of Sustainable Aviation Fuels (SAF), and I promise to come back in a future article with some highlights on the policy developments for SAF. Nevertheless, all presentations are available on the conference site.

In terms of fuels:

- In 2023, more than 500,000 tonnes (600 million liters) of SAF were produced worldwide, representing just 0.2 % of global aviation fuel consumption, and 69 airports are regularly supplied with this fuel. Europe has a production capacity of 5.1 Mtoe/y of HVO/HEFA and 1 Mtoe/y of e-kerosene.
- Synthetic aviation fuels (e-SAF) are still at an early stage of technological maturity. The total e-SAF production capacity in Europe for 2030 is estimated to cover 3-4 % of the total REDII Directive target for transport, while in the context of ReFuelEU Aviation, the target for e-SAF production is 500,000 tonnes (600 million litres).
- Synthetic fuel production is the most expensive technology, with high costs recorded in CAPEX for electrolysis and carbon capture, as well as in the use of electricity.
- Methanol for aviation fuel production is also an interesting alternative technology.

In terms of technologies:

- Nine SAF production technologies have already been standardized by ASTM in Europe, while another 11 are in the process of being standardized.
- A wide range of technologies were presented by research institutions and representatives of the Sustainable Aviation Fuels (SAF) industry, which are at different levels of maturity and use a variety of feedstocks.
- For the short term until 2030, the aviation fuels that meet the requirements of the European Renewable Energy Directive (RED II and its extension RED III) are hydrogenated vegetable oils and fats (HVO/HEFA). This is a mature technology applied at an industrial level by many industries, such as TOTAL ENERGIES and LANZAJET. However, there is reduced availability of raw materials (used oils, frying oils, vegetable oils, etc.) and increased competition for its supply.
- For the timeframe until 2050, more technological options will emerge, such as gasification, pyrolysis, hydrothermal liquefaction (HTL), the production of aviation fuels from alcohol, etc. The relative production costs of SAFs are high but they have the potential to use more types of biomass (e.g., agricultural and forestry residues, industrial waste, municipal waste, etc.).
- Pilot plants were presented by TotalEnergies, BTG-bioliquids/ BTG-next and Axens. Relevant research is being conducted at the European level by EERA (European Energy Research Alliance), which addressed strategic areas of research and the key questions that need further research efforts, to meet the ambitious targets of the EU policies (Fit for 55, REPowerEU, ReFuelEU Aviation and FuelEU Maritime). CRES and CERTH presented their research activities, within the framework of the Icarus, Gold, CIRCforBIO, CRONUS, BioTheRoS, BioSFerA, FUELPHORIA, BioMates and ABATE projects they are carrying out.
- The management of solid waste in a circular bioeconomy system can ensure the production of bio-oils, bioethanol, algae and other products such as biochar as a soil conditioner but also for carbon sequestration in the soil, as presented by the National Technical University of Athens.

I promise to come back in a future article with some highlights on the policy developments for SAF

In terms of feedstock resources:

- The potential of biomass at the European level has been estimated by an EC study to be 310-536 million tons for 2030 and 294-892 million tons for 2050.
- Most quantities for 2030 will be provided by agricultural-forestry residues, for which, however, the relevant supply chains have not been developed yet to a satisfactory level to ensure high availability of biomass at relatively low costs.
- For 2050, significant quantities of biomass are expected to be produced from lignocellulosic and oilseed plants that will be cultivated on degraded lands or as cover crops and in rotation systems with existing agricultural crops.
- The sustainability criteria and in particular Annex IX of the RED II/III Directive, which specifies the feedstocks that are eligible for the production of, among others, aviation biofuels, may limit the scaling-up of technologies that depend on specific feedstocks. For this reason, technological trends are moving towards the development of technologies that can process multiple feedstocks. In addition, field experiments are being carried out in Europe for the cultivation of energy crops in various crop rotation systems and on contaminated soils for phytoremediation, as presented by CRES.

Finally, there is a wealth of financial packages and tools available from the European Commission to financially support the technological acceleration and scale-up of sustainable aviation fuels.

With these encouraging messages, I would like to wish you lovely Christmas holidays with your families and friends and a New Year full of happiness, peace, inspiring moments, original ideas, and the courage to keep striving for a better, greener world!

Myrsini

EERA Bioenergy news in brief

NEW MEMBERSHIP

We warmly welcome the Institute of Innovations on Eco-materials, Eco-products and Eco-Energy, University of Quebec at Trois-Rivières, from Canada, and the Eindhoven University of Technology, from The Netherlands, to the EERA Bioenergy Joint Programme as full members.

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY https://oraprdnt.uqtr.uquebec.ca/

INNOVATIONS INSTITUTE in Ecomaterials, Ecoproducts and Ecoenergies biomass based UQTR https://www.tue.nl/en/

EERA BIOENERGY'S SUBPROGRAMMES MEETING HELD DURING AN ICARUS PROJECT JOINT EVENT

On 18 September, a joint event between EERA Bioenergy and the ICARUS project took place both in person (in Trondheim, Norway) and online.

Highlights of the agenda included a general presentation on EERA JP Bioenergy, for participants in the meeting who were not yet members; and the session by European Commission Senior Expert Maria Georgiadou on R&I renewable fuels policy priorities for the future in the EU.

However, most of the meeting revolved around the upcoming Horizon Europe calls in Cluster 5 and 6 with relevance for bioenergy and the plan to follow up on potential initiatives. Among the calls identified as being of most interest, the following stood out:

Research and Innovation Actions (RIAs):

- HORIZON-CL5-2025-05-D3-02:
  Competitiveness, energy security and integration aspects of advanced biofuels and renewable fuels of non-biological origin value chains

Innovation Actions (IA's):

- HORIZON-CL5-2025-05-D3-01:
  Large-scale production of liquid advanced biofuels and renewable fuels of non-biological origin
- HORIZON-CL5-2025-05-04-06:
  Phase out fossil fuels in energy-intensive through the integration of renewable energy sources
- HORIZON-CL6-2025-01-CIRCBIO-09:
  Bioprospecting and optimized production of terrestrial natural products: new opportunities for bio-based sectors
- HORIZON-CL6-2025-01-CIRCBIO-10:
  Unleashing the potential and advancing the impact of the digitalization/AI of the bio-based value chains
- HORIZON-CL6-2025-01-CIRCBIO-12:
  Demonstration of reduced energy and optimized flexible energy supply for industrial bio-based systems

Coordination and Support Actions (CSAs):

- HORIZON-CL5-2025-02-D3-16:
  Support to the SET Plan stakeholder for a
- HORIZON-CL5-2025-05-D3-14:
  Development of innovative solutions strengthening the security of renewable energy value chains
- HORIZON-CL5-2025-02-D3-15:
  Building a long-term Africa Union (AU) and European Union (EU) Research and Innovation joint collaboration on Sustainable Renewable Energies

Co-fund actions:

- HORIZON-CL5-2025-02-D2-10:
  Clean Energy Transition Co-funded Partnership

EERA BIOENERGY COORDINATOR WELCOMES THE PARTICIPANTS OF THE SEVENTH EDITION OF THE DOCTORAL COLLOQUIUM ON BIOENERGY AND BIO-BASED PRODUCTS (DOC 2024)

The seventh edition of the Doctoral Colloquium on Bioenergy and Biobased Products (DOC2024) organized by DBFZ Deutsches Biomasseforschungszentrum gemeinnützige GmbH took place from 24 to 25 September 2024 in Leipzig (Germany).

This annual event, which was initiated in 2018, brings together future researchers, industry leaders and policymakers at an early stage to share knowledge and discuss research gaps and challenges. At the same time, it serves scientific institutions that are already intensively involved in bioenergy research to network and exchange.

Once more, the event started with Myrsini Christou, EERA Bioenergy JP Coordinator, welcoming the researchers. In addition to presenting this joint programme of the European Energy Research Alliance (EERA), the activity of its different subprogrammes and the work being carried out to promote research in sustainable bioenergy, Myrsini also took the opportunity to highlight the Position Paper that was presented during the European Biomass Conference & Exhibition 2024 (EUBCE) on 'Research and Innovation gaps in the EU'.

"For EERA Bioenergy, as an Alliance of European universities, technology centres and institutes involved in Excellent Research on sustainable bioenergy, it's of utmost importance to define strategic areas of research and the key research questions that need further research efforts, to meet the ambitious targets of the EU policies. For this purpose, a position paper was prepared by our members and published in June 2024", she stated.

EERA DAY IN SPAIN HELD TO ANALYSE THE ADDED VALUE OF SPANISH PARTICIPATION IN THE ALLIANCE

EERA Day in Spain, co-organised by the EERA Secretariat together with Tecnalia and CIEMAT, both members of the EERA Executive Committee (ExCo), took place on 30 October at the CIEMAT headquarters in Madrid. Under the title "The Potential of Research and Innovation Collaboration for the Development of the Energy Transition," the event brought together representatives from the Spanish ministries responsible for research, innovation, and energy; national funding agencies; energy sector technology platforms and associations; energy companies; and the 29 research and development (R&D) institutions that are members of EERA.

EERA Bioenergy was represented by its Management Board and by the leader of Subprogramme 3, Marcelo E. Domine, who intervened in a round table on the 'Added Value of Spanish Participation in EERA Joint Programmes'. This round table aimed to identify the key aspects of participating in a Joint Programme (JP) and the added value for research centres, where 29 Spanish institutions participate in 17 of the 18 JPs, coordinating three of them.

Read here the full event report.

EERA BIOENERGY COORDINATOR PRESENTS POSITION PAPER ON 'BIOENERGY, BIOGAS AND BIOFUELS: RESEARCH AND INNOVATION GAPS IN THE EU' DURING THE 'SUSTAINABLE AVIATION FUELS - TIME FOR TAKE-OFF' CONFERENCE

From 7-8 November, took place in Athens (Greece) the conference 'Sustainable Aviation Fuels - Time for take-off', organised by the Centre for Renewable Energy Sources and Saving (CRES) under the auspices and patronage of the Ministry of Environment and Energy of Greece.

The aim of the conference was to inform key stakeholders on the policy, regulatory, technology, availability and market dynamics of advanced aviation biofuels, as well as to encourage the implementation of coordinated actions to put the Greek aviation sector on a rapid flight path towards independence from fossil fuels and to achieve the goals of the REFuelEU initiative for Greece.

The European and international environment for sustainable aviation fuels (SAF) was analysed by international experts, while Greek research and market experts presented the current state of aviation biofuel resources, technologies and markets in the EU and Greece.

In this context, EERA Bioenergy coordinator, and Head of the Biomass Department at Centre for Renewable Energy Sources and Saving (CRES), Myrsini Christou, had the chance to present the Position Paper on 'Bioenergy, biogas and biofuels: Research and innovation gaps in the EU' during a session dedicated to 'SAF technologies in innovative development'.

In front of an audience consisting mainly of decision-makers and experts from the biomass, fuels and aviation sectors, especially SAF, our coordinator presented the position paper that summarises some of the main issues related to bioenergy in Europe that need further research and that offers recommendations on the way forward for European R&D&I in bioenergy, biogas and biofuels.

LAST STEERING COMMITTEE MEETING OF 2024

The EERA Bioenergy's last Steering Committee meeting of the year took place online through Zoom on the 9 December and addressed relevant issues related to the Joint Programme interests, actions and plans.

The European Commission representative Maria Georgiadou (DG-RTD) informed on the last news regarding the new EU Commission and its commitment to competitiveness. She explained which three pillars of the Draghi report are key essentials for this new Commission: the innovation gap between the US and China; a joint plan for decarbonization and competitiveness; increasing energy security and reducing dependences. Georgiadou also discussed the launch of calls for proposals under the Innovation Fund for scale-up technologies, clean technology manufacturing and RFNBO hydrogen production. Finally, she went over COP29, commenting on the new agreement on carbon market rules, the new approach on climate finance for the next 10 years, and the mobilisation of more funding for developing countries (300 billion/year by 20235 to the poorest nations to fight against climate change).

Within EERA Bioenergy's plan of activities, the coordinators of the different sub-programmes introduced the 2025 perspectives for each SP and outlined the proposal to elaborate a new position paper on R&D&I for scaling technologies, in line with the Draghi report, which was very well received by the members present at the meeting.

Furthermore, Eindhoven University of Technology, one of the 2 new EERA Bioenergy full members, introduced themselves and the EERA Bioenergy Secretariat presented the activities and services provided in 2024 as well as the financial issues. Lastly, the EERA aisbl Secretariat brought updated News and activities of EERA asbl.

Bioenergy highlights

SEMPRE-BIO - SECURING DOMESTIC PRODUCTION OF COST-EFFECTIVE BIOMETHANE

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Within the scope of the ongoing scientific project SEMPRE-BIO targeting to demonstrate novel and cost-effective biomethane production solutions and pathways which maximise the carbon utilisation in the feedstock, 5 innovative biomethane production technologies will be demonstrated through 3 case studies with biogenic CO_2 valorisation at different process stages in:

1. Baix Llobregat in Spain (combining proton exchange membrane water electrolysis (PEM) and CO_2 bio-methanation at the wastewater treatment plant (WWTP));

2. Bourges in France (combining thermo-chemical pyrolysis process and bio-methanation);

3. Adinkerke in Belgium (production of bio-LNG and liquified CO_2 (LCO_2) by cryogenic process, followed by the production of value-added products from LCO_2 and H2 such as biopolymers, biochemicals, and alternative protein sources.

The SEMPRE-BIO project involves experts from 17 organisations and 6 European countries in total (Belgium, Denmark, France, Germany, Norway, and Spain). Overall, the challenge is to decrease investment and operational costs, optimise feedstock supply and use, identify alternative and cheaper feedstocks, improve plant efficiency and operations, factor in the carbon savings and increase and monetise co-benefits, from the commercialisation of side-products such as the digestate or the valorisation of residual gas streams.

The SEMPRE-BIO project recently concluded its 4th General Assembly, held over two days from November 21 to 22 at the DTU headquarters in Lyngby/Copenhagen, Denmark. The partners discussed the project results achieved, and future work steps and enjoyed networking with each other.

Figure 1: The SEMPRE-BIO consortium during the 4th General Assembly held in Denmark.

In the context of the SEMPRE-BIO project, DBFZ is responsible for the overall analysis and the market uptake including techno-economic as well as ecologic assessment by the greenhouse gas (GHG) emissions balances of conventional and selected innovative biomethane processes as well as the analysis of legal framework and policy recommendations.

As a first result, DBFZ was in charge of the evaluation of the status quo and future challenges of biogenic CO_2 valorisation derived from biogas and biomethane in Europe focusing on commercial-scale CCU projects. Valorisation of biogenic CO_2 derived from biomethane represents a dynamic and steadily growing segment in Europe. Already today, the utilisation of the entire biomethane process chain including biogenic CO_2 for material and/or energy recovery results in ecological and cost benefits. Concerning the number of plant sites with CO_2 valorisation from biomethane, Italy, the Netherlands, and the United Kingdom are leading the way in biogenic CO_2 valorisation from biomethane facilities in Europe (60 % in total), followed by Germany and France (23 % in total). For the valorisation of CO_2 from the operating biomethane plants, the focus is currently on the air enrichment in greenhouses (35 %), food and beverage industry (27 %), PtX technologies (10 %), production of dry ice or as a cooling agent (both 8 %).

Figure 2: Distribution rate of different types of CO_2 valorisation at operational (as of the end of 2023) and announced CO_2 capture sites at biogas and biomethane plants in Europe (operational and announced commercial-scale CCU), as of 10/2023; number of mentions (source: based on DBFZ literature review, 2023; DBFZ survey of 4 Horizon Europe projects on biomethane, 2023; DBFZ survey of the German biomethane plant operators, 2023).

The results are summarised within the report on CO_2 utilization. The interactive map depicting the operating European biomethane plants with CO_2 valorisation should be further updated towards the end of the project lifetime.

Moreover, the results consider the reports on **Joint Policy Recommendations** compiled under the involvement of project participants from 3 further under Horizon Europe-funded, ongoing biomethane projects BIOMETHAVERSE, HYFUELUP and METHAREN. The 1st joint report was coordinated by DBFZ and highlights country-specific barriers and perspectives determined based on the survey results from the involved project partners. To increase biomethane production in the short resp. medium term, in particular, legal and administrative barriers must be reduced. It is important to continue to adjust the political and economic framework to facilitate trade between different countries and to create more purchase opportunities for biomethane. The report can be found here.

The research project SEMPRE-BIO (**SE**curing domestic **PR**oduction of cost-**E**ffective **BIO**methane) is funded under the **EU call HORIZON-CL5-2021-D3-03** (Sustainable, secure and competitive energy supply) and topic HORIZON-CL5-2021-D3-03-16 under the **grant agreement No. 101084297**.

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For more information on SEMPRE-BIO, please visit https://sempre-bio.com

Follow the SEMPRE-BIO project on:

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BIOTHEROS PROJECT: ADVANCING SUSTAINABLE BIOFUEL TECHNOLOGIES FOR INDUSTRIAL SCALE

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The transition to sustainable energy is essential to combating climate change. BioTheRoS Project (BIOfuels THErmochemical ROutes into industrial Scale) has this mission, focusing on innovative biofuel technologies designed to reduce reliance on fossil fuels in the aviation and maritime sectors. Through advanced thermochemical biomass conversion methods, BioTheRoS aims to deliver cost-effective, scalable solutions that lower greenhouse gas (GHG) emissions.

Demonstration Facilities in the Netherlands and Austria

BioTheRoS has two pilot facilities in the Netherlands and Austria. These sites demonstrate the feasibility of scaling biofuel technologies, employing processes like pyrolysis, gasification, and Fischer-Tropsch (FT) synthesis to transform biomass into advanced transportation fuels.

Netherlands: Pyrolysis and Upgrading Units

In the Netherlands, *BTG Biomass Technology Group* operates two pyrolysis units: a bench-scale unit with a capacity of 2–5 kg/h and a larger-scale pilot plant capable of processing 80–200 kg/h. These units convert lignocellulosic biomass into pyrolysis oil, which is further upgraded into sustainable aviation fuel (SAF) and marine biofuels.

A dedicated upgrading unit, operating continuously at 0.8 - 1.5 kg/day, is a critical step in ensuring the production of high-quality transportation fuels. Ongoing laboratory tests focus on optimizing the transportation fuel for SAF certification, with encouraging preliminary results.

Figure 1: BTG pilot plant.

Austria:
Gasification and Fischer-Tropsch (FT) Synthesis

In Austria, *BEST - Bioenergy and Sustainable Technologies* operates a 1 MW Dual Fluidized Bed (DFB) gasification reactor, capable of processing 200 kg/h, producing high-quality syngas. This syngas is then converted into synthetic fuel.

The project has already achieved a critical milestone by successfully demonstrating the full process chain, during the initial phase in 2024. This milestone establishes a benchmark for scalability and highlights the potential for industrial application.

Figure 2: 1 MW Gasification plant.

The success of BioTheRoS' demonstration facilities showcases the potential of biofuels to meet industrial-scale energy demands while reducing environmental impact. This work not only advances biofuel technology but also strengthens energy security and supports a cleaner, greener future.

As BioTheRoS continues its innovative work, its progress serves as a testament to the potential of collaboration and innovation in achieving sustainable energy solutions.

Acknowledgements

This article was made possible through the contributions of Patrick Reumerman (BTG) and Gerald Weber (BEST Research). Patrick provided detailed insights into the demonstration unit in the Netherlands, while Gerald shared valuable input about the demonstration sites in Austria.

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Visit the project website!

BioTheRos has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement no. 101122212

SYNGAS MODULAR UNITS PROVIDING RENEWABLE ENERGY FROM MULTIPLE WASTES AND FOR DIFFERENT USES (SUPREMAS)

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Background

Many European countries are net importers of oil and gas (in 2022 the EU's natural gas import dependency rate was 97 %), and thus particularly exposed to energy crisis and market volatility risk as a consequence of geopolitical tensions and threats. European natural gas production is continuing its decreasing trend and the European Agenda's ambitious objectives aim to mitigate the external dependence on natural gas, as well as to promote energy transition towards renewable sources and decarbonisation. In this context, green gases such as bio-syngas are essential to support European energy reliability.

The Project

In this framework, SUPREMAS is determined to advance the European technology leadership in bio-energy development, fostering decentralised gas systems development and contributing to the energy transition for different use cases. SUPREMAS outcomes will enable circular value chains where multiple residues, discarded from different processes, will be valorised providing electricity, heat, cooling, and new materials. SUPREMAS will develop cost-effective modular and movable syngas production units particularly suitable to treat sewage sludge, digestate, and the organic fraction of municipal solid waste.

Figures 1-2: Environmental sustainability and techno-economic viability of the proposed solutions will be validated in the Agroamb Waste Management Plant (Ponte de Outeiro, Lugo, Spain, on the left in the photo below), and the Águas e Energia do Porto Wastewater Treatment Plant (Freixo, Porto, Portugal, on the right).

A deep replicability assessment will be done, and pre-feasibility analysis developed in 10 further demo sites across all over Europe. 6 co-creation workshops will be organized to promote stakeholders' engagement and communities' involvement thus unlocking barriers and making SUPREMAS replication real.

SUPREMAS Consortium consists of 12 organizations from 7 different countries (Italy, Sweden, France, Germany, Spain, Belgium, Portugal). The multinational engineering consultancy company RINA-C coordinates the Consortium which includes a product design and manufacturing company RESET, wastewater treatment plant and waste management companies (AEdP, AGROAMB), experts in energy management ICT solutions development (ARTE), in solutions adaptation to help market uptake (ENGREEN, WIP) as well as in stakeholders' engagement, also guaranteeing proper dissemination of project results.

The consortium also has academic and research organizations (MDU, CIRCE, CIIAE), associations (ERGAR), and innovation partners (SEZ), facilitating the exchange of knowledge between complementary forces (academy and companies) and co-creation efforts, which consequently will be reflected in the quality of the developed work.

Updates

The 1st General Assembly of the EU-funded SUPREMAS project (website) took place at the headquarters of RESET in Rieti (Italy) on 29 and 30 October 2024. During the GA the SUPREMAS partners shared the main project advancements and defined the next steps to be implemented for a successful project continuation.

Figures 3-5. The partners had the opportunity to visit the RESET's facilities and two gasification plants for the syngas production.

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SUPREMAS has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement no. 101160713

BIOMASS UTILIZATION IN IRON PRODUCTION UNDER ECONOMIC AND CO_2-REDUCING BOUNDARY CONDITIONS (BIOFE)

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Background

The iron and steel industry are on the verge of transitioning from coal-based methods to green hydrogen processes. However, this shift from blast furnaces to hydrogen-based direct reduction faces challenges due to the scarcity of green hydrogen and inadequate infrastructure, making natural gas-based direct reduction a bridge technology. Additional challenges include higher energy demands from endothermic reactions and the lack of carbon in sponge iron, which affects electric arc furnace operations. Biomass can offer solutions as a heat source, reducing gas, or solid components in pellet production, addressing both energy and carbon issues in the Direct Reduction process.

The Project

The BioFe Project – "Biomass utilization in iron production under economic and CO_2-reducing boundary conditions" aims to find out how much sustainable biomass is available for the steel industry, how it can be optimally integrated into direct reduction process and what the economic and environmental impact could be. The project is coordinated by the DBFZ – Deutsches Biomasseforschungszentrum gemeinnützige GmbH and is funded through the European Regional Development Fund (ERDF) 2021–2027, administered by the Sächsische Aufbaubank – Förderbank. Officially launched in mid-June 2024, the project is scheduled to run until May 2027.

Within the framework of the project, the DBFZ is focusing on the production of biogenic carbon carriers from sustainably available biogenic residues and waste materials as well as the provision of composite pellets made from iron ore and biochar. As a starting material, locally available residues are examined for their chemical and energy carrier-specific properties to determine whether they are suitable for use. The potential residues are used to produce customized biochar, which is then used to produce the iron ore composite pellets. As part of a process simulation, the integration of the thermochemical processes of the biomass into the direct reduction process will be evaluated together with the project partner German Aerospace Center (DLR Deutsches Zentrum für Luft- und Raumfahrt) in the next step of the project. A total of three paths for the use of pyrolysis of biomass in the direct reduction process (DR) are being investigated: i) as a heat source, ii) pyrolysis gas as a reducing gas, iii) and in solid form as biochar in iron ore pellet production. A combined use of the three possibilities mentioned is also conceivable. Figure 1 shows an overview of the biomass integration process. This project aims to find out how much sustainable biomass is available for the steel industry, how it can be optimally integrated into DR iron production and what the economic and ecological impact could be.

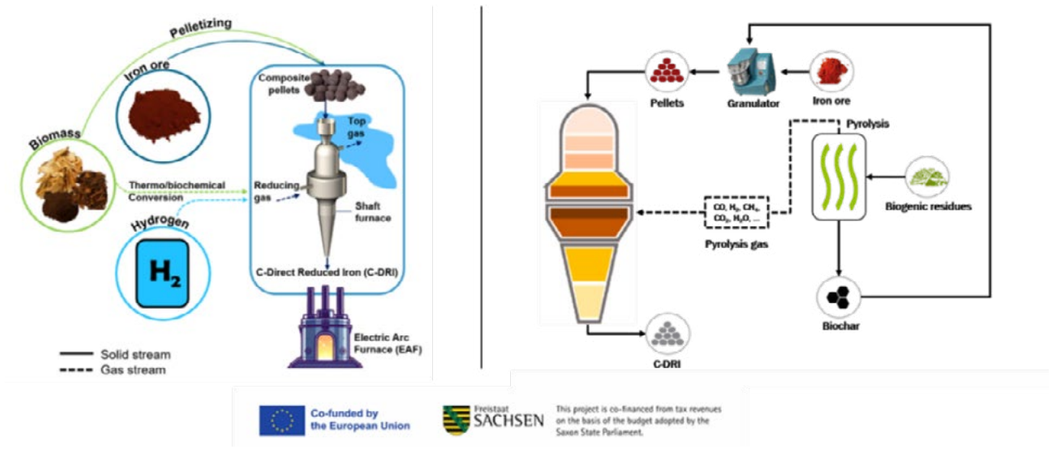

Figure 1: Integration of biomass in the DR process, Source: DLR (CC BY-NC-ND 3.0); DBFZ.

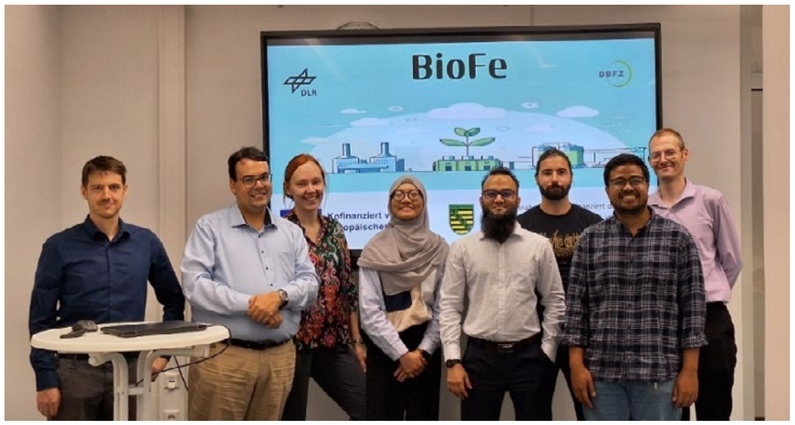

Figure 2: BioFe Project kick-off meeting on 27.28.2024 at DLR - Institute of Low-Carbon Industrial Processes in Zittau; Source: BioFe project

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FLEXIBLE HYBRID FURNACE TECHNOLOGY FOR DECARBONIZING THE EUROPEAN GLASS INDUSTRY – THE GIFFT PROJECT

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Background

The European Union is a global leader in glass production, generating over 39 million tonnes in 2021. However, the glass industry is highly energy-intensive, consuming approximately 4.5 billion cubic metres of natural gas annually—about 4 % of Europe's total industrial gas consumption. The high temperature melting process, essential for glass manufacturing, accounts for over 75 % of the industry's total energy use and leads to significant CO_2 emissions. About 75-85 % of these emissions result from fossil fuel combustion, with the remainder from raw material decomposition.

Despite substantial improvements in energy efficiency over the past century, further significant reductions in CO_2 emissions are limited by the thermodynamic constraints of current technologies. To meet the European Green Deal's climate neutrality goals, the glass industry requires innovative solutions that enable a significant energy transition and greater circularity.

The Project

The GIFFT (Sustainable Glass Industry with Fuel-Flexible Technology) project aims to decarbonise the glass industry by developing a sustainable, hybrid, and fuel-flexible heat generation process. Targeting a 75 % reduction in CO_2 emissions per tonne of glass produced, GIFFT combines several innovative technologies:

- Biomass E-Gasification: Converts biogenic waste and residues into syngas, providing a renewable alternative to natural gas for process heat.
- Plasma-Assisted Multi-Fuel Combustion: Develops a burner capable of hybrid operation using natural gas, biomass-derived syngas, hydrogen, and electricity. This allows for operational flexibility, enabling furnaces to switch between different fuels and maximise the use of low-cost green electricity when available.
- Ash Utilization: Uses biomass gasification ash as raw materials in glass manufacturing. This approach reduces CO_2 emissions by partially replacing virgin raw materials, lowers melting temperatures (reducing fuel consumption), and promotes circularity by utilising by-products that might otherwise be landfilled.

By adapting to biomass resources, power grid conditions, and green fuel availability, the GIFFT system can switch between different operational modes to optimize process heat generation.

Impact

The GIFFT project's innovative approach facilitates the transition from natural gas to low-carbon and dynamic heat production, significantly reducing CO_2 emissions in the glass industry. It enhances energy security and sustainability by:

- Reducing reliance on fossil fuels.
- Promoting the use of renewable energy sources.
- Enhancing circularity through waste valorisation.

Project Partners

The GIFFT project is coordinated by a consortium of leading organisations that bring together expertise from various fields, including the Lithuanian Energy Institute, Vytautas Magnus University, AB Panevežio Stiklas (Lithuania), the Technical University of Munich, PlasmaAir AG, SCHOTT AG, WIP Renewable Energies (Germany), Chalmers University of Technology (Sweden), and Sheffield Hallam University (UK).

Contact Information

For more information about the GIFFT project, please visit our website or contact us at:
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Figure 1: The GIFFT project consortium meeting in the Technical University of Munich, Germany, October 2024.

This project has received funding from the Horizon Europe program under grant agreement No 101122257. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

CARINA - CARINATA AND CAMEIINA TO BOOST THE SUSTAINABLE DIVERSIFICATION IN EU FARMING SYSTEMS

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Considering over 15 % of the current biomass feedstocks used in Europe for the bioeconomy are imported from overseas, technical and sustainable strategies for year-round security supply of affordable and low-iLUC feedstocks are urgently needed to support the competitiveness of agricultural and bio-based sectors. Simultaneously, land abandonment is occurring at an alarming rate in Europe; to help mitigate these risks, developing innovative sustainable farming solutions in the primary production sector for the provision of bio-based feedstock is a promising approach.

The CARINA project is a four-year-long, cross-national, innovative action plan, supported by the European Union. The project focuses on the introduction of two new oilseed crops camelina (Camelina sativa L. Crantz) and carinata (Brassica carinata L. Brown) to new bioeconomy structures and investigate innovative products. Both species have proven to be suited to nearly all European pedoclimatic conditions, showing very interesting prospects in the circular bioeconomy sector. Their cultivation is thought to diversify farming systems, produce sustainable low indirect land use (iLUC) feedstocks for the bio-based economy and set an example to demonstrate the effects of a well-designed crop incorporation and combination. To ensure the accuracy and appropriateness of the approaches, nine Lighthouses with field trials, five Living Labs involving various stakeholder groups and nine Policy Innovation Labs have been established in Europe and play a major role in the joint development of CARINA innovation actions. CARINA capitalises on a highly experienced team of 20 partners, and six affiliated entities, from 13 EU and Associated Countries.

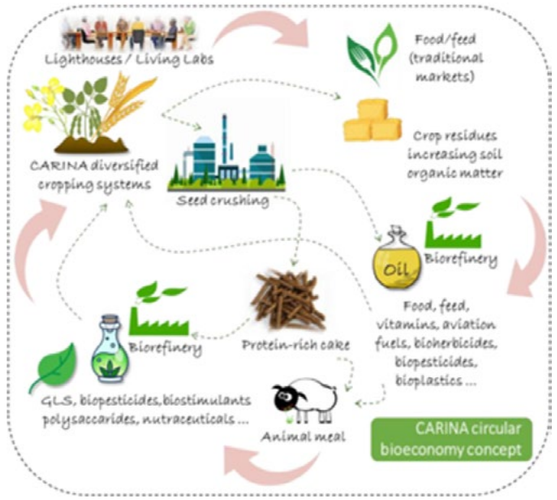

Fig. 1: Circular bioeconomy concept (Source: CARINA consortia agreement).

To consider the complexity of modern agri-food systems and the possible impacts on the society, economy, ecology and the system, an integrated sustainability assessment of CARINA bio-based production systems is carried out. The assessment aims to determine the sustainability contribution of CARINA concepts and promote the successful implementation of agro-bio-based systems for carinata and camelina. The cohesive integrated sustainability assessment encompasses four main components: Social Life Cycle Assessment (SLCA), Life Cycle Assessment (LCA), and Cost and Benefit Analysis (CBA) as well as a subsequent novel sustainability assessment based on an Analytic hierarchy process (AHP) that features integration indicators and allows assessing the integration potential.

This multifaceted approach provides an overarching understanding of the contribution of CARINA concepts to various aspects of sustainability, while also considering the integration potential and limitations of bioeconomy concepts. The results can be used for the decision-making processes of various stakeholders and to promote sustainable bio-based systems.

In our team, we are focusing on the identification, development and assessment of the integration potential of CARINA concepts into the bioeconomy system. Integrated indicators were selected to reflect the integration potential and limitations of bioeconomy concepts and, for example, can assess the co-benefits to the system they are going to be integrated into. This category allows us to consider aspects beyond the classical sustainability framework and integrate important aspects that are not necessarily categorized under economic, social and environmental aspects. Further, it allows us to evaluate whether CARINA bioeconomy systems can lead to an optimized systems interaction.

To derive the sustainability indicators, first, a comprehensive literature review was carried out under defined quality criteria including relevant strategy documents and existing sustainability standards. A long list of indicators was then further categorized, the calculation and appropriateness of the indicators tested and further selected together with individual stakeholders, until an indicator set of at least 40 indicators was determined. These indicators are now being assessed in the individual assessments to extensively depict the integration of CARINA concepts into the bioeconomy system and the results will be available at the end of the project.

Carina
Funded by the European Union

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New members

FULL MEMBERS

INSTITUTE OF INNOVATIONS ON ECO-MATERIALS, ECO-PRODUCTS AND ECO-ENERGY, UNIVERSITY OF QUEBEC AT TROIS-RIVIÈRES (I2E3-UQTR)

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I2E3 INNOVATIONS INSTITUTE in Ecomaterials, Ecoproducts and Ecoenergies *biomass based* UQTR

EERA's first-ever transatlantic member fosters international collaboration in bioenergy research at EERA

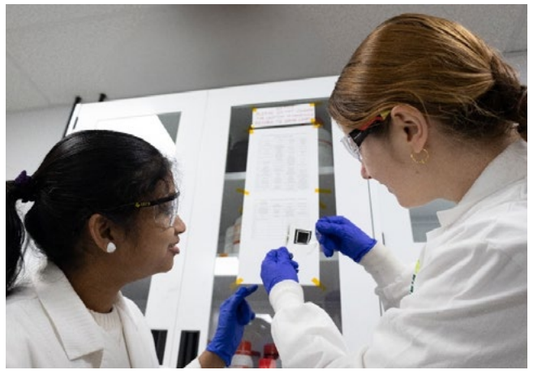
The Innovations Institute in Ecomaterials, Ecoproducts et Ecoenergies (I2E3), a pioneering research centre affiliated with the recently joined Canadian institution, the Université du Québec à Trois-Rivières (UQTR), showcases its leading efforts in driving forward bioenergy innovation. As one of the newest members of EERA's Joint Programme on Bioenergy, I2E3 reflects on the complimentary benefits this opportunity creates in stepping up international research collaboration in the field as the energy transition progresses.

Having recently joined EERA's Joint Programme on Bioenergy (JP Bio), the Innovations Institute in Ecomaterials, Ecoproducts et Ecoenergies (I2E3) is a recognised university research institute, attached to the Université du Québec à Trois-Rivières (UQTR). I2E3 participates in the advancement of the circular bioeconomy based on the use of renewable biomass. Founded more than 50 years ago, the former pulp and paper research centre has since evolved, now significantly contributing to the research and development of renewable biomass-based materials, products, and energies, with an emphasis on minimising environmental impacts and fostering innovation in bioindustrial sectors.

I2E3's approach integrates multidisciplinary expertise from diverse fields to facilitate the transition toward sustainable communities. The Institute **actively collaborates with a wide range of private, public, and institutional partners to ensure the development of cutting-edge technologies** and methods to optimise the use of natural resources, promote the circular bioeconomy, and address the evolving challenges in biomass processing and renewable energy.

As its name suggests, a key research area for I2E3 is the development of clean energy technologies, particularly the production of biofuels such as bioethanol, biodiesel, and green hydrogen from renewable biomass. The Institute also conducts pioneering research in thermochemical processes such as fast and slow pyrolysis, hydrothermal liquefaction (HTL), and other biological processes such as biomethanisation.

I2E3's participation in this Joint Programme (JP) provides the opportunity for significant mutual benefits. On one hand, the Institute contributes its expertise in biomass supply chains, thermochemical conversion, and process integration, particularly in regional bioeconomy models and sustainable biomass processing. With access to advanced facilities for testing and scaling up biomass-to-energy processes, I2E3 brings valuable experience in process intensification (such as ultrasonic treatments to enhance biomass conversion) and integrating bioenergy systems into local economies. By adapting bioenergy production systems to local contexts, I2E3 ensures that the environmental, economic, and social benefits of bioenergy are maximised.



On the other hand, I2E3 expects to enhance its own research capabilities through knowledge exchange and collaboration as part of EERA's Joint Programme on Bioenergy. Moreover, by participating in the JP, the Institute aims to access cutting-edge research, broaden its network, and contribute to the global transition toward a circular bioeconomy. As mentioned by Simon Barnabé, Co-Director for Research and Partnership at I2E3, *"Our expertise in biomass processing and energy conversion can bring innovative solutions to the programme, while also allowing us to learn from international best practices".*

Looking ahead, as the bioeconomy continues to evolve, the **JP Bio partnership offers I2E3 an exciting opportunity to push the boundaries of bioenergy innovation and actively contribute to the inevitable energy transition**. This collaboration represents a significant step forward in enhancing international cooperation in low-carbon energy research, opening new opportunities for innovation and global partnerships.

More information on I2E3can be found through their main website at: Link or from EERA Bioenergy representatives Daniel Bégin (daniel.Begin@uqtr.ca) and Simon Barnabé (simon.barnabe@uqtr.ca).

EINDHOVEN UNIVERSITY OF TECHNOLOGY (TU/e)

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TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

About TU/e

Eindhoven University of Technology (TU/e) is a young university specializing in engineering science & technology, founded in 1956 by industry, local government and academia. Today, this spirit of collaboration is still at the heart of the university community. We educate students and advance knowledge in science & technology for the benefit of humanity. Both in education and in research, TU/e combines scientific curiosity with a hands-on mentality. Fundamental knowledge enables us to design solutions for the highly complex problems of today and tomorrow. We understand things by making them and we make things by understanding them. Our campus is in the centre of one of the most powerful technology hubs in the world: Brainport Eindhoven. Globally, we stand out when it comes to collaborating with advanced industries. Together with other institutions, we form a thriving ecosystem with one common aim: to improve quality of life through sustainable innovations.

About SPE

Industry 4.0 will be small scale, distributed and circular. Truly changing the paradigm of chemical industry requires a unique combination of expertise, ranging from reaction engineering to separations, from photo-catalysis to electrochemical engineering and automation. Experts should truly work together towards a common goal, bringing the circular economy in the process industry to a reality. The research group Sustainable Process Engineering, is part of the faculty of Chemical Engineering and Chemistry at TU/e. The main objective of the research group is to develop intensified and integrated systems based on improved mass and heat transfer for the distributed production of chemicals with low environmental impact and zero waste. We make use of alternative energy sources like light, electricity and bio-based sources, and we combine these in new reactors capable of continuous, safe, and high efficiency production of chemicals. SPE has a well-established expertise in the development of novel integrated reactor concepts such as membrane reactors, (micro) structured catalytic reactors and HiGee reactors (Figure 1). This is achieved based on our continuously improved fundamental knowledge on advanced (multi-phase) reactors, and by employing a combination of state-of-the-art numerical models (at different levels of detail using the multi-level modelling approach), advanced (non-invasive) experimental techniques and experimental demonstration of novel reactor concepts (proof of concept). The group has a lot of experience in research on membranes, membrane reactors, hybrid separation, integrated systems, rotating reactors and biomass conversion, with more than 25 EU projects in these topics. We count on state-of-the-art laboratory infrastructure to synthesize and characterize novel materials, as well as numerous testing facilities for batch and continuous (fully automated) operations in a wide range of operating conditions (Figure).

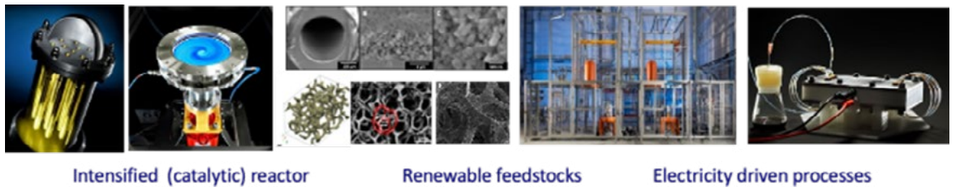


Figure 1: Research scope at SPE.

Figure 2: Example of lab infrastructure at SPE.

Figure 3: Example of lab infrastructure at SPE.

Contributions to Biomass Conversion

In a world striving towards sustainability, replacing fossil resources with non-edible biomass to produce chemicals is becoming increasingly important. Our team at the Sustainable Process Engineering group is at the forefront of this transition, designing novel intensified multi-functional reactors and processes to overcome the challenges of biomass conversion. Our work involves:

- Unraveling complex kinetics
- Understanding the interrelation of physical and chemical processes in the reactor
- Exploring various intensification and separation strategies
- Modeling reactor performance
- Building and testing our reactor designs at various TRL levels (up to TRL 5-6)

One of our latest examples is the HIGFLY project, coordinated by Prof. Neira D' Angelo, where TU/e and project partners have developed a novel route to produce Sustainable Aviation Fuels (SAFs) from advanced biomass feedstocks using intensified processing strategies. If you want to know more, please visit our websites:

www.tue.nl/spe

https://www.higfly.eu/

Useful information

The newly elected European Commission sets freedom and competitiveness as its two key drivers

In a vote that took place in Strasbourg by the end of November, the European Parliament approved the new College of Commissioners that took office on 1 December, thus giving their confidence to the new team and to the vision for Europe in the next five years presented by President Ursula von der Leyen.

The President signalled freedom as the key driver of the EU, something to be nurtured and protected, which for the president means "making choices" that will be framed by the first major initiative that the new Commission will put forward: a Competitiveness Compass: *"The Compass will be built on the three pillars of the Draghi report. The first is closing the innovation gap between the US and China. The second is a joint plan for decarbonisation and competitiveness. And the third is increasing security and reducing dependencies,"* the President explained.

Closing the innovation gap between the US and China

Europe needs to make it easier to grow and scale up start-ups and patent applications. That is why the new Commission will put research and innovation, science and technology at the heart of the economy. For this reason, the first-ever Commissioner for Start-Ups, Research and Innovation will be Ekaterina Zaharieva.

Plan for decarbonisation and competitiveness

Almost five years ago, the European Green Deal was released. To be successful in its goals, Europe must be more agile and capable of better-accompanying people and businesses along the way. This is why, the European Commission will put forward the Clean Industrial Deal within the first 100 days of the mandate, an effort that will involve the entire College.

Reinforcing the European economic security

Since overdependencies can quickly turn into vulnerabilities, stable and secure supply chains are vital. Critical raw materials are the most obvious example: The demand for critical minerals for the clean transition has already doubled during the last mandate, and it could triple by the end of the next one. So Europe needs free and fair trade to diversify its suppliers. Maroš Šefčovič will deliver more partnerships – for trade and investments – and also to protect European economic security against the greatest risks to its strategic interests and sovereignty.

Ursula Von der Leyen insisted that the new Commission is eager and ready to work and highlighted the experience and diversity of the new College Members, which include former Prime Ministers and ministers, former mayors and local officials, CEOs, business owners, journalists, coming from farming and urban backgrounds, and belonging to different generations.

In a press conference after the vote with European Parliament President Roberta Metsola, President von der Leyen thanked the European Parliament for the trust and expressed confidence in the cooperation between the two institutions in the coming years. *"Over the next five years, European unity will be absolutely critical. I cannot stress this enough (…) This is why we need the tightest cooperation between the Commission, the Parliament and the Council. It is the partnership that Europe needs—and deserves. My team and I are fully committed to this"*, she stated.

Von der Leyen also outlined the first months of her new mandate, with seven initiatives expected in the first 100 days, including a Clean Industrial Deal, a White Paper on European Defence, an AI Factories initiative, a Cybersecurity Action Plan for Health Infrastructure, a vision for Agriculture and Food, the enlargement policy reviews, and the Youth Policy Dialogues to be organised by each Commissioner to give a stronger voice to the next generation of Europeans.

Mario Draghi proposes plan to revitalise Europe's energy competitiveness

In his long-awaited report on 'The Future of European Competitiveness', Mario Draghi presented a roadmap with key recommendations to regain economic momentum and, at the same time, make progress on decarbonisation in the midst of the climate crisis. Draghi emphasises the challenge of transforming Europe's energy sector, one of the most critical areas for the bloc's growth and sustainability.

The paper notes that Europe's competitiveness has been stagnating, in part due to the growing influence of the United States and China, with declining productivity and industry facing difficulties in adapting to the major transformations of the century, such as the technological revolution and climate change. The need for a major overhaul of energy policy is presented as a central element of the plan.

The report mentions the importance of developing an industrial action plan to climb the global ladder. Draghi sees the need for more public support for the private sector and a new industrial policy that is coordinated with competition and trade policy in a joint strategy. He also stresses the need for member states to increase their spending on research and development (R&D) in leading sectors, as so far, they have focused more on mature technologies and sectors where productivity growth is slowing down.

The challenge of the energy transition and the transformation of the European energy market

Among the main challenges highlighted in the report is the energy transition, due to high external energy dependence and ambitious decarbonisation targets. Volatility in the energy market, high energy prices and excessive taxation in Europe are discussed in this analysis.

One of Draghi's proposals is the creation of an 'Energy Union' and he suggests a 'joint decarbonisation and competitiveness plan', integrating all member states' energy policies and aligned with climate objectives. The integration of energy policies and cooperation between member states would be key to achieving effective decarbonisation in a coordinated manner and would allow Europe to maintain the competitiveness of its industry while combating climate change.

The report by the former President of the European Central Bank (ECB) aims to accelerate decarbonisation, ensure the sustainability of energy supply, reduce energy costs for the end user and also reduce the energy tax burden for industry. To this end, he points to renewable energies as the key to exploiting Europe's potential and proposes providing tax credits to industry for the adoption of clean energy solutions.

Draghi points out that natural gas will continue to dominate the coming years in the European Union, so that external dependence and price volatility may influence the continent's economy. He proposes strategic partnerships with reliable commercial suppliers with large natural gas reserves (Norway, Algeria, the United States and Qatar), as well as long-term supply agreements to avoid market fluctuations. It points out the importance of establishing joint gas purchasing mechanisms to increase the European Union's bargaining power. It recommends improvements in gas storage and import infrastructures to facilitate equal access for all Member States, greater transparency in energy data for more accurate planning, stricter financial regulation to hinder speculation in energy markets, and helping industrial sectors to have easier access to a competitive energy system (which would prevent them from fleeing to countries with lower energy costs). The report stresses the need to replace the use of nature.

With regard to the electricity market, the aim is to simplify the authorisation of renewables and networks, increase long-term contracts, facilitate access to energy for industry subject to international competition, maintain the nuclear supply chain and the development of new plants, encourage industrial self-consumption, differentiate the remuneration of renewables and nuclear energy from fossil generation, and strengthen storage.

Report 'The future of European competitiveness':

- Part A. The future of European competitiveness – A competitiveness strategy for Europe.
- Part B. The future of European competitiveness – In-depth analysis and recommendations.

COP29 agrees to triple funding to developing countries to $300 billion per year by 2035

From 12-13 November, world leaders gathered in Baku, Azerbaijan, for the World Leaders Climate Action Summit, kicking off the 29th United Nations Climate Change Conference (COP29). Every year, the COP meets to determine ambitions and responsibilities for climate action and to identify and assess climate measures. This year's presidency's plan was based on two pillars: enhancing ambition, to ensure all parties commit to ambitious national plans; and enabling action, which highlights the crucial role of finance in transforming ambition into tangible actions, reducing emissions, adapting to climate change and addressing loss and damage.

The COP29 closed with a new funding target to help developing countries protect their people and economies from climate disasters and share the huge benefits of the clean energy boom and thus reached a landmark agreement:

- Tripling funding to developing countries from the previous target of $100 billion per year to $300 billion per year by 2035.
- Secure the efforts of all actors to work together to increase financing to developing countries, from public and private sources to $1.3 trillion a year by 2035.

The EU was represented by European Council President Charles Michel, who called for an ambitious new collective quantified goal on climate finance that should be designed based on a broad, transformative and multi-layered approach, including various flows of finance and a broader group of contributors; and also reflect developments in countries' respective economic capabilities and shares of global greenhouse gas emissions since the early 1990s.

President Charles Michel underlined the shared responsibility for the climate crisis and insisted on the need to expand the donor base that will contribute to achieving the collective goal. *"This climate threat is existential for the human race and we, the human race, bear responsibility for this war against nature. And it's true that some bear this responsibility more than others. The so-called developed countries"*, he stated.

He recalled that in 2023, the EU and its 27 member states were the biggest contributors to climate finance globally, with 28.6 billion euros, and encouraged others to follow suit, including the G7 and emerging economies.

EU reaffirms at CoP29 its commitment to reduce methane emissions by at least 30 % over six years

The European Commission presented at the World Climate Summit (COP29) the so-called roadmap for a methane reduction partnership. The aim of this initiative is to "further accelerate the reduction of methane emissions associated with fossil energy production and consumption, in collaboration with partner countries, the International Energy Agency and a range of non-governmental organisations (NGOs)".

The new Methane Abatement Partnership Roadmap provides a blueprint for cooperation between fossil fuel importing and exporting countries to help companies improve their monitoring, reporting and verification systems to reduce methane emissions. The launch of the roadmap at COP29, follows the Global Methane Emissions Reduction Commitment, an agreement launched at COP26 (held in 2021) by the European Union and the United States, under which more than 150 countries are already pursuing the collective goal of reducing global anthropogenic methane emissions by at least 30 % by 2030 compared to 2020 levels.

"Reducing methane emissions from the energy sector is an easily achievable climate action target. It makes economic sense. Indeed, it contributes to strengthening our energy security while reducing emissions. The roadmap we are launching today shows the way forward in terms of fostering cooperation between importing and exporting countries. For the EU, it is clear: we can only tackle methane emissions effectively if we work together across global supply chains and with all stakeholders", says Wopke Hoekstra, European Commissioner for Climate Action.

The new roadmap sets out a few concrete actions to be taken, including a robust monitoring, reporting and verification system based on the principles of the Oil and Gas Methane Partnership 2.0 (OGMP 2.0), and a project plan to reduce emissions from existing assets, providing a clear timetable, investment plan and human resource needs.

G20, led by Brazil, establishes 10 High-Level Principles on Bioeconomy

The Brazilian presidency of the G20 has presented the Bioeconomy Initiative (GIB), a project that promises to transform the productive approach at the global level, changing the way the world's economies produce, consume and relate to the environment.

In this context, the bioeconomy emerges as an innovative paradigm that promotes the sustainable use of biological resources, combining science and technology with traditional practices to generate economic, social and environmental solutions. The G20 has recognised its potential to drive inclusive economic growth, generate decent jobs and promote equity in all regions of the world, especially those with high biodiversity and climate vulnerability.

Indeed, during last Wednesday's G20 meeting, members adopted the Ten High-Level Principles on the Bioeconomy, a set of voluntary guidelines that reflect the core values of this initiative, covering not only economic but also social and environmental aspects, with a strong focus on equity, conservation and responsible use of natural resources. These are:

1. Sustainable development in all its dimensions: The bioeconomy must contribute to eradicating hunger and poverty, improving health and well-being, and ensuring global food security.
2. Inclusion and equity: It promotes the defence of the rights of all people, including indigenous and local communities, with a commitment to gender equality.
3. Climate change mitigation and adaptation: Bioeconomy efforts must be aligned with multilateral climate agreements, such as the Paris Agreement.
4. Biodiversity conservation: Promote sustainable use of natural resources and ensure equitable sharing of benefits derived from traditional knowledge.
5. Sustainable patterns of consumption and production: Advocating a circular economy and efficient use of biological resources, restoring degraded ecosystems.
6. Responsible science and technology: The bioeconomy must be developed through science, innovation and traditional knowledge, assessing both benefits and risks.
7. Coherent public policies: Trade in bioeconomy products must have policies that promote fair market conditions, decent jobs and local value creation.
8. Transparent sustainability criteria: Clear, science-based methodologies need to be used to measure sustainability in all value chains.
9. International collaboration: Global cooperation is key to address common challenges, promote innovation and share best practices.
10. Country-specific approaches: Policies must be tailored to local priorities and contexts, recognising the diversity of circumstances across regions.

Brazil's leadership of the G20 presidency is proving key to promoting the bioeconomy internationally. However, for this initiative to succeed, international collaboration and the establishment of robust public policies that promote fair trade and investment in green infrastructure will be essential.

The next step will be to transform these principles into concrete actions that benefit both developed and developing countries. If successful, the bioeconomy could become the key to addressing the major environmental and economic challenges of the 21st century, including climate change, biodiversity loss and global poverty.

Taking stock of the first year of the Global Biofuels Partnership: a catalyst in promoting biofuels globally

Since its founding in September 2023 during the G20 Summit in New Delhi, the Global Biofuels Alliance (GBA) has gained 24 member countries and 12 international organisations, positioning it as a key player in the promotion and development of biofuels globally.

The GBA is a multi-stakeholder alliance that integrates governments, international organisations and industry, bringing together both major consumers and producers of biofuels. The objectives of the alliance include capacity building, technical support to national programmes, policy exchange, technology advancement and the implementation of internationally recognised standards and codes. These activities are developed with the broad participation of all stakeholders, promoting a collaborative and effective approach.

During its first year, the GBA held three Temporary Executive Committee (TEC) meetings, which defined initial initiatives such as the series of biofuels workshops and the development of national biofuels landscapes, focusing on policy frameworks. In addition, GBA has strengthened its global presence by actively participating in relevant international forums such as COP28 in Dubai, the World Economic Forum in Switzerland, India Energy Week 2024 and the Global Biogas Summit 2024 in the UK. Its inclusion as an International Organisation in the Energy Transitions Working Group (ETWG) meeting under Brazil's G20 Presidency and in the International Forum on Sustainable Biofuels during the Italian G7 Presidency underlines its growing influence and recognition.

The Global Biofuels Alliance has proven to be a catalyst in promoting biofuels globally, bringing together diverse actors in a joint effort to address energy and environmental challenges. With a clear focus on international collaboration and technological innovation, the GBA is emerging as a key pillar in the transition to a more sustainable energy future, with India playing a crucial role as a leader and facilitator in the sector.

Data confirm the boom in biogas and biomethane production in Europe

The combined production of biogas and biomethane in 2023 amounted to 22 bcm, according to the 14th edition of the Statistical Report published by the European Biogas Association. This is more than the entire domestic natural gas demand of Belgium, Denmark and Ireland combined and represents 7 % of the EU's natural gas consumption in 2023.

At current biogas and biomethane production rates, Europe could avoid 106 million tonnes of CO_2 emissions each year, provide renewable energy to 19 million European households all year round and fuel 533,000 LNG trucks annually.

The introduction of biogas will be key to strengthening the EU's competitiveness and leadership in clean technologies in the coming years, but also the resilience of its energy system. According to Eurostat, 98 % of the EU's natural gas demand in 2022 was covered by imports. Given this significant dependence on external energy supplies and the resulting dependence on third parties, investment in biogas remains vital.

Despite figures confirming the growth of the sector, as well as its role in achieving climate targets and energy independence, a greater focus on optimising regulatory and market conditions, including coherent planning of biomethane potential and faster permitting procedures, will be essential to ensure sustained growth in the coming years.

Biomethane production alone grew to 4.9 bcm in 2023, with an installed capacity of 6.4 bcm/year in the first quarter of 2024. This represents the largest increase in biomethane production so far, with the largest year-on-year increase in production concentrated in the EU area (21 %).

In terms of end uses, biomethane consumption is concentrated in the most energy-intensive sectors, which favours its rapid decarbonisation. In 2023, 23 % of biomethane produced in Europe went to transport, 17 % to construction, 15 % to power generation and 13 % to industry.

In addition, the biogas and biomethane industries can provide an important source of biogenic CO_2, produced as a co-product of renewable gas. Biogenic CO_2 can be used for the sustainable production of, for example, electronic fuels, sustainable chemicals and carbon capture and storage, which are not yet exploited today. By 2023, Europe could have used 29 Mt of biogenic CO_2, based on the volume of biogas and biomethane produced in that year (22 bcm). This corresponds to 71 % of the EU's 2022 CO_2 demand.

With adequate support, over the next six years until 2030, the number of jobs in the sector can grow to 500,000 and generate an additional benefit of EUR 12 billion per year for the European bioeconomy, taking into account that at least EUR 25 billion will be invested in Europe's biomethane by 2030.

EU energy needs for the last month of 2024 could be covered by bioenergy alone

On 11 November, the European Union celebrated its Bioenergy Day, marking bioenergy's vital contributions to Europe's economic resilience, energy security and decarbonisation goals.

According to the calculations of Brussels-based international organisation Bioenergy Europe, the EU could potentially meet its energy needs for the then remaining 49 days of 2024 using bioenergy alone. This milestone emphasises bioenergy's capacity to support Europe's energy independence while contributing to its climate goals and fostering innovation in sustainable energy technologies, like bioenergy with carbon capture and storage (BECCS).

"The Bioenergy industry is ready to deliver on the upcoming Clean Industrial Deal with its unique know-how and energy capacity" said Jean-Marc Jossart, Secretary General of Bioenergy Europe. *"As Europe is set to strengthen the future of its industries, -bioenergy can step in, providing both a sustainable energy source and creating new growth opportunities, making the EU's economy more competitive and sustainable."*

Bioenergy is a valuable European industrial asset, supporting over 500,000 jobs across the Union and supplying 82 % of Europe's renewable heating. It strengthens local economies and offers new employment opportunities, particularly in rural areas. Bioenergy is a leading European technology for the world, about 74 per cent of bioenergy technology suppliers are based within the EU, showcasing Europe's expertise in advanced green technologies and energy solutions.

Deforestation law: Parliament and Council give companies an extra year to comply

Companies will have one more year to comply with new EU rules to prevent deforestation that will ban the sale in the EU of products sourced from deforested land after Parliament adopted with 546 votes to 97 and 7 abstentions the political agreement with the Council to delay the application of the new rules.

Subsequently, the Council of the EU formally adopted this change.

Large operators and traders will now have to respect the obligations of this regulation as of 30 December 2025, and micro- and small enterprises from 30 June 2026. This additional time is intended to help companies around the world implement the rules more smoothly from the date of application, without undermining the objectives of the law.

The Commission proposed postponing the application date of the deforestation regulation by one year in response to concerns raised by EU member states, non-EU countries, traders and operators that they would not be able to fully comply with the rules if applied from the end of 2024.

Following requests from Parliament, the Commission has committed to ensuring both the information system for operators and traders and the proposal for the risk classification of countries and regions will be available as soon as possible, and at the latest by 30 June 2025. With a general review of the regulation expected no later than 30 June 2028, the Commission will analyse additional measures to simplify and reduce the administrative burden for companies.

"We promised and we have delivered. We paid attention to the calls of several sectors facing difficulties and ensured that affected businesses, foresters, farmers and authorities would have an additional year to prepare. This time must be used effectively to ensure that the measures announced in the Commission's binding declaration, including the online platform and risk categorisation, are consistently implemented to create more predictability throughout the supply chain", Parliament's rapporteur Christine Schneider said.

Before the one-year delay can enter into force, the agreed text also has to be published in the EU Official Journal before the end of 2024.

Publications

Optimising the cost of biomethane grid injection

PDF

Biomethane Industrial Partnership (BIP Europe)

The Biomethane Industry Association (BIP Europe) has published a report which explores the technical, regulatory and economic pathways for integrating biomethane into Europe's extensive gas grid.

The text provides a roadmap for optimising biomethane injection into the grid, which is crucial for Europe's transition to a sustainable energy system, as addressing cost and regulatory barriers paves the way for increased production and use of biomethane. According to the report, this will significantly contribute to meeting the EU's biomethane production target for 2030 and with it the EU's clean energy goals.

European Bioeconomy in Figures 2008-2021

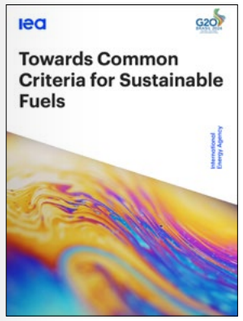
PDF

Biobased Industries Consortium (BIC)

The Bio-based Industries Consortium (BIC) has published the seventh report in the series 'The European Bioeconomy in Figures', demonstrating the macroeconomic effects generated by the bioeconomy, such as turnover or employment, since 2014.

The bioeconomy has been identified by the European Commission as a key sector for achieving the EU's sustainability and climate goals and is an integral part of the EU Green Pact. Furthermore, the EU Bioeconomy Strategy focuses on the development of a sustainable and circular bioeconomy to address societal challenges and improve the competitiveness of bio-based industries. Hence the interest in generating these regular reports.

Towards common criteria for Sustainable Fuels



PDF

International Energy Agency (IEA)

This report – produced by the International Energy Agency (IEA) in support of Brazil's G20 Presidency – explores the feasibility and implications of setting up common criteria to enable fair comparisons of sustainable fuels. It maps commonalities and differences among the standards, regulations and certifications used for sustainable fuels across different regions and markets. It reviews typical carbon intensities and the improvement potential of various fuel production pathways and sets out policy considerations for governments that wish to work toward common criteria for sustainable fuels.

Bioenergy in the European Union – 2024

PDF

Joint Research Centre (JRC)

This report, which is an update of the CETO 2023, provides a detailed examination of the bioenergy sector within the European Union (EU), highlighting its significance in the global context and its role in the transition towards a low-carbon economy. It offers insights into the development and status of various bioenergy technologies, funding landscapes, economic contributions, and employment trends within the EU. The report also contrasts the EU's bioenergy sector with that of other regions, particularly the US and China and details the Technology Readiness Level (TRL) of various bioenergy technologies, such as anaerobic digestion, biomass combustion, gasification, pyrolysis, hydrothermal processing, and torrefaction.

Statistical Report 2024

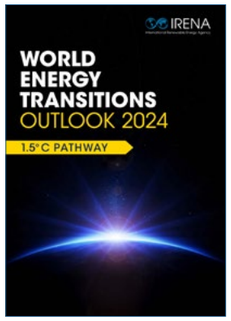
PDF

European Biogas Association (EBA)

Combined biogas and biomethane production in 2023 amounted to 22 bcm, according to the 14th edition of the Statistical Report published by the European Biogas Association. This is more than the entire inland natural gas demand of Belgium, Denmark, and Ireland combined, and represents 7 % of the natural gas consumption of the European Union in 2023.

This report is an extensive examination of the state of the biogas industries in Europe. Although the EBA database is mainly based on solid facts and figures, in some specific cases, qualified estimates, such as extrapolation from survey data, are made by national stakeholders and by the EBA.

World Energy Transitions Outlook 2024



PDF

International Renewable Energy Agency (IRENA)

This report presents a pathway to achieve the 1.5°C target by 2050, positioning electrification and efficiency as key transition drivers, enabled by renewable energy, clean hydrogen and sustainable biomass.

The 2024 Outlook provides an overview of progress by tracking implementation and gaps across all energy sectors and identifies priority areas and actions based on available technologies that must be realised by 2030 to achieve net zero emissions by mid-century.

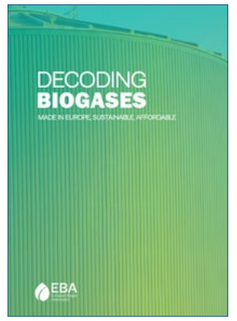
Trends in the EU bioeconomy | Update 2024

PDF

Joint Research Centre (JRC)

This report on Bioeconomy trends in the European Union describes progress towards a sustainable bioeconomy and provides information on the status of national and regional bioeconomy strategies in EU Member States. The report, which supports the EU Bioeconomy Strategy, is intended to serve as a basis for its forthcoming revision. It has been prepared by the European Commission's Bioeconomy Knowledge Centre (KCB), hosted by the Joint Research Centre (JRC).

Decoding Biogases: Made in Europe, Sustainable, and Affordable



PDF

European Biogas Association (EBA)

This report details how biogas is produced and used and its main benefits for the environment, society and the energy sector.

According to the text, biogas plays a key role in complementing and enabling the rise of other renewable energies, as they are an important source of flexibility in the energy system. They provide clean and manageable energy, essential to overcome periods of prolonged low solar and wind production.

Save the date! International bioenergy events

JANUARY 2025

20-21 January 2025
Fuels of the Future
Berlin, Germany

22 January 2025
BioRADAR Co-Creation Workshop
Online

27-28 January 2025
Berlin Conference on Waste Management and Energy (BKAWE)
Berlin, Germany

29-30 January 2025
Future of BioLNG: Europe 2025
Amsterdam, The Netherlands

FEBRUARY 2025

5-6 February 2025
Bio360 Expo
Nantes, France

11 February 2025
BioCircular SUMMIT
Madrid, Spain

12-13 February 2025
RENMAD Biomethane 2025
Toledo, Spain

25-26 February 2025
8th Biomass Trade & Power Europe Conference
Copenhagen, Denmark

MARCH 2025

11-13 March 2025
BIOKET 2025
Brussels, Belgium

17-18 March 2025
International Conference on Industrial Biotechnology and Bioenergy (ICIBB)
Madrid, Spain

18-20 March 2025
2025 International Biomass Conference & Expo
Atlanta, USA

APRIL 2025

1-3 April 2025
Argus Biomass Conference
London, UK

2-3 April 2025
Green Marine Transport 2025
Hamburg, Germany

3-4 April 2025
Euro-Global Summit on Biofuels and Bioenergy
Amsterdam, The Netherlands

7-8 April 2025
Global Summit on Biofuels and Bioenergy
Vienna, Austria

MAY 2025

5-7 May 2025
International Bioenergy Conference (IBC 2025)
Lisbon, Portugal

6-8 May 2025
Sustainable Aviation Futures
Amsterdam, The Netherlands

20-21 May 2025
REGATEC 2025
Weimar (Germany

28-29 May 2025
3rd Annual Advanced Biofuels Forum
Amsterdam, The Netherlands

JUNE 2025

9-11 June 2025
2025 International Fuel Ethanol Workshop & Expo
Omaha, USA

9-12 June 2025
EUBCE 2025
Valencia, Spain

16-17 June 2025
20th World Bioenergy Congress and Expo
Frankfurt, Germany

24-25 June 2025
International Biogas Congress & Expo
Brussels, Belgium

EERA Bioenergy in Europe

Table 1. Full members of the EERA Bioenergy Joint Programme.

Aalborg University
Department of Energy Technology (Denmark)

BERA
Belgian Energy Research Aliance (Belgium)

BESTMER
Ege Üniversitesi Biyokütle Enerji Sistemleri ve Teknolojileri Merkezi Ege (Turkey)

CEA
French Alternative Energies and Atomic Energy Commission (France)

CIEMAT
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (Spain)

CNR
Istituto Motori del Consiglio Nazionale delle Ricerche (Italy)

CRES
Center for Renewable Energy Sources and Saving (Greece)

CSIC
Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain)

DBFZ
Deutsches Biomasseforschungszentrum gemeinnützige GmbH (German Biomass Research Center gGmbH)

ENEA
Italian National Agency for New Technologies, Energy and Sustainable Economic Development (Italy)

I2E3-UQTR
Institute of Innovations on Eco-materials, Eco-products and Eco-Energy, University of Quebec at Trois-Rivières (Canada)

IEN
The Institute of Power Engineering (Poland)

KIT
The Research University in the Helmholtz Association (Germany)
KIT / BIOLIQ

LNEG
Laboratório Nacional de Energia e Geologia (Portugal)

NTNU
Norwegian University of Science and Technology (Norway)

PSI
Paul Scherrer Institut (Switzerland)

SINTEF
(Norway)

TNO
(Netherlands)

TÜBITAK
Scientific and Technological Research Council of Turkey (Turkey)

TU/e
Eindhoven University of Technology (Netherlands)

UKERC
UK Energy Research Centre
ASTON UNIVERSITY
SUPERGEN Bioenergy Hub
(United Kingdom)

UNIBO
Universitá di Bologna (Italy)

UPV/EHU
University of Basque Country (Euskal Herriko Unibertsitatea) (Spain)

VŠB
Technical University of Ostrava (Czech Republic)

VTT
Technical Research Centre of Finland Ltd (Finland)

WUR
Wageningen University & Research (The Netherlands)

Table 2. Associate members of the EERA Bioenergy Joint Programme.

Agricultural University of Plovdiv (Bulgary)	**CIRCE** Centro de Investigación de Recursos y Consumos Energéticos (Spain)	**CNRS** Centre National de la Recherche Scientifique (France)
CoLAB BIOREF Collaborative Laboratory for the Biorefineries (Portugal)	**Çukurova Üniversitesi** University of Cukurova, Faculty of Agriculture, Department of Field Crops (Turkey)	**Energy Agency of Plovdiv** (Bulgaria)
ETA-Florence Renewable Energies (Italy)	**FCiências.ID** Associação para a Investigação Desenvolvimento de Ciências (Portugal)	**IFK Stuttgart** Institute of Combustion and Power Plant Technology (Germany)
IIASA International Institute for Applied Systems Analysis (Austria)	**NIC** National Institute of Chemistry (Slovenia)	**RE-CORD** Renewable Energy Consortium for Research and Demonstration (Italy)

UNICT Università degli studi di Catania (Italy)	**UNIMORE** University of Modena and Reggio Emilia (Italy)	**UNIPD** Università degli Studi di Padova (Italy)
UNITO Università di Torino (Italy)	**UNL** Universidade NOVA de Lisboa, Faculdade de Ciências e Tecnologia (Portugal)	**WIP** WIP Renewable Energies (Germany)

EERA Bioenergy in Europe

EERA Bioenergy is open to new complementary RTD organisations.
Please contact the Joint Programme Secretariat for further details at secretaria@bioplat.org

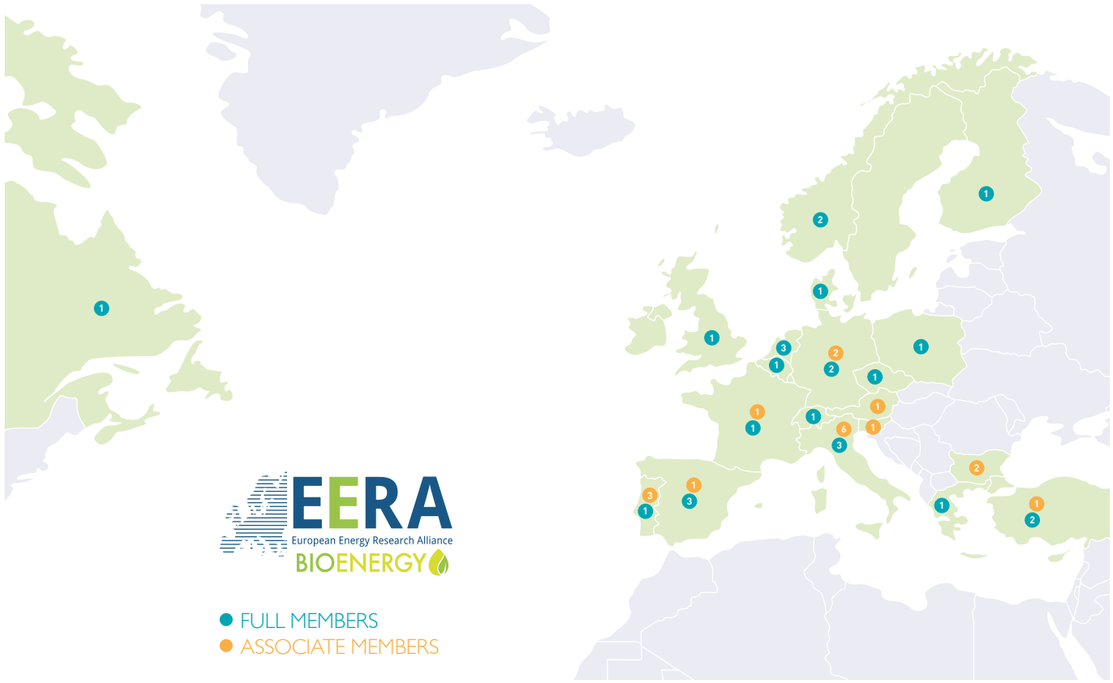


Figure 1: The EERA Bioenergy Joint Programme consists of 44 members (26 Full members and 18 Associate members) from a total of 19 countries. Link

www.eera-bioenergy.eu

Contacts

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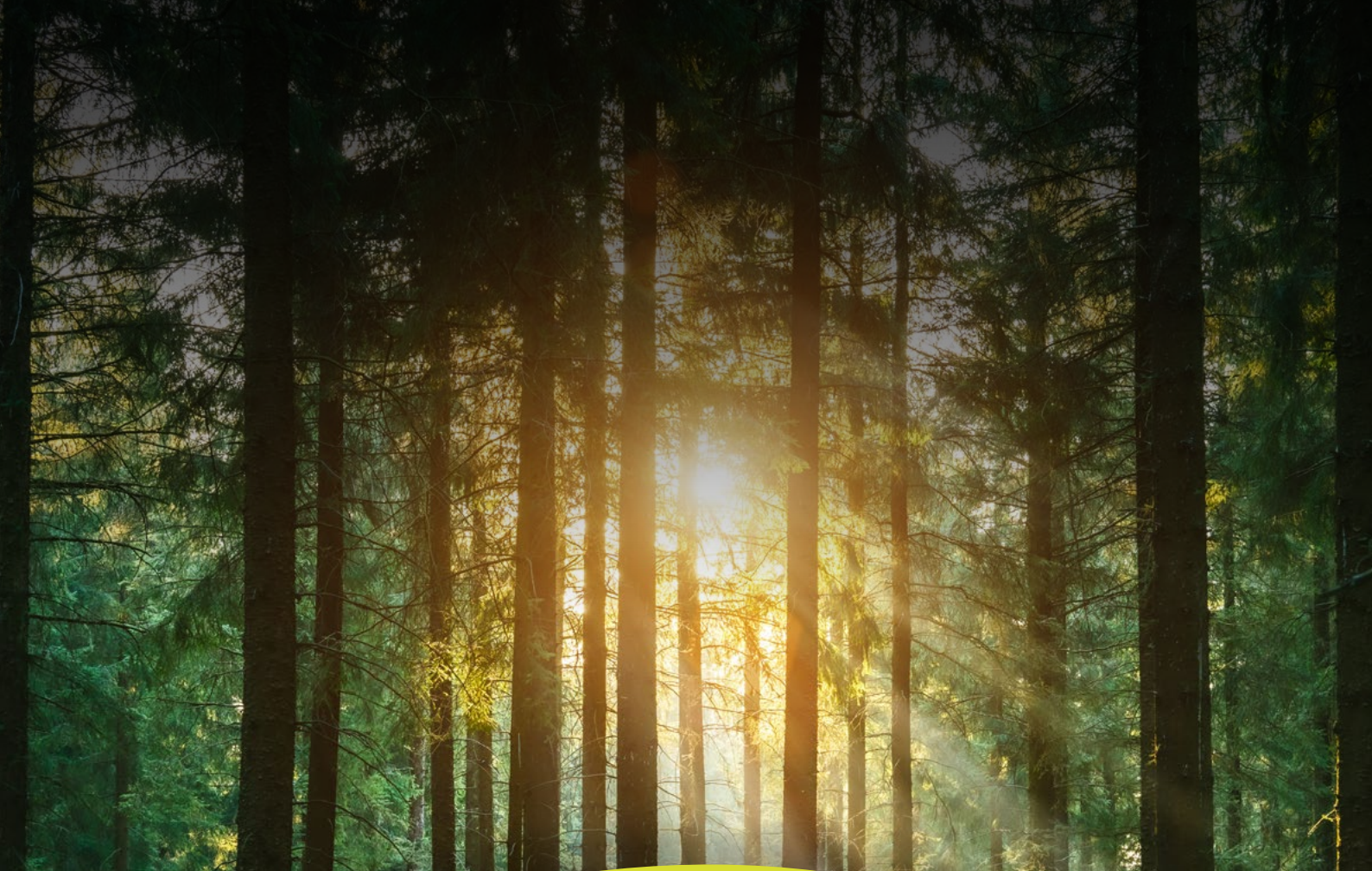

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BIOENERGY