EERA European Energy Research Alliance BIOENERGY

eebionews

EERA BIOENERGY NEWSLETTER

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Joint Programme Coordinator's corner

Andrea Monti
EERA Bioenergy Coordinator

Dear EERA Bioenergy members, dear eebionews readers,

I'm writing these words after the Steering Committee meeting that we held on 22 November in Brussels. I feel we enjoyed a successful meeting, plenty of inspiring debates. It was a great pleasure for me to see so many EERA Bioenergy members participating and committed with the development of the Joint Programme. The room was full and the atmosphere serene and friendly. That gives me every hope for the future.

The presentations of our three guests, Maria Georgiadou and Kyriakos Maniatis (From the European Commission) and Peter Canciani (from Central European Initiative), were very inspired and appreciated.

We have elected the new Subprogramme 4 'Stationary bioenergy' Coordinator (congrats to Julien Blondeau from BERA) and confirmed BIOPLAT as Secretariat for 2020 (unanimously!). We had also the pleasure to welcome our 7 new Members and see their outstanding expertise in the field of bioenergy. I'm sure they will give a substantial contribution to the growth of our group.

I found great the programmes presented by the Subprogrammes coordinators for the next period! I expect that this will lead to very positive results for all members, as it occurred over the last 6 months and also in the past.

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Subprogramme 5 'Sustainability / techno-economic analysis / public acceptance' is now fully operating, very well organized and engaged. Because of its horizontal nature, I'd like to see a strong interaction with the other Subprogrammes in the coming months. The presentation by the Coordinator, Rita V. d'Oliveira (from NTNU) is very promising in this regard.

Next year, 2020, we will work jointly to implement our Strategic Research and Innovation Agenda. As well as to promote collaboration among EERA Bioenergy members to boost the generation of R+D+I projects. Biomass will be essential to meet the ambitious climate goals and we will be here to contribute to its success!

Thank you!

Andrea.

Participants in last Steering Committee meeting (22 November), in EERA aisbl facilities in Brussels.

EERA Bioenergy news in brief

LAST SC MEETING AND ONE NEW APPOINTMENT: SUBPROGRAMME 4 COORDINATOR

The EERA Bioenergy Steering Committee meeting that took place in Brussels, at EERA aisbl offices, on 22 November addressed relevant issues related to the Joint Programme structure and planning of 2020 actions.

Maria Georgiadou (right) and Kyriakos Maniatis (left) from the European Commission, informed about the last news on renewable fuels and bioenergy R&I, as well as the recent initiatives to decarbonize the transport sector in the EU.

Peter Canciani, from the Central European Initiative, introduced CEI to the SC. It's a regional intergovernmental forum committed to supporting EU integration and sustainable development through cooperation between and among its members and with the EU, as well as international and regional organisations, public or private institutions and NGOs.

Furthermore, six new EERA Bioenergy members had the opportunity to present theirselves and their entities to the rest of SC participants.




In the picture above, from left to right, Myrsini Christou (CRES), Andrea Rizzo (RE-CORD), Ana Luisa Fernando (Universidade NOVA de Lisboa) and Salvatore Cosentino (University of Catania).

In the picture below, from left to right, Iker Aguirrezabal (UPV/EHU), and Elena Angelova and Daniela Thrän (DBFZ).

Besides, a new SP4 Coordinator was elected. After presenting his candidacy, Julien Blondeau (BERA) (left) became the new SP4 coordinator by unanimous votation, replacing Berta Matas (SINTEF).

Bioenergy highlights

PERSPECTIVES WIDENED AND KNOWLEDGE GAPS BRIDGED AT CONFERENCE ON 'BUILDING A SUSTAINABLE EUROPEAN BIOFUEL INDUSTRY'

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Figure 1: Participants in the guided tour of the factory on the 'Tuve train', in Volvo facilities.

Researchers, industry specialists and policymakers from across Europe came together from 4 to 6 November in Gothenburg to review the status of bioenergy deployment, analyse the future of sustainable biofuel production and use in Europe and connect sectorial expertise, with the aim of supporting sustainable biofuel production and greenhouse gas mitigation.

The conference, organised jointly by Supergen Bioenergy Hub (UK), Bio4Fuels (Norway) and Renewable Transportation and Fuels (Sweden), focused on the key objective of sustainable biofuel implementation prospects in Norway, Sweden and the UK, and was supported by presentations from a wide variety of academics, industrialists and policy leaders on an extensive array of topics.

The first day was dedicated to a forum for early stage researchers, who were hailed by the conference organisers as the future of the bioenergy sector. This was followed by a site visit to Volvo Trucks, where participants enjoyed a guided tour of the factory on the 'Tuve train' followed by presentations from Volvo Trucks representatives on renewable and conventional diesel fuels.

The second day programme was opened by Anders Ådahl, Co-director Energy Area of Advance at Chalmers University of Technology, with introductions from the directors of the organising research hubs and a presentation from Robert Andrén, Director General of the Swedish Energy Agency. There followed plenary sessions on policy, industry and sustainability as well as parallel sessions on sustainable biomass resources and conversion technologies from biomass to sustainable biofuels.

The day closed with an opportunity to view poster presentations and network over dinner.

The last day of the conference featured a plenary session on industry and end use, with parallel sessions on the potential for biochemical and biomaterial byproducts and alternatives, as well as the environmental and social impacts of European biofuel deployment.

Anders Ådahl closed proceedings alongside the organisers, with input from the audience via Mentimeter, answering questions such as which research areas to prioritise within advanced biofuels and whether European research is adequately supporting the biofuels sector.

Key issues raised were systems analysis, applied research, research costs, techno-economics and the challenges of industrial scale up, as well as knowledge sharing across borders and sectors.

Commenting on the issue of commercial scale-up, Supergen Bioenergy Hub Director Patricia Thornley said: "The technology's there, but it's about making the correct technology choices to deliver systems that are actually sustainable. There's more to do around having the right frameworks in place to incentivise that. We need to isolate the bits of work that make something sustainable and which improve performance, and then share the knowledge on that."

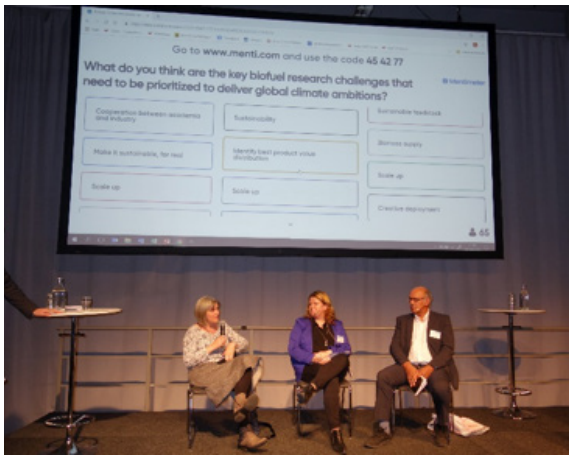

Figure 2: On the right, Patricia Thornley intervention on biofuel research challenges to be prioritized.

Supported by the vast majority of the audience, the research hub directors agreed it would be useful to hold another UK-Nordic conference on advanced biofuels, and signalled the benefits of involving Denmark and Finland to further widen perspectives and knowledge.

Resources and photos can be viewed on the conference webpages.

NEW BIO-BASED PRODUCTS FROM URBAN SEWAGE SLUDGE VALORISATION

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The increasing **sewage sludge** generation rate in cities, together with the directives that regulate its management at European level, the promotion of its recycling or reuse within a circular economy approach, as well as the greater environmental concern of the primary sector, have led CENER (National Renewable Energy Centre of Spain) to participate in the European research and innovation project NextGenRoadFuels (Horizon 2020). Its objective is to demonstrate that urban **sewage sludge** can be used as **feedstock** for the **production of biofuels using hydrothermal liquefaction technology** and also some of its components (e.g.: nitrogen, proteins,..) can be extracted and valorised into **high-added-value products.**

In particular, CENER leads the research line related to the challenge of **handling feedstocks with high organic nitrogen content** through the implementation of dedicated processes for the extraction of nitrogen-derived compounds A reduced nitrogen level in the feedstock is of great importance for fulfilling the standardized requirements for road fuels emissions because NOx is produced from the reaction of nitrogen and oxygen gases in the air during combustion. To overcome this barrier, firstly a **pretreatment of the sewage sludge** using mild temperature enzymatic hydrolysis with enzymes is executed. Secondly **extraction & purification** processes are undergone, for protein-derived amino acid and peptides valorization. The main valorization pathways proposed by CENER are the production of **biostimulants** for sustainable agriculture and the development of new **biosurfactants**, and other bioproducts of great interest for the **chemical industry.**

Interesting results have been obtained to date during this project. On the one hand, samples of **sewage sludge from the first and secondary treatment of wastewater** generated in different countries from different WWTP (Waste Water Treatment Plant) processes have been collected. These samples have been sampled in different European countries such as **Denmark, Germany, Greece, The Netherlands and Spain.** In the case of CENER, NILSA (the public company of Navarre in charge of residues management) and the Mancomunidad de la Comarca de Pamplona have supplied as much as 4 different samples collected either at different plants or in the same plant but at different stages.

Figure 1: On the left, dehydrated sewage sludge. On the right, sewage sludge hydrolysate

The information compiled has provided CENER interesting information regarding the **nitrogen content** and the form in which it is found. Actually, the majority of the nitrogen found in the sewage sludge samples is in the **form of proteins** accounting from 17-22% by dry weight, showing an amino acid profile where **glutamic, aspartic acid, leucine, valine and alanine** can account up to 50% of the total content. Preliminary tests assayed to sewage sludge samples have achieved **yields up to 70% of free amino acids.**

Since the project is on its early phase, CENER considers these results as very positive, and still envisages **room for improvement in the coming months,** keeping in mind the final aim of contributing to the **development of novel valorization routes of organic waste,** on both **laboratory and demonstration** scales, for **subsequent industrial implementation and market uptake.**

AN ONLINE DATA BASE TO UNLOCK THE POTENTIAL OF BIOGENIC RESOURCES

Introduction of a consistent and regularly updatable monitoring system to prioritise the next steps on the resource mobilisation agenda

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Support in achieving the Sustainable Development Goals can be provided through the use of biogenic by-products from agriculture and forestry as well as residual materials and wastes from the processing industry and from urban areas. Current data on the availability of corresponding biomasses is essential key information for assessing the scope of a specific action. Hence, DBFZ's working group "Resource Mobilisation" developed a cross-sectoral, comprehensive, updatable and international applicable monitoring system (Figure 1). With the case study of Germany, the system found its first application on national level. 77 biomasses from five sectors were investigated and through linking more than 1,100 calculation elements (e.g. from statistics, literature and interviews) a dynamic calculation network was formed which comprehensively measures the amount and use of biomass for the reference year of 2015. An application context and the demands of a target market are necessary, to describe the relevance of a potential biomass utilisation. As a first example, the monitoring system includes biomethane as an application context and the German transport sector as a target market. Since corresponding conversion data is stored digitally for each biomass, the online calculation can be carried out individually for one or more biomasses or sectors. Hence, the system can communicate at the push of a button that the digestible and mobilisable biomass could cover 4-9% of the transport sector's energy demand. The choice of different modes of transport enables further evaluation, which shows that the demand is completely covered in certain target markets (e.g. bunkering of seagoing vessels). Further contexts and target markets are being prepared to extend the DBFZ resource database; Bio-CNG and Bio-LNG from biomethane, Bio-SNG, bioethanol, biodiesel and biokerosene will be included in late 2019. In 2020, additional conversion pathways, especially material and cascading use, will follow. All findings are available in an online and open-access database at http://webapp.dbfz.de/resources. The online documentation of the results in English is in progress.

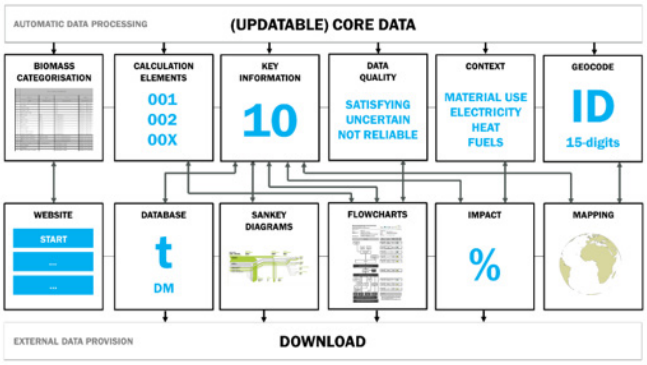

Figure 1: The twelve modules of DBFZ's resource monitoring system (Brosowski et al. 2019)

While being developed in the German context, the system was rolled-out internationally. In cooperation with GIZ, UNDP and national experts, the monitoring was established in Bosnia and Herzegovina. Here, in addition to the national level, several administrative levels up to municipality level were processed. As a result, an open-access online atlas is available at http://atlasbm.bhas.gov.ba (Figure 2). Spatial data at high-resolution can be displayed as maps, which enables users to quickly identify hotspots of biomass potentials. Once quantities and geographic availability of biogenic resources are defined, it needs to be considered whether and how these resources can be mobilised. In order for a resource to be mobilised efficiently, supportive circumstances should to be established. A stakeholder analysis can help to do so by understanding resource and/or market specific hindrances and enablers which can influence the resource owner's motivation and willingness to supply. Based on that, concrete mobilisation strategies for biogenic resources can be developed and implemented.

Hence, the monitoring system is a strong tool to identify and prioritise topics and regions which are of particular importance for the future and efficient use of biogenic residues and supplies the basis for further analyses and strategy development.

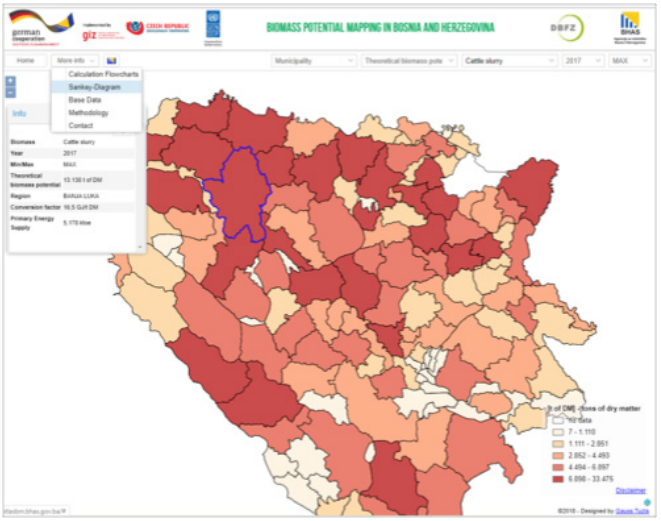

Figure 2: First international application of the monitoring system: Publicly available biomass potential atlas at http://atlasbm.bhas.gov.ba/

Further information:
Monitoring System in Detail
Brosowski et al. 2019: How to measure the impact of biogenic residues, wastes and by-products: Development of a national resource monitoring based on the example of Germany, Biomass and Bioenergy, Vol. 127, https://doi.org/10.1016/j.biombioe.2019.105275

Consistent Biomass Categorisation
Brosowski et al. 2016: A review of biomass potential and current utilisation – Status quo for 93 biogenic wastes and residues in Germany, Biomass and Bioenergy, Vol. 95, https://doi.org/10.1016/j.biombioe.2016.10.017
Mobilisation Strategies
Pfeiffer et al. 2019: Mobilisation of straw as an energetic resource: The danish straw auction model, European Biomass Conference and Exhibition Proceedings 2019, ISSN: 22825819, available at: https://www.scopus.com/record/display.uri?eid=2-s2.0-85071067373&origin=inward&txGid=a76e2b2d67781cd5419e4ee96ce7f6be
International Roll-out in Bosnia and Herzegovina
Pfeiffer et al. 2019: Report on Biomass Potential Monitoring in Bosnia and Herzegovina, available at: http://atlasbm.bhas.gov.ba/data_sources/Metodologija/Biomasa_Engleski_Final_pages.pdf

Open-Access Online Resource Database Germany
http://webapp.dbfz.de/resources

Open-Access Online Atlas Bosnia and Herzegovina
http://atlasbm.bhas.gov.ba

COMPACT GASIFICATION AND SYNTHESIS PROCESS FOR TRANSPORT FUELS - COMSYN

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Project scope

COMSYN aims to develop a new BTL production concept by means of a compact gasification and synthesis process. Biofuel production costs will be reduced by up to 35% compared to alternative routes, which translates to less than 0.80 €/l production cost for diesel. The production concept is based on the distributed primary conversion of various kinds of biomass residues to intermediate liquid products at small-to-medium scale (10-50 kt/a Fischer-Tropsch products, 30–150 MW biomass) units located close to biomass resources. The Fischer-Tropsch products will be upgraded to fuels in existing central oil refineries, bringing the benefits of economy of scale to the overall process.

Project validates the technical production concept from biomass gasification down to bio-crude upgrading at TRL 5. The obtained data is used for creating a techno economic assessment and market and business case studies.

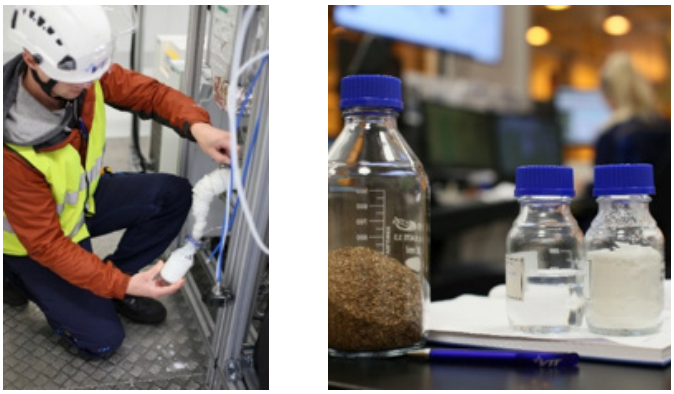

Figure 1: Collecting FT-wax from the synthesis unit Mobsu - on the right: crushed bark (woody raw material for gasification), FT liquid product and FT wax

Experimental development and process validation

Production of biofuel by gasification of biomass residues was successfully validated in the EU's COMSYN project in September 2019. The process performance was verified with bark in an 80 hour-long test run at VTT. The syngas conversion to Fischer-Tropsch (FT) products was conducted by IneraTec GmbH.

The main focus of the test was to study and verify the performance of the gas cleaning train, and especially the entire synthesis process with real wood-derived gasification gas.

The first validation test runs successfully demonstrated the efficiency of the compact gasification and synthesis process concept, as well as the production of FT-products, waxes and other hydrocarbons.

Crushed bark was gasified in a fluidized-bed gasifier with steam as the main gasification agent. The raw gasification gas was filtered with advanced metal filters of GKN Sinter Metals Filters GmbH. Tars and light hydrocarbon gases were reformed using the staged reformer concept developed by VTT. Final cleaning of the reformed synthesis gas of sulphur and other remaining contaminants was realized through a robust sorbent-based cleaning process developed by VTT.

Figure 2: Mobile Synthesis Unit (MOBSU).

The ultra-clean syngas was compressed and led to VTT's mobile synthesis unit called MOBSU, which utilizes the innovative compact Fischer-Tropsch technology of INERATEC. Two products, the FT- wax and FT-oil streams, were collected and will be further refined to high-quality transport fuels by UniCRE, the Unipetrol Centre for Research and Education, assisted by VTT.

Figure 3: Ultracleaning process, VTT.

Based on the achieved results, industrial-scale plants in the range of 25 000 – 50 000 tn/a will be designed and techno-economic and environmental assessments, as well as business case studies, will be carried out by the DLR German Aerospace Center and two engineering companies: Wood from Italy and ÅF-Consult from Finland.

About COMSYN

COMSYN is a four-year EU Horizon 2020 project that lasts from 2017 to 2021 with a budget of EUR 5.1 million from EU Horizon 2020. The project consortium consists of seven partners from four different countries combining research institutes, SME and top-level European industry.

Consortium

- Industry: UniCRE, Wood, GKN, ÅF Consult
- SMEs: Ineratec
- Research organizations: VTT, DLR, UniCRE

More information about the COMSYN project will be available on the project homepage: www.comsynproject.eu

COMSYN project has received funding from the European Union's Horizon 2020 research and innovation Programme under Grant Agreement No 727476.

100% RENEWABLE HEATING AND COOLING IN EUROPE BY 2050 - THE ROLE OF BIOENERGY AND EERA BIOENERGY

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The European Technology and Innovation Platform on Renewable Heating and Cooling (RHC-ETIP) has recently launched its Vision 2050 for 100% renewable heating and cooling (H&C) in cities, districts, buildings and industries in Europe by 2050 (https://www.rhc-platform.org/publications/). Today, bioenergy is by far the most important renewable energy source (RES) for heating purposes, while solar thermal, geothermal and ambient heat through heat pumps account for the bulk of the rest. Direct electric heating is also taking place to some extent, and parts of this are carried out using renewables based electricity. In Europe there is a wave of electrification these days, but in practise it is not realistic that all our energy needs can be covered by renewable electricity or e-fuels in the foreseeable future. Therefore, reaching 100% renewable heating and cooling in Europe by 2050 must be based primarily on non-electricity options in combination with minimising the overall energy need for heating and cooling and utilising excess heat and ambient heat sources. Due to the diversity in resources, possibilities and needs on local and regional levels in Europe, there is no solution that fits all. This is also the case in the bioenergy area. So, what could be the role of bioenergy in reaching the envisioned 2050 targets?

Key messages regarding bioenergy from the RHC-ETIP Vision 2050 are:

"Solar thermal, geothermal, bioenergy, district H&C, and ambient and excess heat recovery -complemented with renewable electricity - are the backbone of a radically new, user oriented, carbon-neutral, efficient, reliable, and flexible energy system."

"RHC technologies play an essential role in developing a carbon-neutral building stock and industry in Europe, thus providing a fundamental contribution to the achievement of the EU climate targets. Existing technologies, including bioenergy, geothermal, solar thermal and ambient heat, have an enormous potential to support a carbon-neutral economy; these contribute significantly to the overall portfolio of RES."

"Bioenergy has the potential to eliminate industrial, agricultural, silvicultural, and food waste and transform it into H&C and electricity, thus reducing the waste of resources while fostering local circular economies. A special role will be played by seasonal thermal storage, as they help to cover the higher heating demand in winter using solar thermal or excess heat harvested in other seasons."

"In the vast majority of urban areas, DHC is technically and economically more viable than other network and individual based solutions and can be 100% decarbonised through the use of renewables (biomass, solar thermal, and geothermal energy), excess and ambient heat, and fossil-free generation."

"100% RHC solutions are already available and competitive, such as biomass boilers, solar thermal collectors and geothermal and ambient heat-based heat pumps. These buildings that are not connected to a DHC network are, however, connected to a natural gas grid, hence enabling the use of natural gas for heating. This natural gas has the potential to be replaced by biomethane (a RE-based synthetic natural gas), making it possible to utilise the well-developed natural gas grid infrastructure to facilitate the RHC transition."

In the industry, it is pointed out that biomass in all its multiple forms (including biogas) can be utilised.

It is also said that, when considering investments into H&C technologies, it should be considered that the final goal of H&C systems in individual buildings is:

- "to minimise their needed size/power/capacity with energy efficiency measures";
- "to apply solar thermal or passive geothermal H&C where possible";
- "to supplement H&C provision with bioenergy sources or renewable electricity, when needed".

In general, biomass can be transformed into gas, liquid and solid forms and exploited accordingly through various thermal devices. The use of thermal storage is considered pivotal to integrate different heating and electrical solutions that cope with price fluctuations and seasonality, for thermal technologies such as solar thermal, geothermal, and biomass.

Hence, the role of bioenergy will remain very important in the foreseeable future. However, there is a significant improvement potential throughout many bioenergy value chains to increase performance, reduce emissions and reduce costs. This is where EERA Bioenergy has a very important role to play, through facilitating for needed research and bringing key research actors in Europe together in a joint effort to develop and optimise the use of biomass for various purposes, including heating and cooling.

EERA Bioenergy recently launched its revised Strategic Research and Innovation Agenda (https://www.eera-set.eu/assessing-the-impact-of-bioenergy-on-the-economy-and-the-general-public/), where a new subprogramme on sustainability, techno-economic analysis and public acceptance was added. This addition enables more extended analysis of bioenergy value chains and their sustainability, and as such completes the research base of EERA Bioenergy.

While the RHC-ETIP Vision 2050 highlights some aspects connected to bioenergy, there is of course a multitude of aspects connected to bioenergy, including improvement of existing technologies and development of new ones, as well as hybrid solutions and integration of bioenergy into our energy systems on a local, regional, national and European level.

E.g. wood and pellet stoves, as point heating sources, are numerous in Europe today, and will most likely remain very important in the foreseeable future. These are today contributing significantly to the use of renewables for heating in Europe. In the case of wood stoves, they have existed for hundreds of years, and research efforts especially during the last three decades, have improved their performance and greatly reduced their emissions. Still they can be further improved, as well as adapted to satisfy energy demands and heat comfort requirements of modern buildings.

While increased implementation of current renewable energy technologies will be very important to reach 100% renewable heating and cooling by 2050, research and development is key in optimising their sustainability and in the search for new technologies of the future, a key mission of EERA Bioenergy.

For more information about RHC-ETIP: https://www.rhc-platform.org/

CLARA H2020 PROJECT CONSORTIUM MEETS AT CENER

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The European Union has set a target of a share of 14 % **renewable energy in the transport** sector by 2030 in the Renewable Energy Directive (RED II) in 2018, in order to tackle the greenhouse gas reductions required to prevent a surge in global average temperatures. This requires a large-scale deployment of biofuels focusing on those that do not compete with food and feed, in addition to electrification and the increased deployment of rail transport.

For that reason, specialists in the field met together last 4-6th in CENER (National Renewable Energy Centre of Spain) headquarters, for discussing on the synthesis of **advanced biofuels** through **thermochemical conversion of biomass-based residues.** This promising route to achieve the above mentioned objectives by the use of gasification technology is being developed in the framework of CLARA project (Horizon 2020). Within the project, an efficient technology for the production of liquid fuels based on chemical looping gasification (CLG) of biogenic residues is being developed in an industrial environment. Furthermore, the project aims at devising and optimizing innovative, cost-efficient technologies for biomass pre-treatment, and syngas cleaning.

Figure 1: CLARA project consortium partners.

Although the project is on its first steps, **the main outcomes highlighted** have been especially focused on biogenic residues, requiring a preceding biomass pre-treatment and the novelty of the suggested chemical looping gasification and syngas treatment concept. Further details in section 4 of the Public Report I.

Interesting results have been also obtained to date during this project in relation to the **pretreatment of biomass** proposed for chemical looping gasification. Although this technology can be considered suitable for feedstocks with high contents of impurities, it is still necessary to adopt a proper pre-treatment of the feedstock in order to optimize the process performance, and at the same time allow for easier handling, storage, and transportation of the biomass.

The pretreatment of the biomass is being carried out in the Biorefinery and Bioenergy Centre (BIO2C) of CENER, the National Renewable Energy Centre of Spain. This is a semi-industrial pilot scale test facility able to develop production processes for bioproducts, solid biofuels, advanced liquid or gaseous biofuels, as well as biorefinery concepts integrating different valorization routes, as an intermediate step between laboratory and the industrial scale-up of these technologies.

The biogenic residues tested so far by CENER in the framework of CLARA project have been **pine forest** residues and **wheat straw.** At the moment, tailored made pre-treatment concepts for wheat straw feedstock are being developed. These concepts are a combination of up to four processes: **physical pretreatment, torrefaction, washing, and pelleting/additivation.** Once the process is optimized, modeled and validated at a laboratory scale, in 2020 CENER will upscale the trials in its demo scale unit, with production capacity up to 350kg/h.

Since the project is in its early phase, CENER considers these results as very positive and still envisages room for improvement in further work.

NEW MEMBERS

FULL MEMBERS

CRES

ΚΑΠΕ CRES | CENTRE FOR RENEWABLE ENERGY SOURCES AND SAVING

CRES is the Greek centre for Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES).

CRES operates in two main activity fields:

- As a Research and Technological Centre for RES/RUE/ES, by developing applied research for the new energy technologies and by technically supporting the market for the penetration and the implementation of these technologies.
- As the National Energy Centre, working on energy planning and policy for RES and ES and developing the necessary infrastructure to support the implementation of RES & ES investment projects.

CRES has a dynamic presence in Greece and internationally, with innovative research results and a large number of contracts for the Greek Government, the European Commission and Governments of non-European countries, concerning the planning, evaluation and realisation of energy investment projects.

The Biomass Department (BD) of CRES, during the last three decades, required outstanding experience in non-food crops production for both energy production and industrial use. It has developed research activities on evaluation of biomass resources availability and energy content; evaluation of biomass and energy potential of a wide range of energy crops grown in experimental field trials; research on new non-food crops better adapted to soil and water stress conditions; economic appraisal of implementing biomass (energy crops, agricultural and processing wastes) in energy markets.

Our main research activities are allocated to:

a. R&I on bioenergy chains from several types of feedstock
b. R&I on thermochemical conversion (gasification) of biomass from several indigenous resources
c. Support actions, feasibility studies
d. Consultancy to policy makers

a. Our R&I on bioenergy chains from several types of feedstock is focused on:

- R&I on exploitation schemes for the production and handling of agricultural /forest residues and relevant industries, as well as, biomass from animal husbandry.
- R&I on biomass cultivation and supply schemes for a wide range of energy and other non-food crops.
- Analysis of energy potential of all the above biomass types to support energy applications.
- Techno-economic evaluation of biomass supply chains for biomass and bioenergy production.

b. Our R&I on thermochemical conversion (gasification) of biomass from several indigenous resources is focused on:

- Research on energy crop fuels' handling and characteristic performance in various thermochemical processes: Flash pyrolysis, gasification, combustion
- CRES installed a gasification unit of a fluidized bed reactor with recirculation, where, various types of biomass are tested, in the framework of research projects. The unit can be handled either autonomously, for producing synthesis gas and power, either as part of a bio-refinery process.
- Availability of resources and raw materials for biogas production in Greece.
- Energy exploitation of biogas.

c. Activities supporting the market are concentrated on:

- Techno-economic assessment of biomass potential and availability for bioenergy, biogas, biofuels in the country.
- Transfer of existing know-how for new and alternative non-food crops for the production of raw material for heating/ power generation and biofuels production.
- Development of networks for biomass handling and support for the creation of biomass logistics and trade centres
- Biomass properties and specifications of produced biofuels and dissemination/implementation of technical specifications and related standards.

DFBZ

DBFZ Deutsches Biomasseforschungszentrum gemeinnützige GmbH

Our Vision

DBFZ research represents a key to a carbon neutral society until 2050 at the latest. Closed carbon cycles of the bioeconomy will have taken the place of the fossil economy.

Our mission

DBFZ supports the efficient integration of biomass as a valuable resource for sustainable energy supply based on wide-ranging applied research. The mission incorporates technical, ecological, economic, social policy, and energy business aspects all along the supply chain, from production, through supply, to use. Working from this broad research base, the DBFZ is also tasked to devise scientifically sound decision-making aids for government policy-makers which can be integrated into ongoing practice.

Research focus

The DBFZ devises conceptual solutions and monitors them with concrete technical means and with a view to their future practicability through its own applied research in order to integrate complex bioenergy technologies into the social environment and the energy system. Apart from research to optimise biomass production, the DBFZ's work covers the complete bioenergy supply chain – from questions of availability, logistics, pre-treatment, and conversion through to its use and integration into the energy system – considering technical, economic, and ecological aspects. Giving particular consideration to the future developments (environmental concerns and economic impact), research policy challenges and framework conditions in relation to the use of biomass as a base material and an energy source, DBFZ developed its own scientific focus for the future of bioenergy based on the "Smart Bioenergy Concept"[1].
To bring together and focus the main research activities and efforts towards the "Smart Bioenergy Concept"[2], a total of 142 scientists (besides the Administrative Department) is currently working in the DBFZ within five Research Focuses:

- Systemic contribution of biomass;
- Anaerobic processes;
- Biobased products and fuels;
- SmartBiomassHeat;
- Catalytic emission control.

The DBFZ is equipped with state of the art research facilities that include e.g. analytical labs, engine testbeds, biogas lab, research biogas plant, solid compacting center, technical center with ten combustion test beds, fuel-conditioning lab, and emission measurements.

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[1] "Smart Bioenergy" means that modern biomass utilisation and integrated systems that optimally interact with various renewable energy sources are developed further. It also means that material and energy use are linked within the framework of framework of the bioeconomy. Thrän, D. (Ed.) (2015): Smart Bioenergy. Technologies and concepts for a more flexible bioenergy provision in future energy systems. Springer-Verlag. Heidelberg. ISBN 978-3-319-16192-1.
[2] As of 31.12.2018.

UPV/EHU

University of the Basque Country

The SUPREN SUstainable PRocess ENgineering group is integrated within the Department of Chemical and Environmental Engineering of the University of the Basque Country. Its R&D activities focus on:

- Preparation, characterization and testing of heterogeneous catalysts for reforming, oxidation, hydrotreating, dehydration and hydrogenolysis processes of both fossil (oil fractions, NG) or renewable (biomass) resources.
- Application of advanced and innovative approaches from chemical reaction engineering to develop microreaction systems or coupled with selective separation (reactive distillation, membranes). These technologies are applied to hydrogen production technologies and to biorefinery processes (biofuels and added-value products).

Such expertise allows the development of research projects for:

1. Design of innovative reaction systems.
2. Development of biorefinery processes.
3. Hydrogen technologies.

Innovative reaction systems

The objective is to develop processes to integrate catalytic reaction systems and separation technologies to improve process efficiency and minimize its investment or operational costs. For gaseous systems, selective membranes are used to purify gas streams or to selectively feed oxygen. The development of micro-structured systems is also studied to intensify hydrogen production by enhancing heat transfer. In order to overcome thermodynamic constraints, the use of selective membranes or reactive distillation processes are also studied, which take advantage of the difference in relative diffusivities or volatilities between reactants and products.

Integrated processes in biorefineries

The main objective is to investigate innovative conversion processes and new catalytic systems in order to improve the sustainability, competitiveness and integration of biorefineries within two technological platforms: oleochemicals and sugars.

I. Oleochemical platform: related to the valorization of bioglycerin to high value-added products (acetals and propanediols).
II. Sugar platform: to develop new catalytic materials for the selective transformation of lignocellulose, via aqueous solutions of monosaccharides (pentoses and/or hexoses), to important intermediates (furfural, 5 hydroxymethyl furfural, levulinic acid). The subsequent transformation into biofuels and chemical products (food additives, drugs, polymers, chemical synthesis, solvents, fuel additives, etc.) is also studied.

Hydrogen production research

The main activities related to hydrogen are focused on several production technologies for (bio)hydrogen production from different feedstock: fossil fuel resources like natural gas and renewable resources like biomass, bio-oils, bio-alcohols, biogas:

I. In the reforming of bio-oils obtained from the pyrolysis of biomass, the catalyst behavior is studied for these complex mixtures of oxygenated and non-oxygenated compounds improving activity, selectivity and stability, as well as by understanding the role of intermediate species and the influence of operation parameters.
II. For the biogas reforming the main purpose is to develop stable and active catalysts to be used in integrated plants for decentralized production of hydrogen including the use of microreactor systems, as well as the corresponding process optimization.
III. The main goal for bio-alcohols is to use them as raw materials for bio-hydrogen production through innovative steam and liquid phase reforming processes in decentralized units.



Intstallations of SUPREN (SUstainable PRocess ENgineering group)

ASSOCIATE MEMBERS

UWM

UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

The Centre for Bioeconomy and Renewable Energies (CBEO) was established in 2006 as a unit of the University of Warmia and Mazury in Olsztyn (UWM). The UWM is composed of 18 faculties with over 20,000 students. The University owns, well equipped scientific-research base (laboratories) and four experimental farms. The UWM has been run research on bioenergy for more than 20 years. CBEO integrates the UWM's research groups in the field of bioeconomy and renewable energy sources (RES). The Centre cooperates with local government units and enterprises in the field of bioeconomy and RES.

As part of research teams, many international projects have been run, e.g.
BalticBiomass4Value https://balticbiomass4value.eu/;
StarProBio http://www.star-probio.eu/;
COSMOS http://cosmos-h2020.eu/;
EuroBioRef http://www.eurobioref.org/;
AGREE http://www.agree.aua.gr/;
ChemBeet; SE-Biomethane and national projects e.g.
BIOmagic http://www.uwm.edu.pl/cbeo/biomagic/;
TechRol.

The main research works focus on production, logistic of biomass including perennial industrial crops (short rotation coppice, herbaceous crops and grasses, e.g. willow, poplar, black locust, Virginia mallow, willowleaf sunflower, cup plant, miscanthus), annual (e.g. crambe, camelina), agricultural and forest residues for multipurpose utilization (industrial and energy) as an element of circular bioeconomy. Productivity of the crops, cultivation management, logistic of plant acquisition (harvesting, storage, handling). Briquettes and pellets production from different feedstock. Characteristics of physical and chemical composition of biomass. Production of bioproducts containing bioactive substances from lignocellulosic biomass of perennial industrial crops grown on marginal lands. Second generation bioethanol from lignocellulosic biomass. Biomass residues utilization for insects rearing. Research on development of solid biofuels utilization for heat generation in home scale (households) and biogas production in local scale for heat and power. Research regarding economy and energy balance of crops cultivation and biomass logistic chains. Very important elements of the research is an assessment of the environmental, economic and social impact of many perennial industrial crops and non-edible oil species cultivation and biomass utilisation with application of LCA and LCC methods.

Link

Link



From left to right, Mariusz Jerzy Stolarski, Ewelina Olba-Zięty and Michal Krzyżaniak, from UWM

Useful information

1. Bioenergy Europe's Essentials

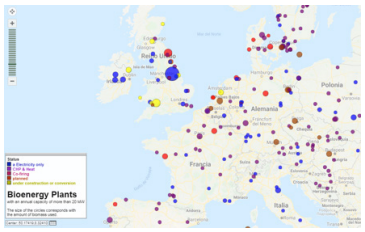
With the climate crisis getting worse by the day, the population must do everything in their power to slow down the consumption of fossil fuels. Bioenergy, together with other renewables, efficiency measures and a switch to more responsible energy behaviors, can cover half of Europe's overall energy demand by 2050.

To help to understand the potential of Bioenergy for a fully-decarbonised Europe by 2050, the Essentials collects basic facts and figures on the feedstocks and technologies currently used in the sector.

Link

2. Mapping The Biomass Industry – Environmental Paper Network

The Environmental Paper Network's Working Group on Forests, Climate and Biomass has launched new tools to track and monitor the expanding biomass energy and pellet industries. The two maps published make publicly available for the first time an extensive global database of existing and planned energy plants running on woody biomass, and of mills manufacturing wood pellets destined to be burned for energy.



These maps aim to bring together the plants and mills that pose the biggest risk of negative environmental and social impacts. Therefore, only energy plants with the production capacity of 20 MW or more, or mills with annual production of 50,000 metric tonnes or more of pellets, have been included in the database. These kinds of installations can be a major threat to forest ecosystems if the wood fuel comes at volume directly from forests. The bigger the plant or mill, the more unlikely it becomes that woody biomass can be sourced and ecologically sustainably.

The maps do not include energy plants that are primarily run on black liquor (a by-product in pulp mills), bagasse (the residue of sugar cane) or post-consumer waste wood, focusing on the ones most likely to rely on raw material directly from the forests and likely to cause additional logging pressure in the world's forests.

Link

3. Opportunities and Challenges for Broadening Biomass Feedstock in Europe

Resource efficient biomass feedstock supply is essential to sustain current capacities and facilitate market development for advanced bioenergy and biofuel technological pathways. The European Technology and Innovation Platform Bioenergy (ETIP Bioenergy) - Working Group 1 Biomass Availability and Supply has prepared a working paper with the aim of synthesizing recent research targeting European biomass feedstock for bioenergy; identifying opportunities and challenges and providing research and policy relevant recommendations for 2030 and beyond

Four research areas are analysed: improving practices for forest biomass supply and logistics; biofuels from marginal land; biomass supply and cost supply assessments and certification & standardization.

Link

4. 2019 Status report on thermal gasification of biomass and waste (IEA Bioenergy Task 33)

IEA Bioenergy Task 33 monitors the status of thermal gasification in its member countries, and publishes a Status report every three years. This summary (and the full report) is based on contributions from member countries representatives and offers an overview of pilot, demonstration and commercial gasification projects in each member country of IEA Bioenergy Task 33.

The full version of the Country reports from each member country, including research activities on thermal gasification of biomass and waste can be found at the Task 33 website in the section "Participants and Country Reports".

Link

Publications

The European Green Deal

European Commission

Becoming the world's first climate-neutral continent by 2050 is the greatest challenge and opportunity of our times. To achieve this, the European Commission presented the European Green Deal, the most ambitious package of measures that should enable European citizens and businesses to benefit from the sustainable green transition. Measures accompanied with an initial roadmap of key policies range from ambitiously cutting emissions, to investing in cutting-edge research and innovation, to preserving Europe's natural environment.

Supported by investments in green technologies, sustainable solutions and new businesses, the Green Deal can be a new EU growth strategy. The involvement and commitment of the public and of all stakeholders is crucial to its success.

Above all, the European Green Deal sets a path for a transition that is just and socially fair. It is designed in such a way as to leave no individual or region behind in the great transformation ahead.

PDF

Bioenergy Europe: Statistical Report 2019

Bioenergy Europe

The European Biomass Association (Bioenergy Europe) has published the following chapters of its statistical report 2019. In addition, each report is accompanied by a policy brief.

- Bioenergy Europe: Statistical Report 2019 - Biogas

  The report provides accurate and up-to-date information on the current state of biogas consumption and production in Europe, between others.

PDF

Bioenergy Europe: Statistical Report 2019

Biomass for Heat

The report provides accurate and up-to-date data on the current state of biomass use for thermal uses and the demand for renewable heat. It also explores trends in the biomass market for thermal uses in both the residential and industrial sectors.

PDF

Bioenergy Europe Statistical Report 2019

Pellets

This report analyses the evolution of the production and consumption of pellets in Europe, going deeper into the different uses for heating and electricity, as well as in the different sectors such as residential, commercial and industrial. In addition, the report provides more recent data on the market for heating appliances, as well as the evolution of the price of pellets.

PDF

Technical, Economic and Environmental Assessment of Biorefinery Concepts: Developing a practical approach for characterisation

IEA Bioenergy Task 42

The idea of biorefining, in general, is considered a promising concept for the processing of biomass into a spectrum of bio-based products and bioenergy. It is seen as one of the enabling technologies of the circular economy, closing loops of streams and aiming at the valorisation of multiple outputs. Due to its complexity and diversity, there is a demand for quantitative, scientifically sound and transparent data on the technical, economic and ecological added-value of biorefining.

In this IEA Bioenergy Task 42 report, four case studies on biorefinery pathways are investigated via a technical, economic and environmental (TEE) assessment. The results will be presented in the structure of biorefinery fact sheets.

PDF

Advanced biofuels: What holds them back?

IRENA (International Renewable Energy Agency)

Advanced liquid biofuels are a key part of low-carbon transport development to meet emission-reduction targets and international climate commitments. Liquid biofuels, requiring minimal changes to fuel distribution infrastructure or the transport fleet, can be deployed rapidly to cut greenhouse gas (GHG) emissions.

This study from the International Renewable Energy Agency (IRENA) analyses current barriers to investment in advanced biofuels. Based primarily on a survey of industry executives and decision makers, the study aims to capture the perspective of project developers aiming to nurture the market and scale up actual usage in competition with fossil fuels.

PDF

Save the date! International bioenergy events

JANUARY 2020

20-21 January 2020
Fuels of the Future 2020 – 17th International Conference on Renewable Mobility
Berlin, Germany
link

22-24 January 2020
6th Central European Biomass Conference – CEBC 2020
Graz, Austria
link

29-30 January 2020
Bio360: ReGen Europe / Biogaz Europe / Bois Energie
Nantes, France
link

FEBRUARY 2020

5-6 February 2020
5th Biomass Trade & Power Europe
Copenhagen, Denmark
link

26-27 February 2020
Lignofuels 2020
Helsinki, Finland
link

MARCH 2020

4-5 March 2020
European Pellet Conference 2020 – World Sustainable Energy Days
Wels, Austria
link

4-5 March 2020
Biomass PowerON 2020
Stockholm, Sweden
link

23-24 March 2020
11th International Conference on Biofuels and Bioenergy 2020
London, UK
link

APRIL 2020

20-21 April 2020
15th World Bioenergy Congress and Expo
Berlin, Germany
link

20-22 April 2020
Argus Biomass Conference
London, UK
link

27-30 April 2020
28th European Biomass Conference & Exhibition (EUBCE 2020)
Marseille, France
link

MAY 2020

18-20 May 2020
Annual Meeting on Reaction Engineering - Jahrestreffen Reaktionstechnik 2020
Würzburg, Germany
link

21-22 May 2020
European Biotechnology 2020
London, UK
link

JUNE 2020

22-23 June 2020
14th International Conference on Biofuels and Bioenergy
Paris, France
link

24-26 June 2020
Biotech France 2020
Paris, France
link

EERA Bioenergy in Europe

Table 1: Full and Associate members of the EERA Bioenergy Joint Programme.

Aalborg University
Department of Energy Technology (Denmark)

web

AICIA
Asociación de Investigación y Cooperación Industrial de Andalucía (Spain)

web

BERA
Belgian Energy Research Aliance (Belgium)

web

CAMPUS IBERUS
Campus de Excelencia Internacional del Valle del Ebro (Spain)

web Campus / web Universidad

CEA
French Alternative Energies and Atomic Energy Commission (France)

web

CENER
National Renewable Energy Centre – Biomass Deparment (Spain)

web

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

web

CNR
Istituto Motori del Consiglio Nazionale delle Ricerche (Italy)

web

CNRS
Centre National de la Recherche Scientifique (France)

web

CRES
Center for Renewable Energy Sources and Saving (Greece

web

CSIC
Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain)

web

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

web

DTU
Technical University of Denmark (Denmark)

web

ECN part of TNO
Energy Research Centre of the Netherlands (The Netherlands)

web

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

web

FCiências.ID
Associação para a Investigação Desenvolvimento de Ciências (Portugal)

web

IEN
The Institute of Power Engineering (Poland)

web

IFK Stuttgart
Institute of Combustion and Power Plant Technology (Germany)
web

IMDEA
Instituto Madrileño de Estudios Avanzados (Spain)

web

INRA
French National Institute for Agricultural Research (France)

web

KIT
The Research University in the Helmholtz Association (Germany)

web KIT / web BIOLIQ

LNEG
Laboratório Nacional de Energia e Geologia (Portugal)

web

NIC
National Institute of Chemistry (Slovenia)

web

NTNU
Norwegian University of Science and Technology (Norway)

web

NTUA
The National Technical University of Athens (Greece)

web IPSEN

SPSI
Paul Scherrer Institut (Switzerland)

web

RE-CORD
Renewable Energy Consortium for Research and Demonstration (Italy)

web

SINTEF
(Norway)

web

TÜBITAK
Scientific and Technological Research Council of Turkey (Turkey)

web

UKERC
UK Energy Research Centre
web

ASTON UNIVERSITY
web

SUPERGEN Bioenergy Hub
web
(United Kingdom)

UNIBO
Universitá di Bologna (Italy)

web

UNICT
Università degli studi di Catania (Italy)

web

UNIMORE
University of Modena and Reggio Emilia (Italy)

web

UNIPD
Università degli Studi di Padova (Italy)

web

UNIPG
Università degli Studi di Perugia

web

CRB
Biomass Research Centre (Italy)

web

UNITO
Università di Torino (Italy)

web

UNL
Universidade NOVA de Lisboa, Faculdade de Ciências e Tecnologia (Portugal)

web

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

web

UWM
University of Warmia and Mazury in Olsztyn (Poland)

web

VŠB
Technical University of Ostrava (Czech Republic)

web

VTT
Technical Research Centre of Finland Ltd (Finland)

web

WUR
Wageningen University & Research (The Netherlands)

web

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 26 full members and 16 associate members from a total of 18 countries.
www.eera-bioenergy.eu

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