EERA European Energy Research Alliance BIOENERGY

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EERA BIOENERGY NEWSLETTER

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SPRING/SUMMER 2021

Joint Programme Coordinator's corner

Andrea Monti
EERA Bioenergy Coordinator

Dear EERA Bioenergy members, dear eebionews readers,

The new framework program of the European Commission remarkably strengthens the objectives of ecological transition and decarbonisation. The bioenergy sector is expected to face very ambitious challenges, as also reiterated during the closing of the recent EUBCE 2021. It is an epochal phase for the expansion of renewable energies, none excluded, seen in a complementary and synergistic way, under increasingly rigorous sustainability standards. Bioenergy and biofuels include many technologically mature supply chains and, therefore, are essential to meet the timing of the energy transition, the objectives of which require an immediate (immediate!) acceleration of investments. Renewable sources, other than the current ones, will gradually spread, and sooner or later will replace the present renewables, but still require significant logistical, technological, and regulatory adjustments with times of uncertain evaluation. But now, we urgently need to use what is technologically mature, albeit perfectible, and bioenergies are one of them. The forestry sector is likely the currently most discussed and controversial bioenergy feedstock, in the light of a more rigorous interpretation of sustainability. The discussion is still very heated, and it needs to be detoxified from sometimes too rigid and obstinate positions. Forests are expanding, and their function as carbon sinks and the contribution that forests can make to achieving carbon neutrality is incontrovertible. At the same time, however, under certain conditions, they can represent a valuable source of feedstock to produce advanced biofuels, bioenergy and other bio-based materials. There is a clear need to converge towards compromise solutions, in compliance with sustainability criteria. Decisions must be made by politicians and not by scientists, but it is by science to provide clear and unambiguous information to support wise decisions. Contributing clear, convincing, and concrete information on the real potential within the plethora of different feedstocks will be an important challenge for our scientific community.

With great satisfaction, I notice more and more interest in our JP EERA Bioenergy. This, I believe, thanks above all to the vitality of our community, and primarily of sub-programme coordinators (Raquel, Jaap, Francisco, Julien and Wolter) and our secretariat (Margarita and Paloma), whom I don't want to miss an opportunity to gratefully thank. Over the last few months, six webinars were organized by sub-programme coordinators, which aimed at facilitating the formation of consortia and proposals for the new Horizon Europe Calls. The participation was, as usual, numerically considerable (more than a hundred participants in total) with also very promising project proposals (above 75 ideas were discussed). Also in this newsletter, I'm very happy to welcome new EERA Bioenergy members (the Italian Council for Agricultural Research and Economics – CREA, represented by Luigi Pari; the Agricultural University of Plovdiv in Bulgary, represented by Hristina Yancheva and Vladislav Popov; and the Collaborative Laboratory for the Biorefineries from Portugal, represented by Joana Bernardo) who will

It is an epochal phase for the expansion of renewable energies

certainly make a valuable contribution to the growth of EERA Bioenergy. Speaking of which, we intend to further promote the association of public research institutions from Eastern Europe where many significant investments in bioenergy are currently taking place. An EERA Bioenergy workshop in cooperation with CEI – the Central European Initiative - has been organized for this purpose.

The new European and national funding program and the absolute centrality of environmental issues lead me to believe that the next few months will be full of professional opportunities, which I am sure we will be able to seize. I wish everyone that this will happen in a post-pandemic period in which we can finally return to our social habits with serenity and lightheartedness.

Have a good one!

Andrea.

EERA Bioenergy news in brief

EERA Bioenergy JP has continued with its activity mainly through the organization of webinars for collaborative project generation on the Horizon Europe Programme. EERA Bioenergy Secretariat and Management Board have been working on different activities to keep the JP dynamic.

THREE NEW ASSOCIATE MEMBERS

We warmly welcome the Italian Council for Agricultural Research and Economics – CREA, the Agricultural University of Plovdiv (Bulgary) and the Collaborative Laboratory for the Biorefineries (Portugal) to the EERA Bioenergy Joint Programme.

WEBINARS ON COLLABORATIVE PROJECT GENERATION

Between March and April 2021, EERA Bioenergy JP has brought together all its members in several webinars to promote collaboration between the five subprogrammes and, thereby, take full advantage of the possibilities that offers Horizon Europe, the new research and innovation framework program of the European Union.

With a budget of €95.5 billion, Horizon Europe is based on three fundamental pillars. The first of them, Excellent Science, follows the main lines of the previous Horizon 2020 program. The second pillar is consolidated on an innovative Europe, which presents the European Innovation Council (EIC) as its main novelty. The third and last pillar of Horizon Europe, Global Challenges and European Industrial Competitiveness are in turn composed of several Clusters.

In this sense, for EERA Bioenergy JP the cluster which stands out is the number 5, dedicated to climate, energy and mobility issues.

This cluster, which aims to combat climate change by making the energy and transport sectors more respectful, more efficient and competitive, smarter, safer and more resilient, has been the main reason for the internal meetings carried out by EERA Bioenergy.

Scientists and researchers from the organization met in a total of six webinars, restricted to EERA Bioenergy members, and unveiled excellent proposals for the Cluster 5 "Climate, Energy and Mobility" of Horizon Europe 2021-2022 work program.

All EERA Bioenergy members were invited to join the discussions for the following topics:

- CL5-2021-D3-02-08: Modelling the role of the circular economy for climate change mitigation.
- CL5-2021-D3-02-08: Cost-effective micro-CHP and hybrid heating systems.
- CL5-2021-D3-02-14: Demonstration of large-scale CHP technologies for a shift to the use of biogenic residues and wastes.
- CL5-2021-D3-02-03: Hybrid catalytic conversion of renewable energy to carbon-neutral fuels.
- CL5-2021-D3-02-016: Innovative biomethane production as an energy carrier and a fuel.
- CL5-2021-D3-02-09: Carbon-negative sustainable biofuel production.

These webinars had no other objective but to boost project collaboration among EERA Bioenergy members in order to promote key technologies and solutions that support European climate policies and the United Nation's Sustainable Development Goals.

SP5 ONLINE MEETING: RESEARCH PRIORITIES

EERA Bioenergy sub-programme 5 on Sustainability, Techno-economic analysis, and Public acceptance, coordinated by Raquel S. Jorge from the Norwegian University of Science and Technology (NTNU), organized an online meeting on 7th of May 2021 . The objectives of this internal meeting were the revision of research areas and research priorities in SP5, as well as analyze ongoing European-funded research with relevance for SP5 and planning future activities.

BOOSTING THE R&D&I COLLABORATION WITH EASTERN EUROPEAN COUNTRIES: THE KEY ROLE OF EERA BIOENERGY

EERA Bioenergy Joint Programme organized in collaboration with CEI (Central European Initiative) the online workshop 'Boosting the R&D&I collaboration with Eastern European countries: The key role of EERA Bioenergy' that took place on Wednesday 9 June, from 15h to 16h (CEST) via Zoom, with the participation of the European Commission.

The new framework programme Horizon Europe and the recovery fund Next Generation EU will represent an extraordinary opportunity to increase synergies and maximize collaboration between European entities in the scope of biomass and bioeconomy. To strengthen ties and establish cooperation with Eastern European entities, EERA Bioenergy invited Eastern European universities, research alliances, technology centers, scientific agencies, institutes and associations to this open workshop that was held remotely and count on more than 55 participants.

Joining EERA Bioenergy will allow joining forces to maximize the excellence in research, development and innovation on biomass, bioenergy, biofuels and bioeconomy.

Agenda

Bioenergy highlights

CSIC-ITQ TAKES PART IN THE H2020 EU PROJECT IDEALFUEL AIMING TO PRODUCE MARINE-TYPE BIO-FUELS FROM LIGNIN

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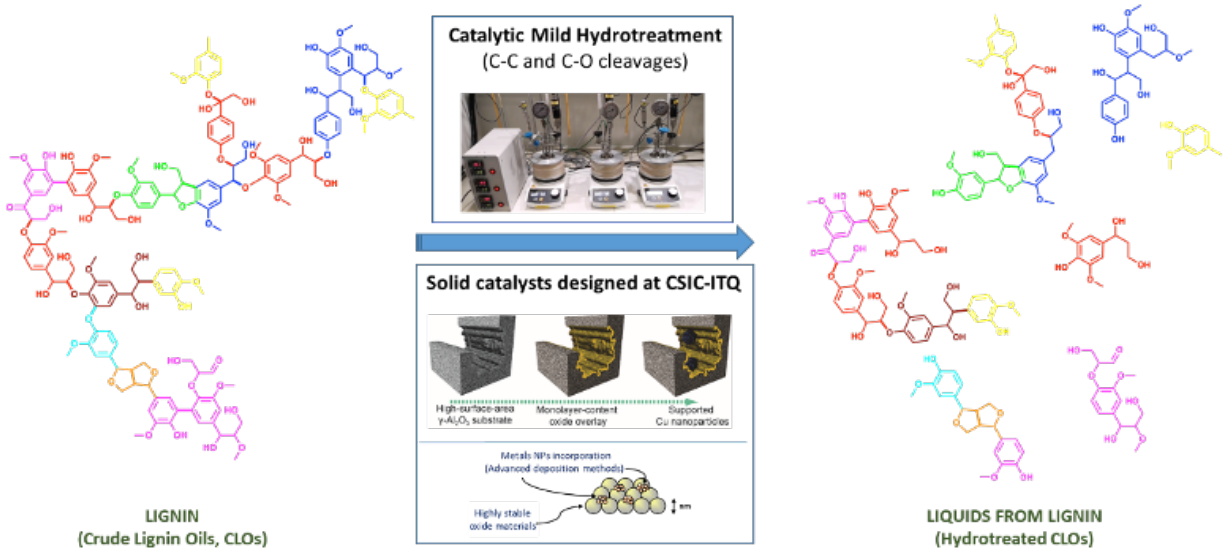
CSIC-ITQ researchers, in cooperation with other partners, Eindhoven University of Technology (TUe, coordinator), OWI Science for Fuels gGmbH, affiliated to RWTH Aachen University (OWI), Vertoro B.V., TEC4FUELS GmbH, Bloom Biorenewables Ltd, Uniresearch B.V., Winterthur Gas & Diesel Ltd., GoodFuels B.V., thyssenkrupp Marine Systems GmbH and Varo Energy Netherlands B.V., take part in the H2020 Research and Innovation Action IDEALFUEL.

The project aims to develop an efficient and low-cost chemical process to convert lignin, a major and rather recalcitrant component of woody residual and waste materials (sawdust and wood chips) into a Biogenic Heavy Fuel Oil (Bio-HFO), with ultra-low sulfur levels that can be directly applied as a drop-in fuel in the existing maritime fleet. Two innovative, efficient and complementary lignin extraction and depolymerization pathways will be upscaled for the production of crude (non-pyrolytic) lignin oils (CLOs) stabilized in bio-methanol, which will serve as feed for the production of marine fuels via mild hydrotreatment catalytic processes. The ambition of the IDEALFUEL project is to develop the new technologies and processes from the current lab-scale (TRL3) via bench-scale (TRL4) to pilot scale (TRL5) to prove the performance and compatibility of the Bio-HFO over the completely blending range in maritime fuel systems and marine engines.
CSIC-ITQ researchers work on the development of solid catalysts for the hydrotreatment of biomass-derived crude lignin oils (CLOs) under mild operation conditions, essential to set the physicochemical properties of lignin-derived liquids within the ranges required for their application as fuels in marine engines.

In their raw state, crude lignin oils contain a mixture of monomeric and oligomeric units of lignin, the most recalcitrant component of lignocellulosic biomass. The target is to develop catalysts, which are capable to drive a selective cleavage of these macromolecular structures into less bulky oligomers through mild and hydrogen-efficient hydrotreating, conferring the final liquid product the energy content, the components quality and the flow characteristic required for its application as a drop-in marine fuel.



Catalysts design is adapted to the composition of different CLOs, which, depending on their production route, contain or not sugar fractions accompanying the lignin oligomers. Materials mainly based on metal-supported materials are synthesized at lab scale by different methods at CSIC-ITQ, such as i) deposition of active metal oxides layers as well as metal nanoparticles with uniform sizes in the range below 10 nm onto solvothermally compliant, high-surface-area porous substrates [1,2]; or ii) incorporation of metal nanoparticles onto robust mixed metal oxides with enhanced acid properties and high surface area [3,4]. Surface spectroscopy and electron microscopy methods are applied to assess the size, spatial distribution and surface reactivity of these different catalyst components. Reaction tests are performed in autoclave-type reactors under moderate H_2 pressure and temperature by using both molecular models of lignin oligomers and methanolic CLOs provided by project partners. Liquid samples collected are analysed by NMR and chromatographic techniques (i.e. GPC, GCxGC-FID/MS) to follow the conversion process. Novel catalysts performance is evaluated in comparison to other well-known hydrotreating catalysts. Based on these fundamental studies at lab scale, optimized catalyst formulations will be identified, thus serving as a basis for upscaling tasks within IDEALFUEL for the project's concept demonstration at bench and pilot pre-industrial scales.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 883753.

IDEAL FUEL

INSTITUTO DE TECNOLOGÍA QUÍMICA
CSIC Consejo Superior de Investigaciones Científicas
UNIVERSITAT POLITÈCNICA DE VALÈNCIA

References:

[1] G. Prieto, A. Martínez et al., ACS Catal., 2015, 5,6, 3323-3335.
[2] J. Kim, G. Prieto et al., ACS Catal., 2020, 9,11, 10409-10417.
[3] J. Mazarío et al., Catal. Sci. & Technol., 2020, 10, 8049-8063.
[4] M.E. Domine et al., WO 201914412 A1, 2019.

SCRCOAT - OPTIMISATION AND VALIDATION OF PROCESSES FOR THE COMBINED REDUCTION OF PARTICULATE MATTER AND ACIDIC POLLUTANT GASES ON BIOMASS FURNACES

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After three and a half years of intense research, the joint project SCRCOAT has been completed in the beginning of 2021. The main objective of the project was the demonstration of a combined exhaust gas purification process that enables an economic reduction of all limit value-relevant exhaust gas emissions at a decentralised combustion plant for biogenic residues.

The transformation from a fossil-based to a bio-based economy is evolving worldwide. This is associated with the increased use of wood assortments and agricultural plants for material purposes. Therefore, a further expansion of energetic biomass use is only possible based on biogenic residues. During the combustion of biogenic residues particulate matter (PM), nitrogen oxides (NO_x), hydrogen chloride (HCl) and sulphur dioxide (SO_2) can occur in elevated concentrations depending on the respective fuel composition. Relevant emission limits have been tightened in Germany based on European requirements. Further tightening of limits at the European level is to be expected in the future so that the intended use of biogenic residues and waste for energy purposes is often only possible with secondary emission control measures. At present, a corresponding abatement technology is only available for the power plant sector and cannot be applied economically on small and medium-sized biomass plants up to 5 MW thermal heat output without further development. Therefore an exhaust gas purification procedure, which can be applied economically in decentral biomass plants, was demonstrated on a pilot plant and under real-life conditions on a field plant.

Core of the exhaust aftertreatment process is a fabric filter with catalytically active filter bags, which enables a combined reduction of PM and NO_x. An additional precoating of the fabric filter removes acidic exhaust gas components such as SO_2 and HCl. Cost advantages compared to conventional exhaust gas cleaning technology are achieved through space and energy savings. Moreover, the adsorption of acidic pollutant gas components provides an integrated protection option for the SCR catalyst against rapid chemical deactivation. For injection of the reducing agent, a two-stream nozzle mounted directly at the heat exchanger was installed. The temperature at this position above 300°C is enough in order to disintegrate completely the reducing agent urea solution in NH_3 and HNCO by thermolysis. Exact dosing of very low amounts of urea solution was realised with a mass flow controller. The precoating material (lime hydrate) was fed directly after the cyclone into the exhaust gas with a spiral dosing unit.

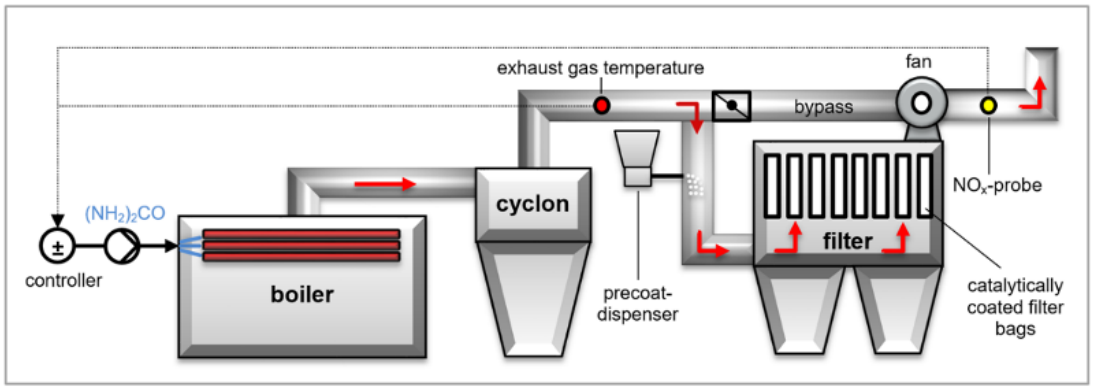

Figure 1: Process scheme for combined reduction of PM, NO_x and acidic gaseous compounds
(Source: Mario König et al 2021 IOP Conf. Ser.: Earth Environ. Sci. 642 012006)

Combustion experiments with straw pellets and leaf pellets were performed at the field plant at a heat output of 300 kW. Figure 2 shows the achieved reduction rates. PM reduction rates up to 99 % were achieved with the precoated fabric filter.

NO_x-reduction of 45 % was achieved for both fuels. The reduction rate of NO_x was limited by the temperature achieved on the filter/SCR-catalyst. To avoid high losses in efficiency, the temperatures were limited to below 200 °C.

Due to initial problems with the dosing system for the precoating material, only a small SO_2-reduction of 16 % could be achieved with straw pellets at the field plant. At the pilot plant, approx. 75 % SO_2 reduction was achieved by precoating. At the field plant with the fuel leaf pellets, a maximum of 55 % SO_2-reduction was achieved by precoating.

HCl could be abated by the injection of the reducing agent and by the precoating material. The lowering of HCl concentration by reaction with urea can be explained by the formation of ammonia chloride (NH_4Cl). The combination of urea dosing and precoating achieves HCl-abatement rates up to 90 %.

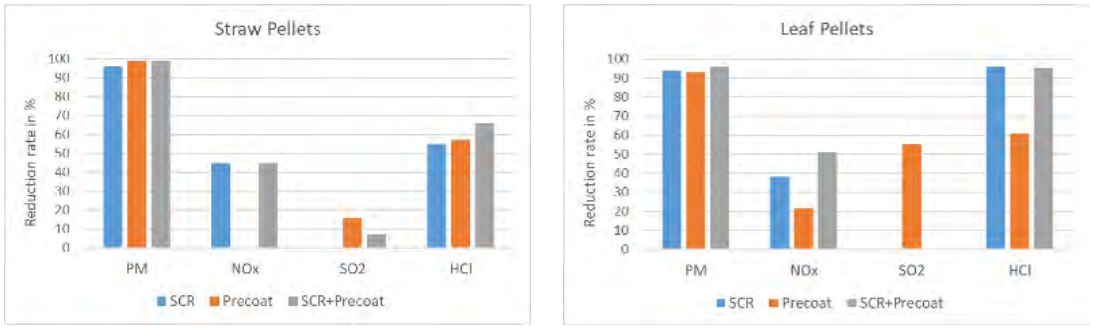

Figure 2: Reduction rate achieved on the field plant with the fuels straw pellets and leaf pellets @ 300 kW

In addition to the combustion experiments, economic and ecological assessment was carried out. It was found that the heat production costs on a 400 kW straw boiler are increased by approx. 1 cent/kWh due to the investment and operating costs resulting from the exhaust gas purification process. Additional greenhouse gas emissions are generated to a small extent by the exhaust gas purification process, as the production of reducing agent and precoating material, as well as the operation of the plant components, require additional energy. However, the share of total GHG emissions is relatively low. For example, compared to the fossil reference (a mix of natural gas and oil), a 400 kW straw-fired boiler saves 88 % of GHG emissions without flue gas cleaning, with flue gas cleaning the saving is still 86 %.

Figure 3: Field installation for the demonstration of the combined emission reduction on a biogenic residues combustion plant (© Karin Wilck)

With a total budget of 1.09 Million €, this project has received 734,866 € funding from the German Federal Ministry for Economic Affairs and Energy under the 7th Energy Research Programme of the Federal Government of Germany. The project partners are three research Institutes and four small and medium enterprises.

Supported by:
Federal Ministry for Economic Affairs and Energy
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PADERBORN UNIVERSITY
ÖKO THERM Biomasse-Heizanlagen
HELLMICH
ITB Industrietechnik Barleben GmbH
Dr. WEIGEL Anlagenbau GmbH

Further Information:
Link

VALORISATION OF DILUTED BIO-REFINING STREAMS

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Lignocellulosic biomass has been investigated extensively as a renewable feedstock for the production of chemicals and fuels due to its low cost, high availability, and does not compete for food resources. Specifically, furfural and hydroxymethylfurfural (HMF) have been recognized as bio-based chemicals of significant importance which can be obtained from lignocellulosic biomass. Their conversion allows us to produce a vast majority of value-added products including biofuels, polymers and resins.

BioSPRINT

As a partner of the BioSPRINT project, the Slovenian National Institute of Chemistry participates in the treatment of hemicellulose-rich streams. Aiming towards more efficient utilization and valorization of hemicelluloses (HMC), the project goal is focused on its purification, conversion and transformation into application-ready platform chemicals. This will be achieved by the intensification of the up- and downstream processes leading towards 'zero-waste' bio-based operations.

Aligning with our specialization in catalysis and chemical reaction engineering, NIC will focus on the development of a microkinetic model for the dehydration of sugars. It is known that with a suitable pretreatment of biomass feedstock such as hydrolysis and/or dehydration, it is possible to produce desirable furanics. Precisely, C6 (hexoses) and C5 (pentoses) sugars commonly obtained from hemicellulose biomass fractions can be further converted via dehydration into furfural and HMF. Taking into consideration the importance of catalyst recyclability and easy separation, heterogeneous catalysts were utilized for the conversion of sugars. Hemicelluloses are complex saccharide mixtures composed of different hexoses and pentoses, along with a variety of impurities and side products present in the stream mixtures.

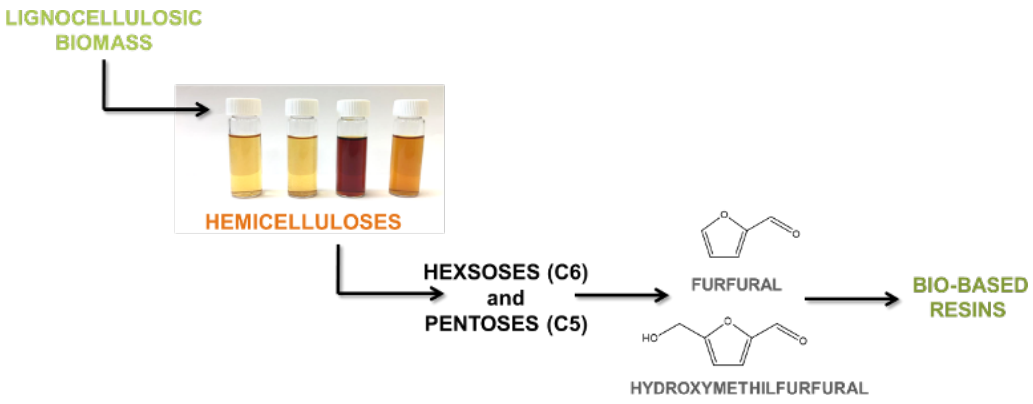
- Despite the extensive work done so far focusing on the dehydration of individual sugars, complex realistic stream mixtures have been rarely considered. Our main goal is to develop a comprehensive mechanistic scheme, beginning with synthetic sugar mixtures, that takes into account potential interactions with impurities that will later be transferred to realistic hemicellulose streams.

- Due to the complexity of the hemicellulose streams, comprehensive composition analyses and stream variability assessment is being regularly performed in our laboratories at NIC.

- Our group is closely involved with the intensification of downstream purification processes achieved by distillation and extraction methods to maximize process performance.

- Produced furanics are to be later applied for polymerization and development of biorenewable resins and polyols.

With the successful conversion, purification, process intensification and further transformation of hemicellulose fractions to value-added consumer products, we will contribute to a carbon-neutral future within a circular bio-economy.



SUSTAINABLE WOOD STOVES THROUGH STOVE, BUILDING INTEGRATION AND VALUE CHAIN OPTIMISATION

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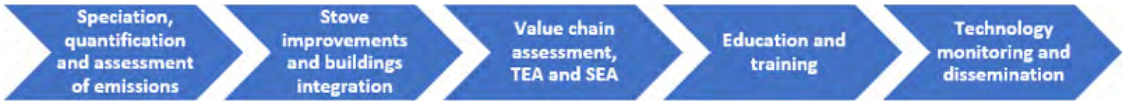
Bioenergy is important in Norway and wood log combustion has long traditions in Norway, constituting above 40% of the total use of biomass for stationary energy purposes, and accounting for about 12% of the domestic heating. Using wood logs is important for the security of supply in Norway, where we today rely heavily on the electricity grid to deliver the needed space-heating for our houses, which are typically wooden (with relatively low thermal mass). With high nominal power, wood stoves can significantly reduce power peaks in the electricity grid, prevent blackouts and act as back-up heating system. In the context of increasing electricity use in households, including electric cars, reducing peak electric power is strategic as it enables to prevent or postpone large investments to reinforce the distribution grid. New houses, as well as retrofit/upgrading of old houses, have increasingly focused on improved energy efficiency. The space-heating effect (power) required for these highly-insulated buildings is drastically reduced, i.e. lower heating effect is needed compared to a new stove in an old house. Previous projects (StableWood and WoodCFD) have increased significantly the knowledge about wood log combustion in stoves to enable improving wood stoves with respect to emissions and energy efficiency, as well as combustion stability and optimum room and building integration. However, to ensure a sustainable wood stove future both in the existing building stock and the residential buildings of the future, further knowledge building within emission reduction, energy efficiency increase, proper building integration, and value chain, techno-economic and socio-economic assessments are needed. This will secure the continued use of wood stoves as an important, comfortable and sustainable heat source in the existing building stock (replacing old/poor stoves) and the residential buildings of the future, providing also substantial socioeconomic benefits. Therefore, SusWoodStoves is established.

The overall objective of SusWoodStoves is sustainable wood stoves through stove, building integration and value chain optimisation, and the sub-objectives are:

1) Speciation and quantification of particulate and gaseous emission levels from wood stoves for representative stove technologies and operating conditions,
2) Reduction of climate and health-related emission levels through emission reduction and energy efficiency measures,
3) Optimum building integration of stoves,
4) Assessment of value chain performance of existing and improved stove technologies and connected systems for different stove-building configurations in Norway,
5) Techno- and socio-economic assessments of the current and future role of wood stoves in the Norwegian energy market,
6) Development of a roadmap for sustainable wood stoves in Norway,
7) Education of highly skilled candidates within this area and training of industry partners,
8) Monitoring of activities and state-of-the-art within this area and dissemination of knowledge to the industry partners, and other interested parties when applicable.

The project will run for four years, 2021-24, and is divided into the following main activities, covering combined the entire wood stove value chain:



SusWoodStoves, with its focus on sustainable wood stoves, is a response to a Research Council of Norway (RCN) knowledge-building project call and the topic Environment-friendly energy and its focus on the long term, sustainable development of the energy system, that enhances the competitiveness of Norwegian trade and industry and accelerates the transition to a low-emission society, including reducing anthropogenic greenhouse gas emissions. It is also directed towards the RCN ENERGIX program plan and its focus on 1) sustainable utilisation and consumption of renewable energy resources - as biomass, 2) reduction of Norwegian and global emissions of greenhouse gases - from bioenergy, 3) enhancement of Norway's security of supply - through increased use of domestic biomass resources, 4) strengthened innovation in Norwegian trade and industry and the public sector - for the wood stove value chain and 5) further development of Norwegian research and educational institutions - to be able to support innovation efforts in the wood stove industry.

Even though the focus is on Norway, the project results should be highly relevant also for other countries with a significant share of contribution to the domestic energy system from wood stoves.

For more information:
Link

LIGNOCELLULOSIC BIOREFINERIES: PURIFICATION CASCADE FOR PENTOSES FROM HEMICELLULOSE

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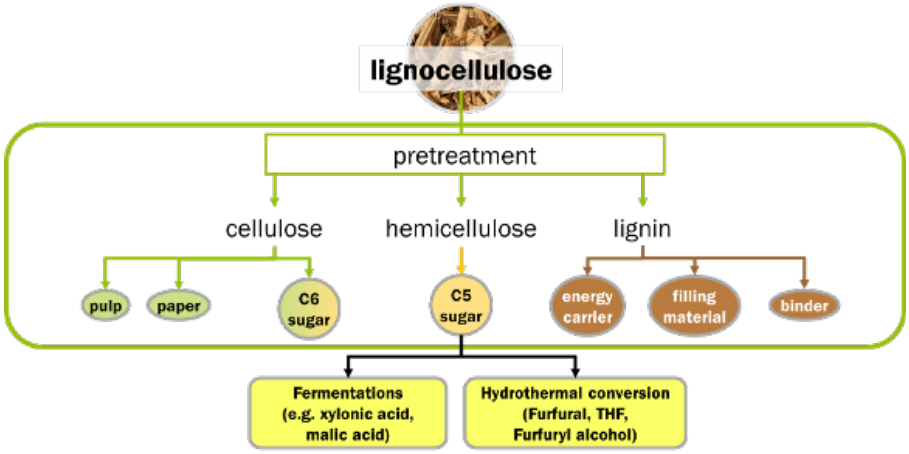
Lignocellulosic pentoses, the underutilised sugars

Wood and other lignocellulosic biomass are composed of approx. 20-35% hemicellulose – a mixture of different polysaccharides made up of mainly pentoses (C5 sugars). Large amounts of hemicellulose are thus processed in biorefineries like in the pulping industry and prospectively also in 2G bioethanol plants. However, the hemicellulose is currently mostly burnt for internal energy provision, since the monomeric sugars accrue in a mixture with other organic compounds and are difficult to recover. If available in a purified form, these monomeric pentoses like xylose are considered valuable feedstocks for biobased fuels and products.



The development of an efficient purification cascade for wood hydrolysates was one of the topics of the KomBiChem^{Pro} project. To obtain fermentable xylose, removal of lignin fractions by adsorption, hydrolysis of oligomeric xylose to monomeric xylose, and the purification of the monomeric xylose by means of NF was developed [1]. The suitable process parameters were identified at lab scale and transferred to pilot-scale equipment (between 1 - 100 kg/h throughput).

Results

For the removal of lignin fractions in the beech wood hydrolysate, adsorption on polymeric resins and zeolites was assessed [2]. Over 93% of the lignin compounds were adsorbed on the most promising adsorbents (XAD7HP and SP700) at an adsorbent-to-solution ratio of 1:5 w/v. At the same time, the losses of oligomeric and monomeric xylose were low (less than 8%). It was possible to desorb the lignin fractions from the adsorption column with a 50 wt% aqueous ethanol solution in an adsorbent-to-ethanol solution ratio of 1:3 w/v. This way almost all adsorbed sugar was also recovered.

The pretreated beech wood hydrolysate was then hydrothermally treated to convert oligomeric sugars into monomeric sugars. It was possible to identify process parameters that allowed conversion without further degradation of the sugars to furans etc.

For subsequent concentration of the monomeric xylose, nanofiltration (NF) was successfully applied [3]. Parameters for the NF of this solution were found to be a transmembrane pressure of 3.0 MPa, a temperature of 35°C, and a crossflow velocity of 1.1 m/s. Thus, obtaining a permeate flux of 38.2 L/(m2h) and high retentions for sugars (100% for oligomeric xylose, 99% for glucose, 96% for monomeric xylose) and low retentions for inhibitors to subsequent fermentations (30% for 5-HMF, 20% for furfural, and 4% for acetic acid). About 60% of the water in the sugar solution was removed by nanofiltration. Thereby, a monomeric xylose concentration of 126 g/L in the retentate and a reduction of the inhibitor-to-xylose ratio by 52% were achieved. The purified xylose stream is then applicable for fermentation processes. The production of xylonic and malic acid was tested in the KombiChemPro framework, but other applications are also possible.

Conclusions

The separation cascade that was developed in lab-scale and transferred to pilot-scale can be used to obtain purified pentoses from pulping processes and pretreated lignocellulose. It would be interesting to apply the separation cascade also to hydrolysates resulting from other pretreatment methods. This could be a step to allow the utilisation of the large amounts of hemicellulose currently not being used for value-added products.

Acknowledgements

This work in the KomBiChem^{Pro} project was conducted in close collaboration with Fraunhofer Centre for Chemical-Biotechnological Processes CBP and was funded by the Federal Ministry of Education and Research (FKZ: 031B0083B).

Further readings:

[1] R. Nitzsche, A. Gröngröft, J. Köchermann, K. Meisel, H. Etzold, M. Verges, M. Leschinsky, J. Bachmann, B. Saake, S. Torkler, K. Patzsch, B. Rößiger, D. Pufky-Heinrich, G. Unkelbach, Biomass Conversion and Biorefinery 2020. DOI: 10.1007/s13399-020-00769-z.
[2] R. Nitzsche, A. Gröngröft, M. Kraume, Separation and Purification Technology 2019, 209, 491 – 502. DOI: 10.1016/j.seppur.2018.07.077.
[3] R. Nitzsche, J. Köchermann, A. Gröngröft, M. Kraume, Industrial & Engineering Chemistry Research 2021, 60 (2), 916 – 930. DOI: 10.1021/acs.iecr.0c03256.

SUWANU EUROPE – SUSTAINABLE WATER TREATMENT AND AGRICULTURAL REUSE OPTIONS IN EUROPE

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Together with nineteen European partners, the Agricultural University of Plovdiv participates in a Horizon2020 project focused on the use of reclaimed water in agriculture.

Water scarcity is a global problem affecting a wide range of European regions, far beyond those traditionally considered water-scarce and arid areas. Competition for traditional water resources is posing new challenges to citizens, economies, and ecosystems that rely on current water supplies. In particular, agriculture irrigation accounts for the highest water use in Europe, reaching an average of 44 % of the total water abstractions in Europe and up to 70 % in Southern European regions.

In this context, urban reclaimed water has increasingly been recognized as an additional resource with a large potential for alleviating water scarcity, particularly in coastal areas. Urban reclaimed water is considered a highly reliable water supply, largely independent from the irregular rain patterns of Southern Europe and able to satisfy peak water demands for irrigation, particularly during the summer season.

REGIONAL SCOPE

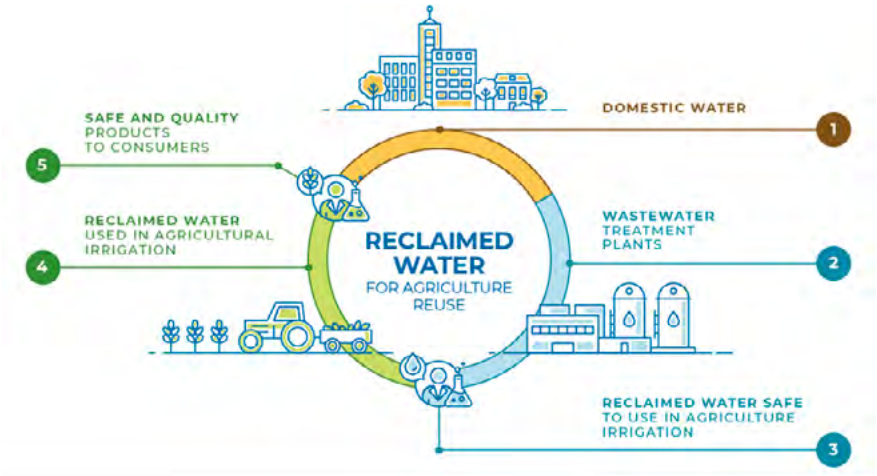
SUWANU EUROPE is a Thematic Network whose main aim is to address the common challenges affecting the agricultural sector throughout Europe. To achieve this goal, 8 target regions have been selected: Andalusia (Spain), Braunschweig (Germany), Thessaloniki (Greece), Plovdiv (Bulgaria), Alentejo (Portugal), Po River Basin (Italy), Occitan (France), Antwerp and Limburg (Belgium).

The overall objective of the SUWANU EUROPE project is to promote the adoption of new strategies for agricultural irrigation with reclaimed water through the establishment of a permanent network of relevant local actors, coupled with a dynamic information exchange system about lessons learnt in which researchers, private innovators, civil organizations and public administrations can effectively interact.

SUWANU EUROPE

WHAT IS SUWANU EUROPE?

The aim of the SUWANU EUROPE project is to promote an effective exchange of knowledge, experiences and skills between practitioners and relevant actors involved in water reuse for agricultural irrigation. The project will boost the transfer of applicable technological and organizational solutions all around Europe and thus result in a more resilient agricultural sector, able to effectively cope with current and foreseen water scarcity and climate change effects.



Circular Economy in using Reclaimed Water for agriculture reuse

EXPECTED RESULTS

- Characterization of the 8 target regions to assess the potential of the use of reclaimed water in agriculture.
- Database of water reuse projects in Europe.
- Fact-sheets and practice abstracts with successful projects and case studies in pioneer countries in water reuse such as Cyprus and Israel.
- SWOT and AKIS analysis in each target region as the basis for the subsequent strategy.
- Participatory workshops with key actors to identify the different views and interests of a broad representation of society for the co-creation of strategies.
- Action Plans with specific objectives, recommendations and activities adapted to the regional context that facilitate the implementation of innovative solutions.
- Online courses and training sessions for different groups of actors that respond to their knowledge needs and increase the capacities of practitioners in the field of reclaimed water.

Database of water reuse initiatives in Europe (https://suwanu-europe.eu/database)

Link

New members

ASSOCIATE MEMBERS

AGRICULTURAL UNIVERSITY – PLOVDIV (AUP)

The Agricultural University – Plovdiv (AUP) is a leading institution in Bulgaria providing a high-quality student-centered education, releasing competent specialists committed to civic virtues, and fostering research for rapid innovation in agriculture by collaborating closely with business. AUP's expertise stretches over agronomy technologies, plant protection, agroecology, environment and food safety and quality, marketing and management, sustainable agriculture and forestry, responses to climate change, resource efficiency, etc. In its extensive experimental fields, AUP supports integrated applied research for designing solutions for agricultural business.

For five consecutive years, AUP is the undisputed national leader in the professional field "Crop science" and the last three years is a leader in "Plant Protection" and "Animal breeding" according to the ranking system of universities in Bulgaria. In 2019 AUP was accredited by the National Agency for Assessment and Accreditation with a score of 9.61 that puts the University in the top three of higher education institutions in the country.

The University participates in international consortia under the "Horizon 2020" and has implemented a number of scientific and educational projects. The latest research projects under this program are Staccato, EcoStack, SuWaNu Europe, within the field of biodiversity conservation, environmentally safe plant protection and sustainable use of water resources, etc. AUP implemented projects in the area of educating and consulting were Re-Agro, PROVIDE, PRO-AKIS, and CLAIM. The university representatives participate as consultants on the ground for the needs of FAO, ETF, TAIEX, EIT-Food, IFOAM, and other international organisations.

At a national level, AUP is involved in the development of several National Research Programmes of the Ministry of Education and Science. One of them is in collaboration with scientists from Sofia University St. Kliment Ohridski and other 2 Universities and 2 Academies of Science named "Healthy Foods for Strong Bioeconomy and Quality of Life" 2018-2022. Recently, AUP completed a contract with the Ministry of Agriculture, Foods, and Forests concerning the elaboration of analysis of the impact of Bulgarian agriculture on the environment and climate change.

Some of the research topics of AUP are related to increasing the economic competitiveness of agricultural biomass production, primary by-products from food crops, and solid or semisolid waste streams from secondary biomass processing (wheat, maize, sunflower, etc.) with a reduced environmental impact and without competing with food production. Research groups carried out studies on the development of models for bioenergy cropping systems, on recycling biomass, and on wastewaters for subsequent use in agriculture from the point of view of the circular economy, among many others.

Website

CoLAB BIOREF - Collaborative Laboratory for the Biorefineries

BIOREF
Laboratório Colaborativo para as Biorrefinarias

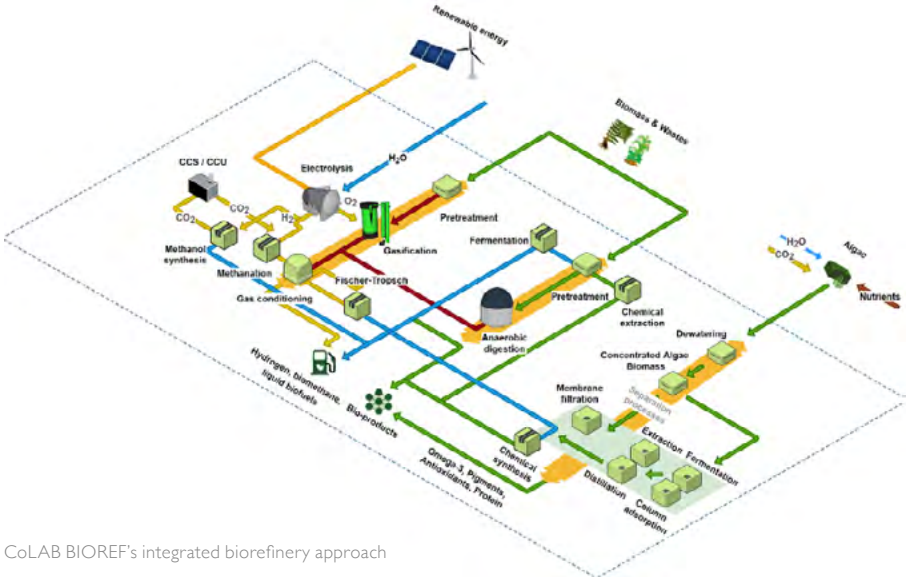
Joana Bernardo
Scientific-technical Director
joana-bernardo@bioref-colab.pt

CoLAB BIOREF is a non-profit private association in Portugal that links highly qualified knowledge and innovation with the market, identifying industrial needs in the biorefinery sector while promoting bioenergy and bioeconomy.

CoLAB BIOREF is an autonomous entity with its own labs investing in advanced biorefining technologies closely cooperating with our 20 associates: 11 companies and 9 academic research centers. We promote a market-oriented R&I Agenda using advanced technologies for developing new processes and products at TRL 4-7, promoting the deployment of advanced biorefineries. As such, our work is focused on three strategic domains: Bioenergy, Renewable gases, and Sustainable bioeconomy. CoLAB BIOREF provides a broad service from technical consultancy, scientific analysis, life cycle analysis, techno-economic assessment, and upscaling key biorefining technologies (e.g., Biomass-to-X, Power-to-X, fermentation, gasification, pyrolysis), targeted for innovating technological solutions to solve current bottlenecks of the most advanced biomass conversion platforms.

Currently, we are a key partner of Project Move2LowC (budget: 9 M€) which aims to build 4 biorefineries in cooperation with our BIOREF´s associates. BIOREF intends to be a trustful partner for international consortia and networks, and our first year of activity already resulted in the submission of 5 international projects and 9 project agreements with companies.

Our vision is "to be an international reference in biorefining technologies - multiproduct, multipurpose".



CoLAB BIOREF's integrated biorefinery approach

Website
LinkedIn

CREA IT: The Panacea Research Group for bioeconomy crops logistics

crea
Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria

Dr. Luigi Pari
Researcher
www.crea.gov.it
www.gruppo-panacea.it

The collection of agricultural products, including that one's for energy and/or bioeconomy use, their fractioning, selection, storage, transport, handling and pre-treatment affects up to 80% of the production costs and the quality of the final product.

The agricultural machinery industry is not interested in studying technological solutions until a real market is outlined and there is an important demand for their products, due to the high costs of developing prototypes and the technological and market unknowns that may arise during the development of the value chain.

Public research, by accessing the resources of Research Projects, is the only one that can contribute to the solution of technological gaps as long as the value chain is not well defined.

For this reason, CREA IT, a Research body belonging to the Italian Ministry of Agriculture https://www.crea.gov.it/en/home in the last 30 years has been involved in several European research projects to develop technologies for the collection, separation, transport, storage, handling and pre-treatment of various biomasses, both woody and herbaceous crops, and il the valorisation of both agricultural and forestry by-products.

CREA It has also coordinated several National Projects in order to adapt the technologies developed in the Europeans one's to the different characteristics of the Italian reality identifying the best practices for alternative crops but also training the Italian stakeholders in order to support them in the technical choice for the bioeconomy model.

European Research Activities:

To meet all the request of technological innovations, CREA formed the Panacea research group (http://www.gruppo-panacea.it/home/en/) which since 1990 has contributed to the following European Projects:

- Modernization of Sweet Sorghum harvesting and storage - JOULE E.U 1990/1991
- Cynara cardunculus Network AIR E.U. 1995/1997
- Models for economic evaluation of the selected biomass cultivations as on alternative land use in the European Community AIR CT3-0985 - E.U 1995/1997
- Sustainable development of the rural environment through the reintroduction of LIFE E.U. 1995/1997
- Robinia to Energy APAS-RENA EU, E.U 1995/1996
- Centers for continuing education in Agricultural Engineering, Tempus E.U. 1999/2001.
- Options for Achieving the targhet of 45 MTOE from energy cropping in the EU in 2010, Altner EU, 41030 / C / 00-022 / 2000, 2000-2003
- Biomass in the Mediterranean, Altner E.U. MiPAF 2000/2001 (DM Mipaaf)
- Global Process to improve Cynara cardunculus exploitation for energy applications Biocard, FP6-Energy-3, E.U. 2005/2008
- Optimization of perennial crops in the Mediterraneae area (Optima) (Contract n - 289642), E.U. VII Framework Program 2011/2015.
- Fiber Crops as a Sustainable Source of Bio-based Materials for Industrial Products in Europe and China (Fiber) (Contract n. 311965), E.U. VII Framework Program 2013/2015
- Evaluation of the energy crop Jatropha curcas as a mean to promote renewable and sustainable energy for the Mediterranean region (JatroMed) (Contract n. 2011 / 221-037) E.U. EuropeAid 2011/2015
- Develpment and implementation of a new, and nonjexistent, logistic chain on biomass from pruning (Europruning) (Contract n. 312078) E.U. VII Framework Program 2012/2016
- Demonstration of innovative integrated biomass logistics centers for the Agro-industry sector in Europe (AgroInLog) (Contract n. 727961) H2020 RUR 2016-1, 2017/2020

- Marginal lands for Growing Industrial Crops: Turning a burden into an opportunity - Magic (Contract no. 727698). H2020-RUR-2016-2017, running.
- Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels - Becool H2020-LCE-22-2016. (Contract n. 744821), running.
- A thematic network to design the penetration path of non-food crops into European agriculture - Panacea Call RUR 2017-1 (Contract n. 773501), running.
- Introducing cactus plantations (Opuntia spp.) And smart water management systems in marginal lands of Egypt and Morocco to drive rural renaissance in the Mediterranean Region - MediOpuntia, ERANETMED 3rd JOINT CALL 2018 - running
- Camelina: a Cash Cover Crop Enhancing water and soil conservation in MEDiterranean dry-farming systems - 4CE-MED, PRIMA Call 2019, 2020 - running
- Collaborating with the Italian industries involved in the development of the various bioenergy supply chains and circular bioeconomy models, such as, for example, Powercrop, Coprob, Novamont, Mossi and Ghisolfi, Eni, Versalis, etc.

The Panacea Group of CREA has contributed to the development of new systems for the mechanization of woody crops (poplar and eucalyptus harvesting for energy), new machines for herbaceous crops (fibre and sweet sorghum, arundo donax, miscanthus) new machines for harvesting oil crops (cynara cardunculus, camelina, rapeseed, jatropha,) and fibre crops (hemp, kenaf and broom) and agricultural by-products (pruning, chaff, roots, corn stalks etc) developing new approaches for the logistics of the supply chain in order to reduce the environmental impact (soil compaction, product fermentability, number of transport, etc.) decrease the logistic costs and make prototypes available in order to contribute to the start-up phase of the new supply chains.

Poplar chips storage tests

Poplar harvester

Arundo donax harvester

Cynara cardunculus harvester

The activities were carried out in close synergy with industrial groups and mechanical industries and this allowed, in the space of a few years, to have in the market types of machinery for the new crops that did not exist before, developing also finalized strategies for knowledge transfer and scientific support between public research institutions and stakeholder, both agro-mechanical companies and farmers.

540 scientific publications were produced in English but also in Italian, in order to reach the national stakeholders engaged in the bioeconomy business. All publications and innovations produced are presented on the website www.gruppo.panacea.it, where all the prototypes developed are also visible during working: http://www.gruppo-panacea.it/home/en/movies.

Non-European research activity.

This research approach, aimed at identifying logistic problems in the value chain and solve them, has also been applied in non-European Countries in International Projects:

- Sugar cane mechanization and by-products valorisations in the Philippines and Brasil.
- Valorisation of pineapple by-products in Costa Rica in the Santo Domingo Republic.
- Valorisation of rainwater and recovery of run-off and percolation water in North African Countries in order to fight against desertification.

Rain water harvesting prototype

Useful information

European climate law: Council and Parliament reach provisional agreement

The Council's and the European Parliament's negotiators reached a provisional political agreement setting into law the objective of a climate-neutral EU by 2050, and a collective, net greenhouse gas emissions reduction target (emissions after deduction of removals) of at least 55% by 2030 compared to 1990.

Regarding the 2030 target, negotiators agreed on the need to give priority to emissions reductions over removals. In order to ensure that sufficient efforts to reduce and prevent emissions are deployed until 2030, they introduced a limit of 225 Mt of CO_2 equivalent to the contribution of removals to the net target. They also agreed the Union shall aim to achieve a higher volume of carbon net sink by 2030.

Other elements of the provisional agreement include the establishment of a European Scientific Advisory Board on Climate Change, composed of 15 senior scientific experts of different nationalities with no more than 2 members holding the nationality of the same member state for a mandate of four years. This independent board will be tasked, among other things, with providing scientific advice and reporting on EU measures, climate targets and indicative greenhouse gas budgets and their coherence with the European climate law and the EU's international commitments under the Paris Agreement.

The negotiators agreed that the Commission would propose an intermediate climate target for 2040, if appropriate, at the latest within six months after the first global stocktake carried out under the Paris Agreement. It will at the same time publish a projected indicative Union's greenhouse gas budget for the period 2030-2050, together with its underlying methodology. The budget is defined as the indicative total volume of net greenhouse gas emissions (expressed as CO_2 equivalent and providing separate information on emissions and removals) that are expected to be emitted in that period without putting at risk the Union's commitments under the Paris Agreement. Negotiators also agreed that the Commission would engage with sectors of the economy that choose to prepare indicative voluntary roadmaps towards achieving the Union's climate neutrality objective by 2050. The Commission would monitor the development of such roadmaps, facilitate the dialogue at the EU level, and share best practices among relevant stakeholders.

The provisional agreement also sets an aspirational goal for the EU to strive to achieve negative emissions after 2050. The provisional political agreement is subject to approval by the Council and Parliament, before going through the formal steps of the adoption procedure. The provisional agreement was reached by the Council's Portuguese Presidency and the European Parliament's representatives, based on mandates from their respective institutions. The text of the agreement will follow.

More info

Safe and resilient forests: Commission works for wildfire prevention in Europe and globally

On the International Day of Forests (22nd March), the Commission published new guidelines to facilitate a better understanding of land-based wildfire prevention and effective responses. They point towards prevention measures that can be taken through governance, planning and forest management, and outline how EU Member States can access EU funding for wildfire resilience and work together at the EU level.

Forests are necessary for biodiversity, climate and water regulation, the provision of food, medicines and materials, carbon sequestration and storage, soil stabilisation and the purification of air and water. In recent years, the impact of wildfires on people and nature has increased. The new guidance looks at interconnected factors behind this increase and provides an overview of existing principles and experiences on managing landscapes, forests and woodlands that can save lives.

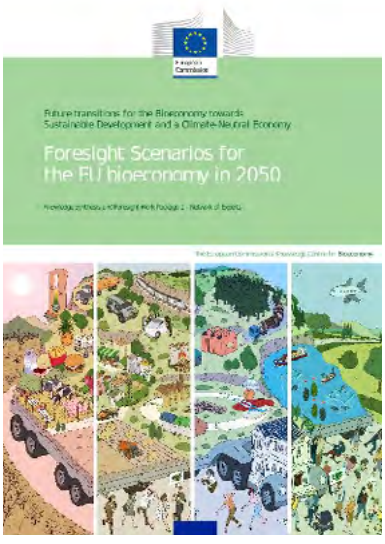
The European Green Deal announced a new EU Forest Strategy for 2021 to ensure effective afforestation, and forest preservation and restoration in Europe. This will help to reduce the incidence and extent of wildfires. The EU Biodiversity Strategy to 2030 also aims to contribute to the EU and its Member States being adequately equipped to prevent and respond to major wildfires, which seriously damage forest biodiversity. The new EU Strategy on Adaptation to Climate Change puts emphasis on the need to strengthen the resilience of forests and includes several actions to support this objective. Climate change is already damaging Europe's forests directly and indirectly through fires, droughts and unprecedented bark beetle outbreaks. Such impacts are likely to increase in the future.

Joint Research Centre (JRC) Bioeconomy Publications

Joint Research Centre, the Commission's science and knowledge service, published two reports with focus on future transitions for the bioeconomy towards sustainable development and a climate-neutral economy.

Future transitions for the Bioeconomy towards Sustainable Development and a Climate-Neutral Economy - Foresight Scenarios for the EU bioeconomy in 2050

The report presents the results of a collaborative foresight process which elaborated four scenarios for the future EU bioeconomy until 2050:Scenario 1: Do it for us - proactive policy, Paris target nearly achieved (2 °C global temperature increase by 2100), no societal change (Business As Usual trend for consumption);Scenario 2: Do it together – integrative policy, Paris target fully achieved (1.5 °C global temp. increase by 2100), fundamental societal change (towards sustainable consumption);Scenario 3: Do it ourselves - societal action, Paris target missed (global temperature increase 2.5 °C by 2100), fundamental societal change (towards sustainable consumption);Scenario 4: Do what is unavoidable - reactive policy, Paris target clearly missed (3.5 °C global temperature increase by 2100), no societal change (Business As Usual trend for consumption). The report presents initial reflections on transition pathways gained from these scenarios in 2050, and insights for the future of the bioeconomy in Europe, and abroad, with a focus on implementing a circular, sustainable, and transformative BioWEconomy, not only in the EU, but globally.



Link

Future transitions for the Bioeconomy towards Sustainable Development and a Climate-Neutral Economy - Bioeconomy opportunities for a green recovery and enhanced system resilience

The COVID-19 pandemic is causing an unprecedented global health crisis and socio-economic upheaval and led to severe consequences well beyond previous crises of the last decades which mostly were related to financial issues. COVID-19 caused sudden economic, psychological, and partly physical shocks to markets, societal sub-systems (e.g., education, food, health), and people. As a direct consequence, today, food security and resilience are at stake. The effects on bio-based products and bioenergy (in particular: biofuels) vary and their role in the recovery (with possible changes in customer's behaviour) could differ as well. The linkages of the bioeconomy to post-pandemic recovery with regard to impacts and possible responses are currently being discussed by many institutions and initiatives, even though there is currently limited data on the impact of the pandemic on the bioeconomy. This report presents preliminary results based on initial analysis from the authors on knowledge synthesis on the EU bioeconomy system, trends, and perspectives of the future development towards 2030 and 2050.

Link

Bioenergy Europe's New Brochure: We are Renewable Energy Champions!

Bioenergy Europe has launched its new brochure which presents the sector's contribution to climate efforts, environment & biodiversity, innovation, and the EU economy.

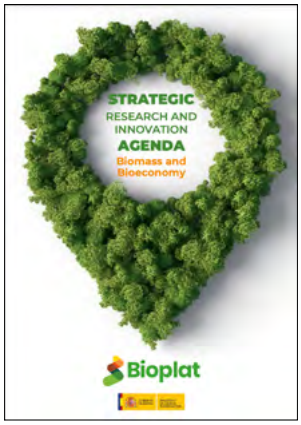
Bioenergy has great potential in Europe and can become the #1 fuel to decarbonize a significant part of our remaining heat, electricity, and transport demand by 2050. It is the main renewable energy source in Europe, representing 57% of the renewable energy consumed in the EU.

Bioenergy is a committed champion in emission reduction, sustainable forest management, and air quality improvements while contributing to a green European economy.

The brochure is structured around 4 main areas: Climate, Sustainability, Innovation and Economy.

Link

The Spanish Biomass sector launches the first Strategic Research and Innovation Agenda on Bioeconomy



The Strategic Research and Innovation Agenda (SRIA) of the Spanish Biomass and Bioeconomy sector aims to serve as a facilitating instrument for the coordination of policies, strategies and financing in R&D&I, to promote the development of projects based on biomass that allow overcome existing barriers and position Spanish companies, universities and research centers at the forefront of the transition towards the bioeconomy and the sustainable use of biomass in Europe. Taking full advantage of the substantial added value that this sector is capable of generating.

The SRIA includes biomass and the bioeconomy in its broadest sense, from recoverable organic matter (waste, by-products, dedicated crops) to transformation / recovery technologies and applications such as bioenergy (generation of thermal and electrical energy, biofuels) and bioproducts. It addresses the biomass value chains as a whole, highlighting the relevant positive externalities that they induce, as a contributing element to the achievement of energy, sustainability and environmental policy objectives. Maintaining a multi-perspective approach, integrating decarbonization, industrialization, just and inclusive energy transition, sustainability and territorial structuring.

Within the area of Raw Materials (biomass resources), it is defined as a priority area of research and innovation: Optimizing the identification, obtaining and mobilization of biomass raw materials for different uses: bioenergy and bioproducts. For which the following research, development and innovation challenges are detailed:

- Identification, quantification and geolocation of biomass.
- Standardization of biomass.
- Mobilization of biomass.
- Dedicated biomass crops.
- Biomass logistics.
- Biomass storage.
- Relationship between use of forest biomass and fire prevention.
- Traceability in biomass value chains.
- Activation of raw materials and biobased monomers.

In Bioenergy, a priority area for research and innovation is defined: Extend and optimize the technical-economic and environmental response of the processes involved in the generation of bioenergy. For which the following research and innovation challenges are identified:

- Analyze the possibilities of adapting old coal-fired power plants to biomass.
- Hybridizations between biomass facilities and other renewable technologies.
- Optimization of savings in the complete biomass cycle.
- Advanced pretreatments.
- Innovation in combustion processes to increase efficiency and control emissions.
- Integration of biomass as fuel for industrial processes.
- Use of the biodegradable fraction of municipal waste, sewage sludge or slurry, for the production of biogas or biomethane.
- Cost optimization of biogas upgrading to obtain biomethane.
- Analysis of the energy capacities of biomass in the electricity mix.
- Thermochemical, chemical and biological technologies for biofuels and bioliquids.
- Sustainable biofuel production technologies for aviation that represent an advance with respect to the hydrogenation of vegetable oils.
- Development of intermediate bioenergetic carriers.
- Introduction of processes to integrate residual biomass streams (pyrolysis processes, hydrothermal liquefaction (HTL)) in refineries.
- Hydrogen production technologies from biomass.

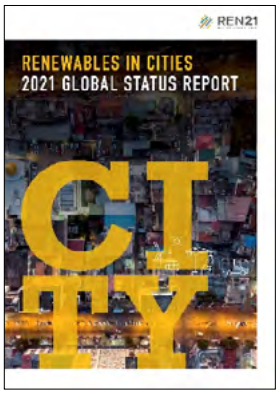
The Bioproducts that should be investigated and innovated in Spain to achieve commercial productions are listed in the table below:

BIOPRODUCTS	MARKET	Examples
Food additives (antioxidants, preservatives, etc.)	Human food, animal nutrition, cosmetics	Rosemary extract, grape seed extract, olive extract
Zootechnic additives	Animal nutrition	Plant extracts, essential oils, prebiotics
Food ingredients with healthy properties	Human food and the nutritional supplement sector	Standardised plant extracts, prebiotics
Pharmaceutical active ingredients	The pharmaceutical industry	Plant extracts and purified compounds, with European Pharmacopoeia quality
Cosmetic active ingredients	The cosmetics industry	Purified extracts and compounds
Biofertilisers, biostimulators	Agrochemical	
Natural bioproducts	Paper	Cellulose, hemicellulose, starch, sugars, chitin, plant fats and oils, lignin, natural rubber, terpenes
Biochar and activated carbon	Catalysis, absorption (chemical industry) Environment	Depolluting Catalysts
Biotechnology sourced bioplastics	Food	PHAs
Monomers	The chemical industry, paints,	Mono ethylene glycol, lactic acid, succinic acid, 1,4BDO (1,4 butanediol), 2,3BDO (2,3 butanediol), 1,3Propanediol, IBMC (isosorbide bis-methyl carbonate)), levulinic acid, 1,3 propanediol, xylitol
Polymers	The chemical industry, paints, adhesives, coverings,	Polyesters, polyolefins, polyurethanes, polyamides, epoxides
Solvents	The chemical industry	Ethanol, MEK (methyl ethyl ketone, lactate esters)

The socioeconomic and environmental added value generated by the valorization of biomass in the framework of the circular bioeconomy is transversal to raw materials, to the generation of bioenergy, biofuels and bioproducts. A series of areas are prioritized in which ancillary studies and analysis of sustainability, technical-economic, regulatory, market penetration, research and demonstration projects, educational and communication strategies, among others, from which will contribute to increasing knowledge about sustainability and excellence of the production of bioenergy and bioproducts.

This Strategic Research and Innovation Agenda was drafted within the framework of BIOPLAT, the Spanish Platform 'Biomass for the Bioeconomy', a nationwide and non-profit organization that promotes the sustainable development of biomass and the bioeconomy in Spain since 2006. It integrates all the public-private actors that make up the value chain of the biomass, to jointly promote the advancement of the sector and thus achieve an economy based on this abundant renewable resource. EERA Bioenergy members, such as CIEMAT and CENER, are members of the Steering Committee of BIOPLAT.

Publications



Renewables in Cities: 2021 Global Status Report

REN 21

REN21's Renewables in Cities Global Status Report (REC) series provides an overview of the status, trends and developments of renewable energy in cities, using the most up-to-date information and data available. The REC's neutral, fact-based approach documents in detail the annual developments in policies, markets, investments and citizen action, with a particular focus on renewables in public, residential and commercial buildings as well as public and private urban transport. This report aims to inform decision-makers and to create an active exchange of views and information around urban renewable energy.

PDF

Barometers 2020: Solid biomass + Biogas + Biofuels

EurObserv'ER

EurObserv'ER Solid biomass fuels Energy Barometer 2020

Solid Biomass fuels is an umbrella term for all solid organic components to be used as fuels. They include wood, timber industry by-products (wood chips, sawdust, etc.), wood pellets, black liquor from the paper industry, straw, bagasse, animal waste, or solid plant residues. Energy recovery from solid biomass fuels is mainly used to produce heat and electricity. Solid biomass fuels energy consumption was 2.2% higher in 2019, reaching 102.6 Mtoe in the EU28 countries. The increment can be ascribed to both, a significant rise in the electricity output of several countries, and also to about 1.2% of additional heat consumption. Consumption rose in all the top eight solid biomass fuels consumer countries. The biggest increases can be credited to the UK (509 ktoe), the Netherlands (354 ktoe), Poland (320 ktoe), Sweden (272 ktoe), the Czech Republic (267 ktoe), Germany (131 ktoe) and Finland (125 ktoe), often resulting from increased electricity production.

PDF

EurObserv'ER Biogas Energy Barometer 2020

Primary energy production from biogas in the EU28 countries has increased only slightly. According to EurObserv'ER, output reached 16.6 Mtoe in 2019, which is marginally higher than in 2018, but around the same level as in 2017. The rollout of regulations less supportive of using food-type energy crops for producing biogas has fuelled this general trend and has been compounded by the limitation on the capacity allocated to biogas tenders and less attractive biogas electricity payment terms. Concerning the outputs, electricity generation from biogas hardly changed (from 62.7 TWh in 2018 to 62.5 TWh in 2019) while biogas heat grew by 4% to 893.4 ktoe. The most important growth has been observed in the use of biomethane in transport sector having increased from 186.8 ktoe in 2018 to 269.6 ktoe in 2019.

PDF

EurObserv'ER Biofuels Barometer 2020

Last year, biofuel consumption used in transport in the European Union of 28 increased by just over 1.1 million tons oil equivalent (Mtoe). According to EurObserv'ER, it should stabilize at 17.8 Mtoe in 2019, as against 16.7 Mtoe in 2018, which is a 6.8% increase. This growth is directly linked to the increase in certain member countries' incorporation mandates, through policies implemented (linked to motivational taxes or fuel-wide obligations to reduce GHG emissions) to achieve the binding 10% target of renewable energies in the transport sector by the end of 2020. The breakdown of biofuel sources for 2019 for the EU28 (including UK) is:

- biodiesel: 80.5%
- bioethanol: 18.0%
- biogas: 1.5 %

As for biogas fuel consumption (biogas purified until an equivalent quality to that of Natural Gas is obtained) meant for NGV (Natural Gas Vehicle) motorisations, is now identified in 9 countries. Some Member States view biogas fuel as a strategic priority for achieving the renewable target share in transport by the 2030 timeline. This particularly applies to Sweden and Italy whose legislation encourages its use in transport.

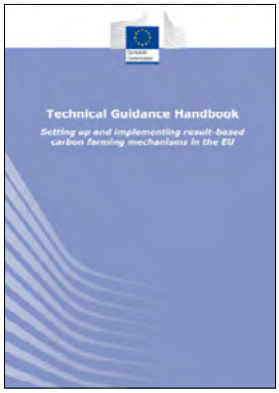
PDF

Energy taxation and its societal effects

JRC Science

Taxes account for a significant share of the final price of energy products in the EU. Energy taxes provide flexible and cost-effective means for reinforcing the polluter-pays principle and for reaching objectives of the European Green Deal. However, as energy taxation raises the price citizens have to pay for their energy, the poor are at risk to be more burdened by energy price increases than the wealthy. This report provides a detailed overview of energy taxation – the current policy context, household energy prices and the impact of energy taxation on financially disadvantaged citizens. The Energy Taxation Directive (ETD) that is currently under revision is also discussed together with the EU Emission Trading Scheme (ETS) and national carbon taxes as the main instruments used in the EU to reduce the greenhouse gas (GHG) emissions. Furthermore, as the redistribution of the tax revenue is crucial for the success of the energy transition, we explore different ways of using the revenue of energy taxation such as supporting further efforts to cut the GHG emissions or offsetting the burdens on the poor by increasing welfare benefits, re-investing the revenue through special schemes (e.g. renovation subsidies), supporting households with lump-sum transfers and other.

PDF



Setting up and implementing result-based carbon farming mechanisms in the EU

COWI, Ecologic Institute and IEEP (2021)

This Technical Guidance Handbook is intended to support the development of result-based payment schemes for carbon farming in the EU. The Handbook has been prepared as part of a wider study Analytical support for the operationalisation of an EU Carbon Farming Initiative, funded by the European Commission, which explores the options for wide-scale adoption of result-based carbon farming schemes or initiatives linked to climate change mitigation and adaptation. The Guidance is based on the two published reports from the first part of the study: -- a review and analysis of existing international and EU carbon farming schemes (COWI et al., 2020); and - the Annexes to this Technical Guidance Handbook, five detailed case studies of emerging result-based carbon farming initiatives in the EU, based on analysis of published documents and interviews conducted with stakeholders (COWI et al., 2021). The case studies examine five key thematic areas, analysing the potential for using result-based carbon farming payments in an EU context: peatland restoration and rewetting; agroforestry; maintaining and enhancing soil organic carbon (SOC) in mineral soils; managing SOC on grasslands; and livestock farm carbon audit. The Guidance also draws on relevant EU experience of result-based payment schemes for farmland biodiversity, developed over the past 25 years.

PDF

Bioenergy Europe: Statistical Report - Bioelectricity Report 2021

Bioenergy Europe

The European Biomass Association (Bioenergy Europe) has published the first chapter of its 2021 Statistical Report focussing on the power of bioelectricity, and showing once again that bioenergy is crucial in achieving the EU climate ambitions and the green transition.

The "Bioelectricity" report reveals that two thirds of the electricity generation in the EU is still provided by non-renewable sources, of which 38 % is provided by carbon intensive fossil fuels. As a result, the carbon intensity of the electricity in the EU remains significant, with huge variations amongst Member States. Bioenergy is a crucial contributor to the EU renewable energy targets representing the third main source of renewable electricity after hydro and wind, producing 5,3% of the total electricity in the EU27 and 15,4% of the total renewable electricity.

The report is accompanied by a policy brief.

PDF

State of Europe's forests 2020

Forest Europe has published its annual report on the State of Europe's Forests 2020. The report is a result of cooperation with numerous experts, specialists from different countries, governments, and international organisations and was published by the Ministerial Conference on the Protection of Forests in Europe.

PDF

Save the date! International bioenergy events

JUNE 2021

9-10 June 2021
Oleofuels 2021
Marseille, France
link

10-11 June 2021
15th International Conference on Economics of Forest Biomass and Bioenergy
Copenhagen, Denmark
link

11 June 2021
Greening Energy in Rural Areas Through the Valorisation of Agricultural Residues
Online
link

22 June 2021
European Pellet Conference
Wels, Austria & Online
link

AUGUST 2021

16 - 18 August 2021
The 10th Asia-Pacific Biomass Energy Exhibition (APBE2021)
Guangzhou, China
link

SEPTEMBER 2021

20 - 23 September 2021
Wood Energy Conference 2021
Online
link

OCTOBER 2021

19 - 20 October 2021
International Biogas Congress & Expo + International Biomass Congress & Expo
Brussels, Belgium
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

Agricultural University of Plovdiv
(Bulgary)
web

BERA
Belgian Energy Research Aliance (Belgium)
web

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

BOUN
Boğaziçi University (Turkey)
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

CIRCE
Centro de Investigación de Recursos y Consumos Energéticos (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

CoLAB BIOREF
Collaborative Laboratory for the Biorefineries (Portugal)
web

CREA
Italian Council for Agricultural Research and Economics Location (Italy)
web

CSIC
Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain)
web

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

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

ETA-Florence Renewable Energies
(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

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 / web

PSI
Paul Scherrer Institut (Switzerland)
web

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

SINTEF
(Norway)
web

TNO
(Netherlands)
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

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

WIP
WIP Renewable Energies (Germany)
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

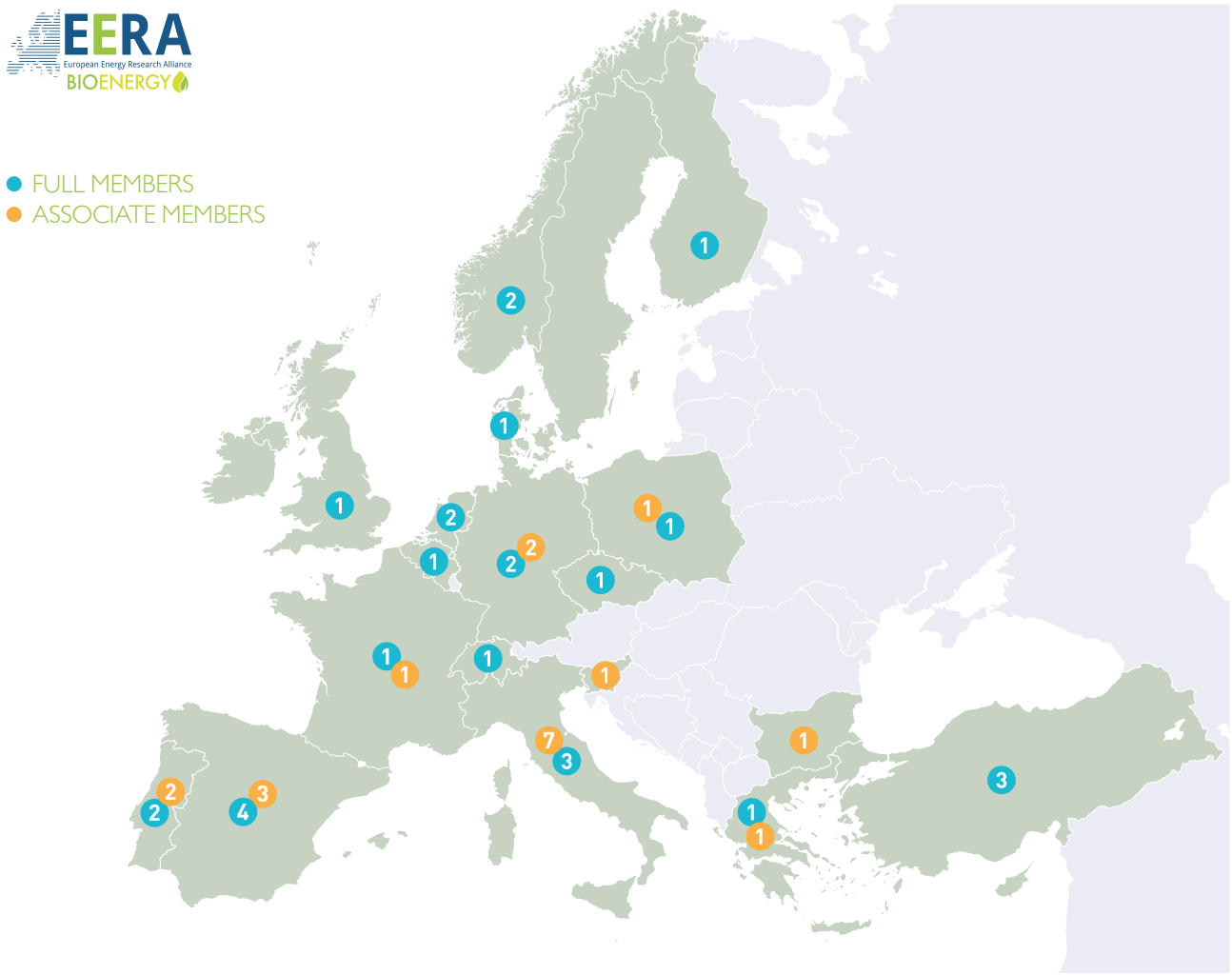


Figure 1: The EERA Bioenergy Joint Programme consists of 46 members (26 Full members and 20 Associate members) from a total of 18 countries. Link

www.eera-bioenergy.eu

Contacts

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