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EERA BIOENERGY NEWSLETTER

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Joint Programme Coordinator's corner

Andrea Monti,
EERA Bioenergy Coordinator

Dear EERA Bioenergy members,
dear eebionews readers,

As newly installed JP coordinator, I will not retrace the 2018 activities, which will be instead of the subject of the message by the former coordinator, but I would like to share my thoughts on the challenges facing us in the coming year.

The EU strategy sets out a clear ambition to phase out fossil fuel subsidies and step up its efforts towards renewable and sustainable energy sources. The European emission strategy from transport, particularly road transport, is also equally ambitious, GHG emissions are expected to decrease by 55% by 2050 (1990 basis). The effect of such measures is already apparent in EU: 22% GHG emissions reduction (1990 basis) and over 16% of renewables of the gross energy consumption in the last year. The firm determination of the EU to continue in this direction was clearly announced at the conclusion of the recent SET plan meeting in Vienna (November 2018). Moreover, the EU is committed to double investments in clean energy R&I over the next five years (Mission Innovation). By contrast, the global situation is increasingly alarming as trapping greenhouse gases in the atmosphere have reached another new record high in 2018 (405 ppm!, WMO, 2018). It is all the more important, therefore, that the European course of action will not be limited to the Member Countries.

The European Energy Research Alliance is an authoritative public research pillar of the SET-Plan

The European Energy Research Alliance is an authoritative public research pillar of the SET-Plan, the Commission's initiative to foster research and innovation in low-carbon technologies, and our primary task, as EERA Bioenergy, has been and will continue to be to contribute to successfully move forward the SET-Plan bioenergy targets in a cost-effective and sustainable way. This is particularly important at the present time, when the SET-Plan is entering its most critical phase, moving from planning to implementation. To take as an example, the estimated volume of investment for deployment of implementation action of bioenergy sector (Action 8) is about €2,3 billion (plus €104 billion for demonstration and scale-up activities as private funding); again, the three first approved implementation plans (CSP/STE, CCUS, and energy efficiency) estimated €7 billion as a needed budget until 2030. It goes without saying that the successful implementation of the SET-Plan will need a strong cooperation and commitment among SET-Plan Steering Group, EERA, ETIPs, funding bodies, and authorities. Finally, a conditio sine qua non for the successful contribution of our JP in meeting the aforementioned targets are a cooperative spirit, dedication, selflessness, and sense of responsibility.

As repeatedly said in our SRIA (2018-2020) we should maintain a process and systems integration approach, keeping the five SPs strictly aligned and coordinated. Moving towards more horizontally integrated approaches will result in increased flexibility and resilience of the system. The preconditions are not lacking: the EERA Bioenergy nature is highly interdisciplinary, and with my pleasure, I have seen with my own eyes that we are a very reactive and proactive group! For example, when our JP, in the same way as other EERA JPs, have been invited to join the Expert Group for future cooperation programmes with Africa, our reaction was very swift and much larger than expected, and of high caliber in term of quality! About ten EERA Bioenergy members have immediately expressed their interest to join the Expert Group, and some of them attended the Step #1 official meeting last week. Importantly, Africa is a privileged partner for the EU in all the bioenergy programmes; the Joint European Union-Africa Strategic Partnership, for example, provides the framework for a solid cooperation in the bioenergy. The EU is also strongly supporting the African Renewable Energy Initiative (AREI). I have the feeling that we will have plenty of opportunities in Africa for research on bioenergy in the short-medium term. Equally remarkable is the involvement of EERA Bioenergy members in research and cooperation programs with Latin America and other non-EU Countries. All these activities should be highly supported and extended as it will enable the EU to enforce strategic international partnerships to deploy bioenergy. At the same time, we need to look into the Bio-based Industries Consortium (BIC) and the Knowledge & Innovation Community (KIC) of the European Institute of

Innovation & Technology (EIT) to identify innovative projects and bring them to the attention of investors, particularly in some strategic sector such as mobility. For aviation and maritime, for example, liquid drop-in biofuels are seen as the only viable option for the next 30-40 years, despite the production of aviation and maritime biofuels in the EU is hardly any. It should be remembered that the transport sector represents about 30% of EU final energy consumption (almost 25% of GHG emissions) and relies on oil for almost 95%. R&I needs, therefore, to address more efficient routes to produce advanced or renewable biofuels, including hydrogen.

I thought long on this and I concluded that it would be highly advisable to elaborate a snapshot of the programmes involving EERA Bioenergy members to systematize our actions in different Member States in relation to the objectives of the SET-Plan. Improving the reporting from the Member States on national research and innovation priorities and investments has been indeed indicated among the priorities of the SET-Plan. A coordinated action of our JP could be, therefore, very useful to support decisions, but also to enhance the quality of public information. Nowadays, we have various easily accessible means of communication which I believe we, like JP, should use more intensively to provide updated and reliable information, while contrasting several misleading or specious information on bioenergy of sometimes dubious origin.

EERA Bioenergy should play a specific and recognizable role within the European bioenergy fabric that it's inherently complex and extremely comprehensive; nonetheless, our JP cannot be separated by a close and continuous cooperation with other authoritative scientific networks on bioenergy. We should link more with other key European entities having similar objectives to avoid unnecessary duplications and move beyond silos; we should indeed establish joint activities between our JP and other scientific communities. This is already happening with ETIP but should be replicated with other important players such as AEBIOM, IEA etc. At the same time, focus meeting with the EC representatives (DGs, mainly ENER, RTD, JRC, MOVE and CLIMA), as well as EERA JPs, should be facilitated.

The organization of strong consortia to prepare high-quality proposals against the EU calls in the field of bioenergy and biorefinery should be also taken into great account, e.g. the potential involvement of EERA bioenergy in the BIC funding programme or other PPPs. This could also help valorize the EERA label which has been poorly underutilized so far. A high success rate of labeled proposals would result in a sounding board for the broad spectrum of the scientific community so that other outstanding players will want to cooperate or access the EERA Bioenergy. As a result, the overall JP quality and potentialities will also increase.

Finally, I wish EERA Bioenergy Group every success and hope that my thoughts and issues raised in this message will be taken up.

Andrea Monti.

EERA Bioenergy brief news

IMPLEMENTATION OF THE NEW SRIA 2018-2020

The EERA Bioenergy Steering Committee meeting that took place in Brussels, at EERA aisbl office, on 3 December was attended by Full and Associate EERA Bioenergy members, as well as by relevant agents from the European energy innovation ecosystem, such as Maria Georgiadou (DG RTD), Kyriacos Maniatis (DG ENER) and Birger Kerkow (ETIP Bioenergy).

The Joint Programme Coordinator and the Subprogramme Coordinators addressed the implementation of the new SRIA – Strategic Research and Innovation Agenda, which was formally approved in the meeting. They presented the Implementation Plan of each Subprogramme, highlighting the objectives, actions and projected workshops to ensure a successful implementation of the SRIA along 2019.

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ASTON UNIVERSITY'S EUROPEAN BIOENERGY RESEARCH INSTITUTE (EBRI), EERA BIOENERGY FULL MEMBER, HAS APPOINTED PROFESSOR PATRICIA THORNLEY AS ITS NEW DIRECTOR

Professor Thornley joins Aston from the Tyndall Centre for Climate Change Research, at the University of Manchester and brings with her the 4.5 million EPSRC Supergen Bioenergy hub, which Patricia leads.

Patricia is a chartered physicist with over 20 years experience working in bioenergy in industry and academia. She was involved with engineering implementation of many of the UKs early bioenergy plants, before leading the 4.5 million EPSRC SUPERGEN Bioenergy Hub, which aims to bring together industry, academia and other stakeholders to focus on the research challenges associated with delivering sustainable bioenergy systems.

Her personal research interests focus on the environmental, social and economic impacts of bioenergy systems in the UK and overseas and how these can be practically managed to deliver sustainable bioenergy systems.

LINK

THE EERA BIOENERGY FULL MEMBERS, ECN PART OF TNO AND SINTEF, PARTICIPANTS IN A EUROPEAN RESEARCH PROJECT FOR CONVERTING A COAL-FIRED POWER PLANT INTO A BIOMASS PLANT

In November 2018, the European ARBAHEAT consortium launched a research project to investigate the conversion of the ENGIE Ultra-SuperCritical coal-fired Rotterdam power plant into a biomass-fired heat and power plant. The innovative technology used to produce the required steam treated biomass has been developed by the Norwegian company Arbaflame AS. The goal of this showcase is to investigate the technical possibilities of cost-effectively converting the coal-fired power plant into a flexible 100% sustainable biomass-fired plant, which will be able to deliver sustainable electricity as well as sustainable heat. For this project, the consortium will receive over € 19 million EU funding.

Full press release can be downloaded here: PDF

Information from CORDIS: LINK

Coal-fired Rotterdam power plant into a biomass-fired heat and power plant (photo by Engie).

European Commission | Horizon 2020 European Union funding for Research & Innovation

FORMER JOINT PROGRAMME COORDINATOR'S FAREWELL

Juan Carrasco
CIEMAT

Dear members of the EERA Bioenergy Joint Programme (JP),

After finalizing the mandate as JP Coordinator, I would like to share with you some thoughts on the trajectory followed and existing challenges ahead for our JP.

In these years, significant progress has been made towards the main objectives that were set out in 2013 with the purpose to achieve, in the SET-Plan context, greater alignment of the activities of the participants in the JP and with those of external stakeholders. As well as to achieve a greater projection and impact of the JP at the EERA level, the SET-Plan, and at the international level. In this context, the holding of workshops, particularly numerous in the period 2015-2016, has proven to be a satisfactory tool at promoting collaboration in joint activities and proposals, often with external stakeholders, taking as a main reference the H2020 Program. Moreover, the participation since 2016 in the ETIP-Bioenergy Executive Committee, and the development of high innovation projects in the field of advanced biofuels, such as the AMBITION Project, are also some examples of the actions that have been carried out to address the proposed objectives. In the same way, in the field of international cooperation, it is worth highlighting the active participation and organization in the framework of the European Biomass Conference and Exhibition (EUBCE) of the I and II Europe-Asia Forums to exchange information and search for collaboration in the field of Bioenergy. Besides, on the same line is the BECOOL H2020 Project to tackle EU-Brazil cooperation in the field of advanced transport biofuels, which counts on a wide participation of JP members and it's being coordinated by the present JP Coordinator.

> **In these years, significant progress has been made towards the main objectives that were set out in 2013**

In advisory tasks -other main objective of our JP- it has been particularly significant the assessment carried out by the JP on the Priority Action 8 (Bioenergy and Renewable Fuels) of the new SET-Plan, in which our JP has been part of the Temporary Working Group in charge of preparing the Implementation Plan of the Action. Last, but not least, it is worth to mention the relevant work developed towards producing common views of JP participants on challenges and research priorities on Bioenergy. This was made in the JP DoW 2015-2017 and at present, it is shown in the new Strategic Research and Innovation Agenda (SRIA 2018) recently approved by the JP Steering Committee. The SRIA constitutes the common view of the JP for the bioenergy deployment in the EU, situating it in the context of bioeconomy and circular economy and addressing challenges, research priorities and objectives of the new SET-Plan.

Likewise, the improvements introduced in terms of professionalization, both, at the level of external corporate image and internal operability of the JP are highlighted, for which the elaboration of an updated Governance, in the context of EERA, that is expected to be soon approved by the SC, as well as the creation of the Secretariat within the structures of the JP itself have been decisive initiatives.

At this time, the JP, in addition to continuing and enhancing lines of action already started, such as participation in ETIP Bioenergy already mentioned and the collaboration with other complementary Joint Programmes of EERA, faces new challenges. One of these is the achieving and development of projects under the EERA quality label, including international cooperation projects, which can contribute to the JP goal of becoming a relevant actor for the achievement of SET-Plan objectives. The involvement in advisory activities such as the participation in the Implementation Working Group, continuation of the Temporary Working Group, to follow-up the Implementation Plan of the cited Priority Action on Bioenergy and Renewable Fuels of the SET-Plan, and the new collaboration foreseen on R&D&I advisory issues with the Energy DG are good examples of relevant advisory activities to be performed by our JP in the next months. The successful completion of these challenges should be based on an important mobilization of the JP participants around these tasks, as well as based on going deeper into the professionalization of working modes and procedures, which is essential for the quality of the rendered services and research work performed. In this context, I wish the new JP Coordinator and the Management Board the greatest success in the management of these issues.

I would not like to finish without first thanking the members of the Management Board that I have had the honor to chair during my term as JP Coordinator for their work and support, to the JP members in general for their participation and collaboration in the activities carried out within the JP, and in particular to the members of the Executive Committee for their understanding even in problematic issues arising as it has been the defective management of JP fees in the past year.

I take the opportunity to wish you a Merry Christmas and very Happy New Year 2019.

Juan Carrasco.

Bioenergy Highlights

IEA BIOENERGY TASK42 – BIOREFINING IN A CIRCULAR ECONOMY

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Task42 – Biorefining in a Circular Economy – deals with the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive biorefinery systems and technologies, and to advise policy and industrial decision makers accordingly. Being part of IEA Bioenergy, the main focus of the activities in the work programme is on bioenergy, biofuel and biogas-based biorefineries. In which other related Tasks (combustion, gasification, hydrothermal conversion, biogas, biofuels) mainly deal with technology assessment and support, Task42 focuses more on the development, optimisation and market deployment support of full sustainable biomass-to-products value chains and business-cases within a Circular (Bio)Economy, where biomass is sustainably used for the synergistically co-production of bioenergy (fuels, power, heat) and biobased products (chemicals, materials, minerals, CO2, etc.).

Figure 1: Bioenergy linking market sectors and actors within a Bio(based) Economy [IEA Bioenergy Task42].

Using the energy-based biorefinery approach (power, biofuel, biogas producers) main focus will be on the production of these secondary energy carriers, where the business cases can be fully sustainably optimised by up-/downstream separation and valorisation of biobased products and/or the upgrading of chain/process residues to biobased products. Within the product-based biorefinery approach (chemical, materials, food/feed industry, etc.) main focus will be on the production of these biobased products, however, remaining chain/process residues will be used in this case for the production of bioenergy. Thus, bioenergy will play a central role both in energy and product-based biorefineries. By this co-production approach the overall environmental footprint will be reduced, overall economics and market competitiveness will be improved (requiring less governmental support), both resulting in a better social acceptance of the use of available biomass sources (forestry, forestry residues, agro-crops, agro-residues, process residues, post-consumer residues, aquatic biomass sources, etc.).

In former triennia bioenergy-related deliverables, see http://task42.ieabioenergy.com/ were: The set-up of an energy-based biorefinery classification system and assessment tool, including the preparation of variety of energy/fuel-based factsheets; biorefinery overview and status reports of countries that participated in in Task42, market overview reports of products (chemicals, materials, proteins) that potentially can be co-produced with secondary energy carriers to improve overall business cases, national stakeholder meetings in partnering countries.

In the coming triennium (2019-2021) a variety of bioenergy-related deliverables will be produced, i.e.:

- Further development and use of the Task42 Biorefinery Assessment Platform (BAP) for the production of Biorefinery Fact Sheets (BFSs). The goal of these BFSs is to show stakeholders (both policy makers, SMEs, industry) best practices of using the biorefining approach for optimising full sustainability aspects of using biomass sources for the production of secondary energy carriers and beyond.
- Biorefinery Country Reports, a Global Biorefinery Status Report and a Global Biorefinery Database and Mapping System for biorefineries knowledge exchange at a global level.
- Reports on Sustainable Lignin Valorisation to both secondary energy carriers and added-value biobased products.
- Thematic stakeholder workshops/events, Webinars/Skype Meetings, and training course contributions to inform policymakers, industry and students on the opportunities of biorefining for bioenergy and biobased products.

If you want to be actively involved in the activities of the new triennium and/or if you have any information on new commercial, flagship, demo or pilot-based biorefinery initiatives that you want to be published in the Global Report, Database and Mapping please let us know.

LINK

INVESTIGATION OF THE DETAILED INDOOR THERMAL ENVIRONMENT OF BUILDINGS HEATED USING WOOD STOVES

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For a long time, building science has developed theories and methods to evaluate the indoor thermal environment of buildings and the resulting thermal comfort for occupants. Nowadays, these methods are commonly used in the building industry and typically resort to building performance simulation (BPS). Nevertheless, the space-heating using a wood stove challenges these theories and evaluation methods. Wood stoves are point heat sources. They are relatively powerful compared to other heat emission systems (such as radiators). In addition, their heat emission to the room is transient and the operation of the stove is strongly related to users. Firstly, this transient and powerful heat source challenges the standard thermal comfort theories (such as ISO 7730). Secondly, the heat source tends to create less homogeneous temperatures in the room where the stove is placed (i.e. wall and air temperatures). This is against the common assumption in commercial BPS tools that typically assume isothermal walls and air in the room. To solve this problem, one may think about Computational Fluid Dynamics (CFD) but this method is computationally expensive. In fact, the indoor temperatures resulting from wood stove heating are strongly related to the building thermal mass. To be correct, the problem should both compute the slow thermal dynamics of walls and the fast dynamics of airflows. This makes the use of CFD prohibitive to investigate thermal comfort during the entire space-heating season or limits the use of CFD to short periods of physical time (i.e. a couple of hours).

Nonetheless, it would be beneficial to be able to accurately predict the indoor thermal environment of buildings heated by wood stoves. Firstly, this would support measures to ensure thermal comfort and user satisfaction. Secondly, it would increase the knowledge about the building integration of wood stoves. For those given building geometrical and thermal properties, it would make possible to specify the characteristics of the wood stove that guarantee thermal comfort and sufficiently long cycles necessary for clean combustion. For instance, a stove that is oversized may lead to overheating or make the user operate the stove most often at part load, with small but not optimal batch loads or even close the air vents to stop the combustion. Thirdly, the energy use with wood stoves would be better understood and documented. In current building standards, the heat emission efficiency related to wood stoves is most often simplified and rely on limited scientific grounds. Finally, this would enable to make virtual testing of new stove technologies such as using advanced heat storages or radiation shields in the stove envelope.

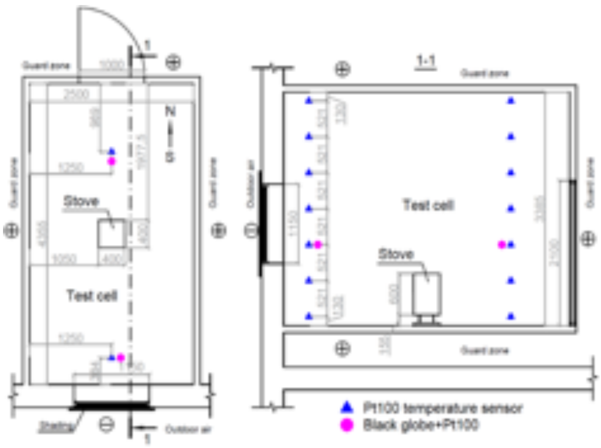

Figure 1: Sketch of a laboratory room in Trondheim heated using an electric stove that mimics the heat emission of real wood stoves: the measured air and wall temperatures are compared to simulations.

In the past decade, NTNU and SINTEF in Norway have been strongly involved in this research area by two successive national research projects, StableWood (2011-2014, www.sintef.no/stablewood) and WoodCFD (2015-2018, www.sintef.no/woodcfd). The potential and limitation of standard BPS tools to predict the indoor thermal environment has been properly documented using field measurements[1]. The building integration of wood stoves in passive houses has been investigated for Belgium[2] and Norway[3]. Simplified power sizing methods for wood stoves as a function of the building thermal properties are under development. Finally, so-called "zonal models" have been successfully tested as a cheaper alternative to expensive CFD[4]. In the future, this knowledge will be further extended and validated, for instance, by better taking the user behavior into account.

[1]Georges, L. and Ø. Skreiberg, Simple modeling procedure for the indoor thermal environment of highly insulated buildings heated by wood stoves. Journal of Building Performance Simulation, 2016. 9(6): p. 663-679.
[2]Georges, L., Ø. Skreiberg, and V. Novakovic, On the proper integration of wood stoves in passive houses: investigation using detailed dynamic simulations. Energy and Buildings, 2013. 59: p. 203-213.
[3]Georges, L., Ø. Skreiberg, and V. Novakovic, On the proper integration of wood stoves in passive houses under cold climates. Energy and Buildings, 2014. 72: p. 87-95.
[4]Georges, L., et al. Validation of a zonal model to capture the thermal stratification in a room heated by a stove. in Roomvent & Ventilation 2018. 2018. Helsinki.

THE BECOOL PROJECT FOR THE DEVELOPMENT OF INNOVATIVE LIGNOCELLULOSIC CROPPING SYSTEMS FOR ADVANCED BIOFUELS

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The BECOOL project is pursuing the development of integrated cropping systems between conventional and dedicated lignocellulosic crops in order to promote the availability and diversification of lignocellulosic feedstocks locally for advanced biofuels without creating land competition issues. Currently, such systems are absent in Europe and many unexplored possibilities of potential effective combinations between indigenous/new lignocellulosic species and conventional food crops exist.

In terms of feedstock diversification, the BECOOL project has identified several annual crops with a high potential (sunn hemp, biomass sorghum, kenaf, hemp) that can be easily integrated into conventional crop rotation systems, which would increment feedstock availability and improve land use efficiency. Moreover, shorter and more efficient and defined biomass supply districts could be established with increased productivity of lignocellulosic feedstocks per unit land.

Figure 1: Sunn hemp.

Figure 2: Biomass sorghum.

Sunn hemp is a tropical legume well adapted to warm temperate climates showing promising quantitative and qualitative characteristics as a lignocellulosic feedstock. In the BECOOL trials (carried out in Italy, Spain and Greece) sunn hemp yielded from 7.5 to 15 Mg ha-1 of dry biomass corresponding to a maximum of close to 285 GJ ha-1. Traditionally sunn hemp is used as soil improver cover crop and for forage production but recently has also been studied for its ability in weed suppression and nematode control.

Biomass sorghum is a deep-rooted drought-tolerant species particularly well suited to Mediterranean conditions, with a high water and nitrogen use efficiency that can help to make a more efficient use of soil resources. In the BECOOL trials, biomass sorghum yielded from 12 to over 30 Mg ha-1 of biomass characterized by a high hemicelluloses and sugars content. For these reasons, it represents one of the most near to practice crops for advanced biofuels.

Kenaf is a promising species although requires a long warm season with abundant rains to maximize its productivity. In the BECOOL trials, kenaf yielded from 10 to 15 Mg ha-1, but in other studies in Southern EU arrived up to 20 Mg ha-1 when irrigated. Traditionally, kenaf was used as a fiber crop for cordage production but has also been used as nematocide and for weed suppression.

Hemp is nowadays considered as a promising lignocellulosic feedstock for advanced biofuel that grows well in a wide range of environments (from temperate warm to continental climates). Hemp use in rotation could contribute to the control of pests, weeds, insects and nematodes together with the soil structure amelioration. The Cannabis sativa varieties are characterized by high statures and biomass production potential. In the BECOOL trials hemp yielded from 5 to 20 Mg ha-1. In the past, it was extensively grown in south Europe for its fiber quality used mainly for paper pulp production. Recently, hemp market is growing rapidly also for food and feed (seeds) production, and cannabinoid extraction (flower and leaves).

Based on these initial results it seems that biomass cropping systems for biofuel or industrial use can be innovated/diversified locally. Integrating dedicated lignocellulosic annual crops within conventional cropping systems is a sound opportunity to increase biomass yield per unit land. The adoption of such integrated copping systems can increase farmers' revenue, create new jobs (especially in the rural area), and minimize the land pressure (mostly at local level). Besides the potential profitability of this innovative cropping systems, enhanced environmental benefits due to favorable crop sequencing effects could be achieved.

Figure 3: Kenaf.

Figure 4: Hemp.

CENER IS DEVELOPING TECHNOLOGY FOR URBAN BIOREFINERY CONCEPTS TOWARDS A CIRCULAR BIOECONOMY

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Biomass Department of CENER (National Renewable Energy Centre) is deeply aligned and supportive with the need to move towards a circular bioeconomy, in which the society is capable of **valorising the wastes** produced in an integral and cascade mode. Considering that across EU, around 100 million tonnes of biowaste are produced every year, with a management cost up to 143 billion euros, additional efforts in the management and valorization of these seem to be essential.

On that regard, during 2018 CENER is involved in **4 specific initiatives** in cooperation with other institutions, in order support at different technological readiness levels the most adequate management and valorization routes of organic fraction of municipal solid waste (OFMSW) and sewage sludge.

At national level, **"Circular Urban Biorefinery in Navarra"** aims at designing a new concept of integral and cascade valorization of the different fractions that make up the OFMSW to obtain bioproducts with greater added value. In further detail, CENER is developing processes for **OFMSW fractionation**, and carbohydrates, protein/lipid/lignin fractions valorisation through a variety of biochemical and chemical processes, subsequent optimization and upscaling, and upstream/downstream processes for the **separation and purification** of fractions.

At European level, **PERCAL project** (H2020-BBI) shall be highlighted, which main objective is to exploit **OFMSW** as feedstock to develop intermediate chemical products at high yield and low impurity level with huge industrial interest, such as lactic acid, succinic acid and biosurfactants. In particular, CENER is leading the research line of biosurfactants production by valorising the fermentation by-product remaining after bioethanol, succinic acid and lactic acid production. The hydrolysis and extraction of both protein and lipid fractions contained in the fermentation by-product and their use for the synthesis of the **biosurfactant**, which it is validated by the industry, are the main pillars of the research.

Supporting also the valorisation of OFMSW, **SCALIBUR demonstration project** (H2020) aims at closing the gap between technological feasibility and industrial applications of urban biowaste valorisation by enhancing strategic cooperation between sectors. In the framework of this initiative promoting the valorisation of different biowaste fractions such as OFMSW, sewage sludge or HORECA wastes, CENER leads the pathway related to **OFMSW valorization**; executing the enzymatic hydrolysis and fermentation in its **BIO2C demonstration plant** (TRL7), for later production of **biopesticides and biobased polyesters**. CENER will also develop a comprehensive environmental assessment of the whole valorization process.

Moving towards another biowaste such as **sewage sludge, NextGenRoadFuels research and innovation project** (H2020) aims to prove the hydrothermal liquefaction technology pathway as a viable, sustainable and efficient route for the production of liquid **drop-in fuels for road transport** using such low value aggregated urban wastes as feedstock. On that regard, CENER leads the research line related to the challenge of handling feedstocks with high organic nitrogen content. To overcome this barrier, firstly a pretreatment of feedstock using a mild & low-temperature enzymatic hydrolysis with enzymes is executed. Secondly, an extraction & purification processes are undergone for protein-derived amino acid and peptides valorization.

With these and other coming initiatives and European level cooperation, CENER is **developing technology for new biowaste valorisation routes** both at research & demo scale, for a later industry and market uptake, being absolutely **committed** to contributing to the Circular Economy Roadmap proposed by the European Commission, and to the wellbeing of the future society.

Figure: BIO2C demonstration plant (CENER).

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NUMERICAL SIMULATION OF THE TRANSIENT BEHAVIOR OF WOOD LOG DECOMPOSITION AND COMBUSTION

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Heat from wood combustion in domestic wood stoves is the main contributor to the bioenergy in Norway. However, wood combustion in such small-scale combustion appliances can cause significant emissions, e.g. fine particulate matter. Therefore, optimization of old technologies and the development of new designs are required in order to manufacture wood stoves with reduced emission levels, higher efficiency and greater ease of use. To perform the required improvements, the combustion process inside the wood stove must be well understood.

Common CFD platforms, e.g. Ansys Fluent, have well-established models for the gas phase but lack detailed solid phase models. At SINTEF/NTNU a solid phase model has recently been developed as a standalone code. This code should now be dynamically connected with the gas phase model. Since processes in the gas and solid phases influence each another, a dynamic coupling of the two models is required to obtain an accurate simulation tool. Fundamental studies on wood combustion can still be done by means of the standalone code. The wood combustion process includes drying, devolatilization and char conversion of the solid fuel *(Figure 1)*. Since all three stages are interrelated, the detailed modeling of all conversion stages with respect to a distinct location inside the wood log had to be done to derive an accurate solid phase combustion model.

A review of numerical models for thermochemical degradation of thermally thick woody biomass has been written[1]. This has been used as a starting point for detailed studies on drying[2], decomposition and combustion[3], numerical issues related to wood log conversion[4] and the effect of higher dimensional simulations[5].

The work has been carried out in the competence building project WoodCFD **(2015-2018, www.sintef.no/woodcfd)**. In all these publications the WoodCFD Ph.D. candidate, Inge Haberle, has been the first author. She successfully defended her Ph.D. thesis in November this year.

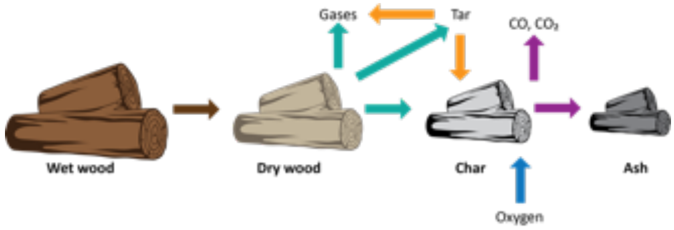


Figure 1: The wood log conversion process.

[1]Inge Haberle, Øyvind Skreiberg, Joanna Lazar, Nils Erland L. Haugen. "Numerical models for thermochemical degradation of thermally thick woody biomass, and their application in domestic wood heating appliances and grate furnaces" Progress in Energy and Combustion Science, 63, 204-252, (2017).
[2]Inge Haberle, Nils Erland L. Haugen, Øyvind Skreiberg. "Drying of thermally thick wood particles: A study of the numerical efficiency, accuracy and stability of common drying models" Energy & Fuels, 31, 13743-13760, (2017).
[3]Inge Haberle, Nils Erland L. Haugen, Øyvind Skreiberg. "Combustion of thermally thick wood particles: A study on the influence of wood particle size on the combustion behavior" Energy & Fuels, 32, 6847 - 6862, (2018).
[4]Inge Haberle, Nils Erland L. Haugen, Øyvind Skreiberg. "Simulating thermal wood particle conversion: Ash-layer modeling and parametric studies" Energy & Fuels, 32, 10668 - 10682, (2018).
[5]Inge Haberle, Nils Erland L. Haugen, Øyvind Skreiberg. "A two-dimensional study on the effect of anisotropy on the devolatilization of a large wood log" submitted for publication.

Useful information

1. RED II agreement – European targets for 32% of renewables and 3.5% of advanced biofuels by 2030

On 14 June, a political agreement on a recast Renewable Energy Directive (RED II) was reached between the Commission, the European Parliament and the Council. The RED II includes a 32% binding renewable energy target for the EU by 2030, with an upwards revision clause by 2023. At least, 14% of transportation fuel must come from renewable sources by 2030, crop-based biofuels have been capped at 2020 levels but cannot exceed 7%, and for advanced biofuels have set minimum targets: 0.2% in 2022, 1% in 2025 and 3.5% in 2030.

Official statement here.

Picture from Miguel Arias Cañete (**@MAC_europa**) Twitter account.

2. EurObserv'ER Biofuels barometer 2018: The consumption of biofuels for transport in Europe increased 9.2% in energy content between 2016 and 2017

Since 1998, the EurObserv'ER barometer measures the progress made by renewable energies in each sector and in each member State of the European Union in an as up-to-date way as possible (with figures less than 12 months old). EurObserv'ER produces a series of figure-backed indicators covering energetic, technological and economic dimensions.

Last September, EurObserv'ER realeased its last biofuel barometer, showing biofuels consumption for transportation in the European Union (EU) reached 15.5 million tonnes oil equivalents (Mtoe) in 2017, a 9.2% increase compared to 2016. According to the report, biodiesel – including renewable diesel HVO – is the dominant biofuel type accounting for 12.5 Mtoe or 80.7% of biofuels used, followed by ethanol at 2.8 Mto, 18.4%. Vehicle-grade biomethane accounted for the balance – 0.2 Mtoe or 0.9% in 2017.

Currently, almost all the biofuels consumed for transportation within the EU now comply with the European Commission's sustainability requirements. Bioethanol production in Europe has increased in 2017 by 11% as compared to 2016 and the EU ranks as the top biodiesel producer worldwide.

Outside the EU, the United States (US), Brazil and China were the biggest biofuels consumers in 2017. Within the EU, France is the leading consumer of biofuels by volume followed by Germany and Sweden respectively. Spain's year-on-year consumption grew by 15%.

With its 20.8% biofuel incorporation rate, over double the EU 2020 target of 10%, Sweden has by far the highest level of biofuel usage of all EU Member States. The country also has the largest amount of biomethane used as a transportation fuel. The contribution towards the renewable energy targets of biofuels produced from so-called high indirect land-use change (ILUC) risk biofuels is to be frozen at 2019 levels and gradually reduced as of 2023 down to zero in 2030.

LINK

3. World Bioenergy Association (WBA) factsheet: Biomass supply chain

WBA factsheets present an unbiased overview of bioenergy technologies and are a guiding tool for policy makers, researchers and companies. The objective of drafting and publishing factsheets is to bring rational arguments in the public discussion and to support the development of bioenergy.

In 2015, 60 EJ of energy from biomass were supplied globally. However, there is a lot of potential yet to be fulfilled. IEA envisages that the bioenergy supply will increase to 160 EJ by 2050. This is a tremendous challenge and an opportunity as well. Increasing the biomass use to 3.5 times the current use would require enormous efforts from all stakeholders in the biomass supply chain.

This factsheet focusses on supply chains of feedstock sectors including forestry and agriculture.

PDF

WBA fact sheet

BIOMASS SUPPLY CHAINS

HARVESTING & COLLECTION, PRE-TREATMENT AND UPGRADING, STORAGE, TRANSPORTATION & HANDLING

SUMMARY

Bioenergy plays a key role in mitigating climate change in all sectors of energy supply and the supply chains of biomass are crucial in order to realize the full potential of bioenergy. The technology offers a unique degree of flexibility compared to other renewable energy sources not only in the variety of feedstock, but also the various production pathways, end products and its use in end energy sectors of heating, cooling, electricity and transportation. The efficient operation of all components of supply chains including harvesting and collection, pre treatment, upgrading, storage, transportation and handling is important to ensure a stable supply and reduce overall costs of the technology. This factsheet focusses on supply chains of feedstock sectors including forestry and agriculture.

The first step in the biomass supply chains is the harvesting and collection of feedstock in the forest or the agriculture field which are described in the factsheet. In forestry, the system of felling trees with related machinery can be divided into two categories: Cut to length and tree length systems - each offering its own set of pros and cons. During harvesting of biomass from forest in conventional systems, it is important to leave out impurities to get higher energy content of the final feedstock. This will avoid challenges in the rest of the supply chain. For agricultural biomass, harvesting is usually done in easily accessible areas, but highly dependent on the seasonal variation of the agriculture sector.

Once the biomass is harvested and collected, pre treatment is done to ensure a high standard of fuel which include drying and/or densification to pellets etc. Such processes ensure proper specifications of biomass including higher energy content and lower moisture content so as to facilitate ease of transportation and storage of the fuel. Various modes of transportation including road, rail and sea are used depending on the feedstock volumes and cost of the transportation.

Feedstock costs associated with supply chains form the major share of the total cost of the technology. The overall cost is highly case dependent and the successful management of the supply chains is critical for the success of any investment. Thus, improving the supply chains in terms of efficient harvesting, collection, pre treatment, storage, transport and handling will unlock the immense potential of the technology source.

INTRODUCTION

Bioenergy plays a key role in mitigating climate change, contributing more to the primary energy supply than any other renewable energy source. In all main sectors of energy use; heating & cooling, electricity and transportation, developments in bioenergy are likely to significantly contribute to reaching national and global emission reduction targets.

In 2015, 60 Exajoules (EJ) of energy from biomass were supplied globally. Comparably, the total supply to the global energy system was about 560 EJ the same year.

However, there is a lot of potential yet to be fulfilled. IEA envisages that the bioenergy supply will increase to 160 EJ by 2050 . This is a tremendous challenge and an opportunity as well. Increasing the biomass use to 3.5 times the current use would require enormous efforts from all stakeholders in the biomass supply chain.

Much attention is given to energy conversion technologies and sustainable management of forests and plantations, which indeed are very important issues in order to realize the full potential of bioenergy, and vital when ensuring sustainability of the operations. However, factors regarding logistics as well as design and coordination of whole supply chains, are critical in order to ensure a stable supply and reduce overall costs. Hence, to increase the supply of sustainable bioenergy, a broader supply chain view is necessary to be able to reach the full potential through development of more efficient, cost effective and sustainable supply chains.

There are many potential configurations of bioenergy supply chains. Bioenergy offers a unique degree of flexibility compared to other renewable energy sources, not only in the variety of possible feedstock-to-energy pathways, but also since storage is possible in many stages of the supply chain, enabling greater control of production planning and opportunity to balance the supply of intermittent sources such as wind and solar.

This factsheet focuses on supply chains of biomass from forestry, agriculture and plantations of dedicated energy crops. Municipal solid waste (MSW), sewage and industrial sludge are not within the scope of this factsheet. To learn more about bioenergy from MSW, and related supply chains, see the WBA factsheet on Energy Recovery from Waste.

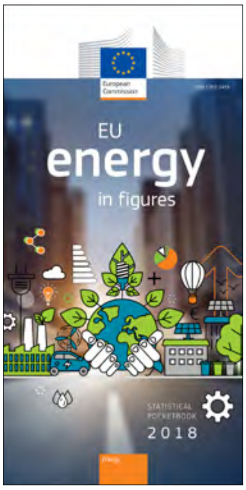
Despite the variety of paths that can be followed in order to convert biomass to useful energy, some steps are commonly involved in the supply chain configurations. This factsheet provides an overview of harvesting & collection, pre-treatment & upgrading, storage, transportation & handling from the source of the feedstock until the fuel enters the final energy conversion process.

Figure 1. Overview of the main sections of this factsheet

1

June 2018

Publications



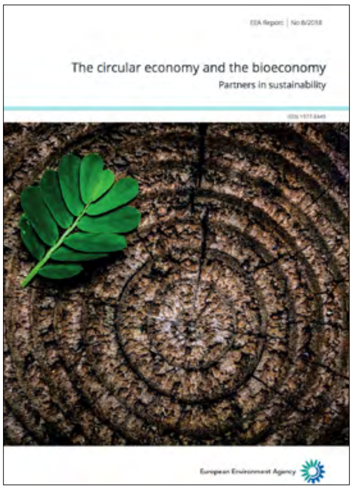
EU energy in figures – Statistical pocketbook 2018

European Commission (EC)

EU energy statistical pocketbook (2018 version) provides energy statistics for all EU countries and the EU as a whole, covering areas including energy production and consumption, socio-economic indicators, and the impact of the energy sector on the environment. You can also find an energy profile for each EU country as well as details of each country's progress towards the EU's 2020 climate and energy targets.

The data contained in this pocketbook is drawn from several sources: from the European Commission's services, from international organisations such as the European Environment Agency and the International Energy Agency and also from the European Commission's estimates when other data is unavailable.

LINK



The circular economy and the bioeconomy — Partners in sustainability

European Environment Agency (EEA)

This is the third in a series of reports on the circular economy in support of the framing, implementation and evaluation of European circular economy policy from an environmental perspective. The two previous reports applied a systemic approach to framing a circular economy and to the products within it. This report on the bioeconomy addresses circularity aspects of bio-based products and the sustainable use of renewable natural resources.

LINK

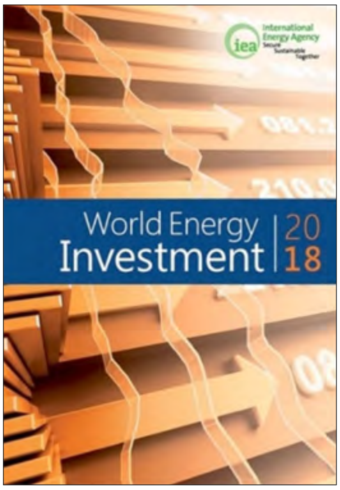
A sustainable Bioeconomy for Europe: strengthening the connection between economy, society and the environment

European Commission (EC)

The 2018 update of the Bioeconomy Strategy aims to accelerate the deployment of a sustainable European bioeconomy so as to maximise its contribution towards the 2030 Agenda and its Sustainable Development Goals (SDGs), as well as the Paris Agreement. The document also responds to new European policy priorities, in particular the renewed Industrial Policy Strategy, the Circular Economy Action Plan and the Communication on Accelerating Clean Energy Innovation, all of which highlight the importance of a sustainable, circular bioeconomy to achieve their objectives.

The update proposes a three-tiered action plan to: Strengthen and scale up the bio-based sectors, unlock investments and markets; deploy local bioeconomies rapidly across the whole of Europe and understand the ecological boundaries of the bioeconomy.

PDF



World Energy Investment 2018

International Energy Agency (IEA)

The IEA's World Energy Investment provides a wealth of data and analysis for decision making by governments, the energy industry and financial institutions to set policy frameworks, implement business strategies, finance new projects and develop new technologies. It highlights the ways in which investment decisions taken today are determining how energy supply and demand will unfold tomorrow.

This year's edition points to another year of falling investment in 2017, and that energy investment is failing to keep up with energy security and sustainability goals.

LINK

Save the date! International bioenergy events

JANUARY 2019

16 – 17 January 2019
Biomass Trade Summit Europe 2019
Rotterdam, Netherlands
link

21 – 22 January 2019
16th International Conference on Renewable Mobility: Fuels of the Future 2019
Berlin, Germany
link

30 – 31 January 2019
Biogaz Europe 2019
Rennes, France
link

FEBRUARY 2019

13 – 14 February 2019
Lignofuels 2019
Oslo, Norway
link

18 – 19 February 2019
European Pellet Conference 2019
Wels, Austria
link

27 February – 1 March 2019
World Sustainable Energy Days
Wels, Austria
link

MARCH 2019

4 – 5 March 2019
International Conference on Biofuels and Bioenergy 2019
Barcelona, Spain
link

13 – 14 March 2019
Gasification 2019 – 8th Gasification Conference
Brussels, Belgium
link

27 – 28 March 2019
2nd International Conference On Biofuel and Bioenergy
Paris, France
link

APRIL 2019

10 – 11 April 2019
9th European Algae Summit
Lisbon, Portugal
link

25 – 26 April 2019
10th Annual Conference on Bioenergy and Biofuels
Helsinki, Finland
link

MAY 2019

20 – 21 May 2019
International Conference on Renewable Energy Gas Technology (REGATEC) 2019
Malmö, Sweden
link

27 – 28 May 2019
EUBCE 2019 – 27th European Biomass Conference and Exhibition
Lisbon, Portugal
link

JUNE 2019

5 – 6 June 2019
Oleofuels 2019
Venice, Italy
link

27 – 29 June 2019
14th World Bioenergy Congress and Expo
London, UK
link

EERA Bioenergy in Europe

Participants and Associate Participants of 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)

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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

CSIC
Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain)

web

DTU
Technical University of Denmark (Denmark)

web

ECN
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

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
web Suschem Greece

PSI
Paul Scherrer Institut (Switzerland)

web

RISE
Research Institutes of Sweden
(Sweeden)

web

SINTEF
(Norway)

web

TÜBITAK
Scientific and Technological Research Council of Turkey
(Turkey)

web

UKERC
UK Energy Research Centre
(United Kingdom)
web

ASTON UNIVERSITY
(United Kingdom)
web

SUPERGEN Bioenergy Hub
(United Kingdom)
web

UNIBO
Universitá di Bologna (Italy)

web

UNIMORE
University of Modena and Reggio Emilia
(Italy)

web

UNITO
Università di Torino
(Italy)

web

Università degli Studi di Padova
(Italy)

web

Università degli Studi di Perugia
CRB - Biomass Research Centre
(Italy)

web Unipg web CRB

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

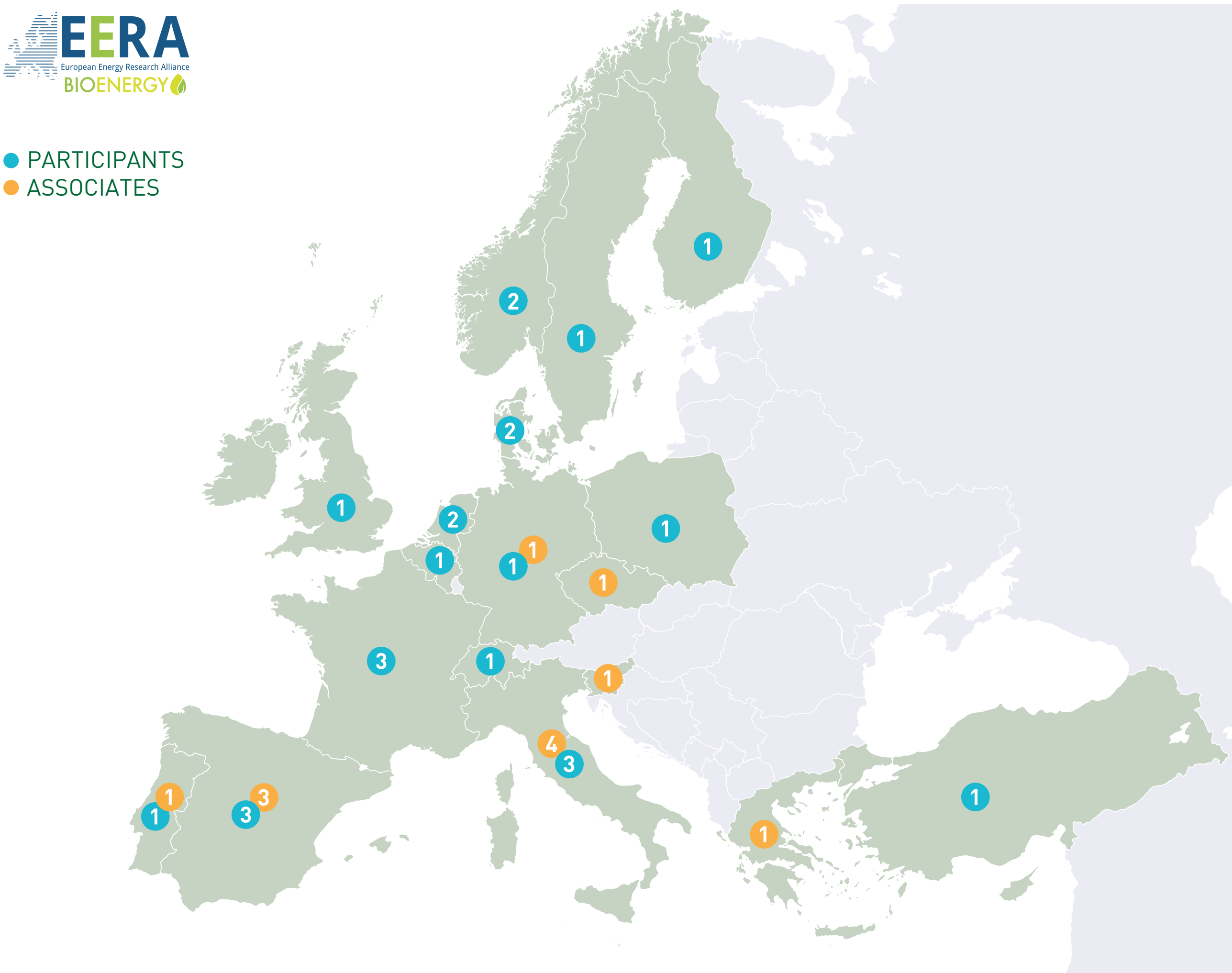

Figure 1: The EERA Bioenergy Joint Programme consists of 24 participants and 12 associate participants from a total of 18 countries.
www.eera-bioenergy.eu

Contacts

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