EERA Bioenergy NEWS

Issue 4 December 2014

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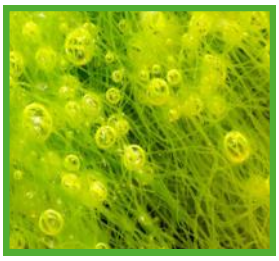

Welcome

Juan Carrasco, Joint Programme Coordinator

The decisions made during the last European Energy Research Alliance (EERA) Executive Committee Strategy meeting, held in Lisbon last July, will help shape important changes in the management of EERA and the strategy of the Joint EERA Programmes. In particular, it was concluded that for EERA to become an essential instrument within the European Strategic Energy Technology Plan (SET-Plan), it is necessary to increase the level of integration of the activities developed within EERA.

This new management perspective echoes the plans of the EERA Bioenergy Joint Programme (JP) outlined in the previous edition of EERA Bioenergy NEWS (July 2014). Here it was stated that by getting involved in financed projects, this will be the most effective way to develop the activities in our Joint Programme (JP).
In light of this, the Joint Programme Management Board (JPMB) of EERA Bioenergy is currently working on a response about the positioning of the Bioenergy JP within EERA.

For this purpose a strategy is being devised to promote and facilitate the definition and elaboration of joint activities that can be further implemented in R&D proposals. In principle, this includes some of the existing EU open calls; namely Horizon 2020 and ERA-NET for experimental projects, plus COST (European Cooperation in Science and Technology) Actions for networking etc.

As part of the above mentioned strategy, a revised Bioenergy JP is being developed for the period 2015-2017. The JP will maintain its current Sub Programme structure, and is currently defining its work priorities for the future; particularly its objectives and R&D activities for 2015, with the aim to progressively incorporate new activities up to its full

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EERA European Energy Research Alliance Bioenergy

Welcome

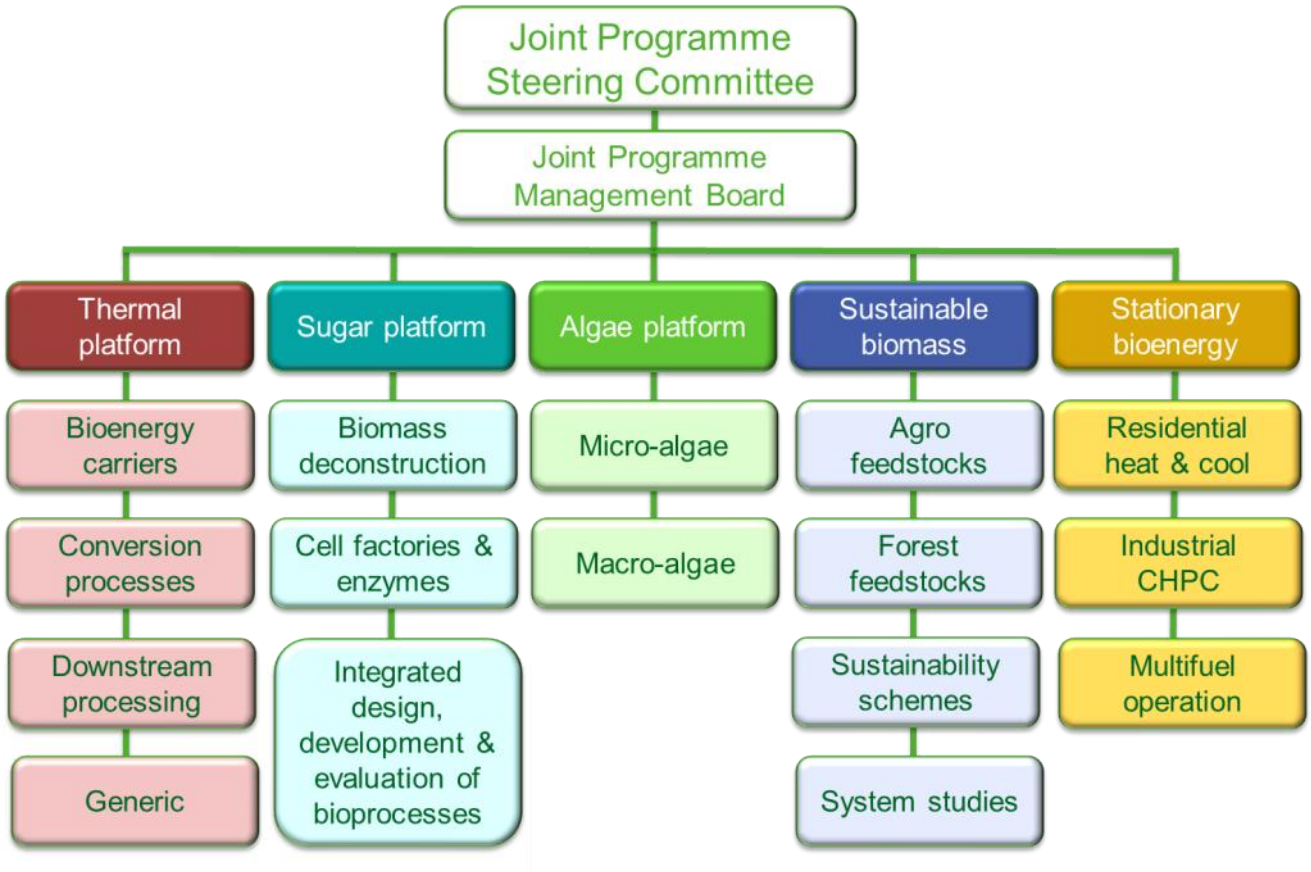

Figure 1: The structure of EERA Bioenergy.

potential in the successive years. Of the actions planned, particular attention will be paid to promoting collaborative-type events with related industries, as well as with national authorities. By doing this, the JP can be successfully integrated into national bioenergy activities and can become a useful tool to promote a coordinated national effort on bioenergy at EU level. Additionally, another initiative to be considered in the new strategy is the development of studies that reflect the position of EERA Bioenergy ahead of important issues that may affect the implementation of bioenergy in the EU.

The final goal is the accomplishment of a robust JP to develop a realistic, relevant and high quality research agenda to accelerate the SET-Plan objectives, while providing the participants with a wide collaborative framework that will support their R&D work with adequate resources.

The EERA Bioenergy JPMB is hopeful that the above mentioned strategy will be approved by the EERA Bioenergy Steering Committee and it firmly believes that in order to guarantee the future success of the EERA Bioenergy JP, it is crucial to involve all of the JP participants in the whole process.

Finally, I would like to thank those of you who have worked with us to help define the various JP activities and I would like to encourage all participants to be active in the final review of the new JP draft, as well as in its future implementation.

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Stationary Bioenergy

Sub Programme 5

Sub Programme 5 Coordinator
Michael Becidan
(SINTEF, Norway)

The EERA Bioenergy Joint Programme (JP) Sub Programme 5 aims at improving the competitiveness of stationary bioenergy for different scales, technologies and systems. All the main products, heat, power and cooling are included. It addresses three major themes:

- R&D Area 1: Residential/domestic heating and cooling, including micro-CHP;
- R&D Area 2: Industrial and municipal combined heat, power and cooling (CHPC);
- R&D Area 3: Utility multifuel operation.

The proposed priority activities for 2015 are:

R&D Area 1 - Tomorrow's residential buildings, i.e.:

- Wood and pellet stoves - Low-load wood stoves with more stable heat release and with improved emission or efficiency performances, plus down-scaled pellet stoves or improved part load operation pellet stoves;
- Wood and pellet boilers;
- Micro CHP and hybrid systems.

See Figure 1 illustrating the lower heat release peak and more stable heat release most adapted to the well-insulated residential buildings of tomorrow. Figure 2 shows that the new technology will allow for an extended heating season.

R&D Area 2

- Role of biomass CHPC plants in renewable energy system as a storable energy source;
- Biomass and bioenergy will present great potential when considering its integration in the renewable energy system containing large share of wind and solar power;
- Innovative concepts for integration will be needed;
- Smart thermal grids (concepts);
- Chemical thermodynamic modelling of ash behaviour.

Chemical thermodynamic models based on staged-equilibrium process model to

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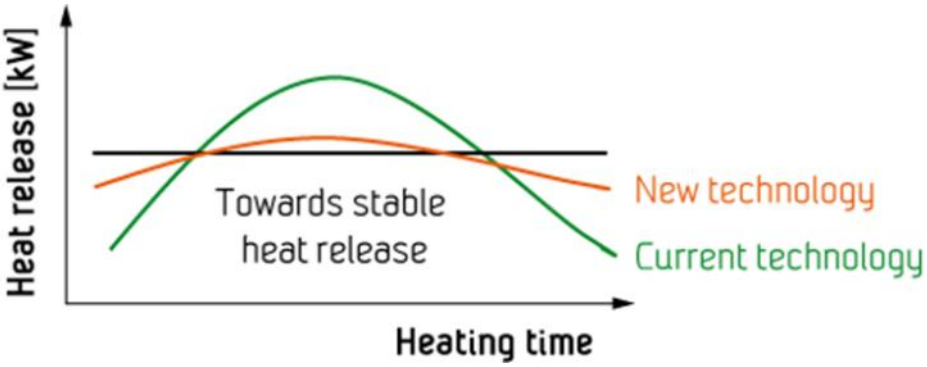

Figure 1: SINTEF StableWood project. This diagram illustrates the lower heat release peak and more stable heat release most adapted to the well-insulated residential buildings of tomorrow.

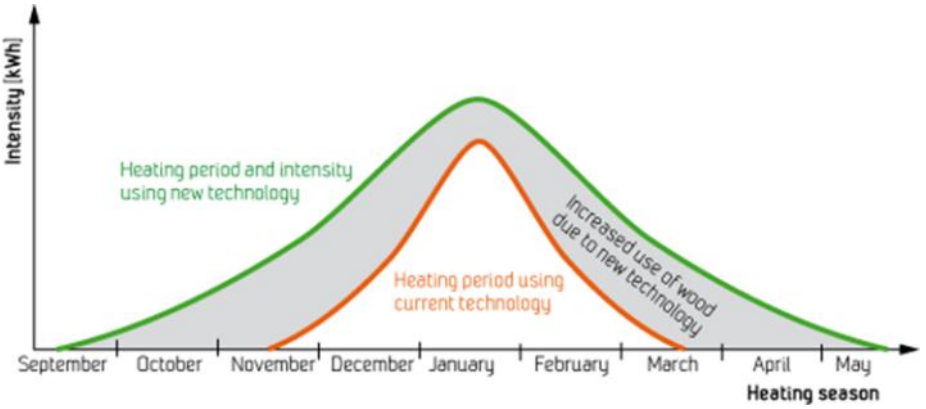

Figure 2: SINTEF StableWood project. This diagram shows that the new technology will allow for an extended heating season.

Stationary Bioenergy

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examine ash melting and corrosion in combustion conditions to optimized combustion process, or to develop suitable combustion additives for fuel combustion behaviour control.

R&D Area 3

- Repowering towards 100% coal replacement by biomass.

The main focus will be on policy measures in the various EU countries and discussions around the strategic decisions in the power industry.

- Energy Islands in biorefineries.

This is a neglected aspect. It is important because it represents a significant fraction of the OPEX and it has a major impact on the CO_2 footprint of biorefineries. Moreover, using the biorefinery residues (e.g., fermentation residues) for heat and power generation is not straightforward. In many cases, significant adaptation of existing equipment or even new technology and integration concepts are required. Cooperation and synergies with SP2 and 3 are evident.

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SINTEF

EERA European Energy Research Alliance Bioenergy

Stationary Bioenergy - Current Work Packages

R&D Area 1 - Residential/domestic heating and cooling, including micro-CHP

This Work Package (WP) addresses energy, environmental and user aspects of small-scale systems.

R&D Area 2 - Industrial and municipal combined heat, power and cooling (CHPC)

This WP is dedicated to three aspects central for the future and unique role of biomass:

- Bioenergy as a 'storable renewable' energy source and its role in energy systems as shaped by the progress within the solar and wind energy;
- Online monitoring and modelling of combustion;
- Recovery of nutrients and valuable chemical elements for overall system optimization.

R&D Area 3 - Utility multifuel operation

WP3 aims at supporting the further increase in biomass co-firing levels to over 50% (e/e), i.e. to a situation where coal becomes the secondary fuel, assessing the impact and potential of variable part load operation and investigating novel technology and process concepts.

SCCER BIOSWEET in Switzerland

Foundation of a new Competence Centre

Oliver Kröcher
of the Paul Scherrer Institute, Switzerland

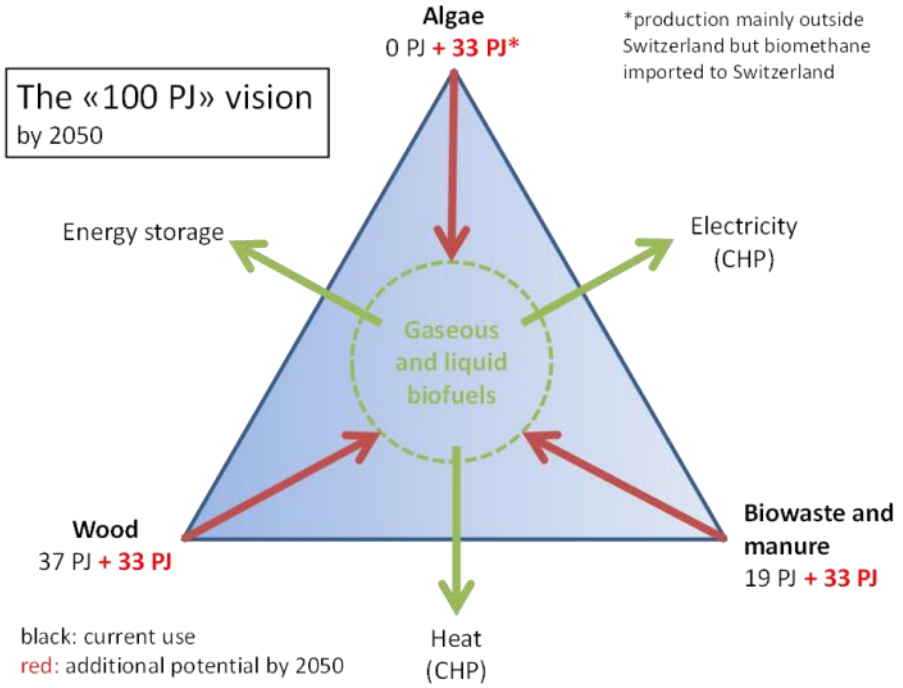

Figure 1: The "100 PJ" vision of the SCCER BIOSWEET.

At the Paul Scherrer Institute (PSI) in Switzerland, a Competence Centre for bioenergy research has been founded together with 12 other research institutions. This Competence Centre shall help to make the Energy Strategy 2050 of the Swiss federal government come true.

As part of the Energy Strategy 2050 the Swiss government and parliament have decided to increase support for energy research in Switzerland. This includes the setting up of seven inter-university networked Swiss Competence Centres in Energy Research (SCCERs), for which CHF 72 million of federal funds has been earmarked. In the SCCERs the ETH domain (PSI, ETH Zurich, EPFL Lausanne, EMPA, WSL, EAWAG), the universities and the universities of the applied sciences are to join forces with industrial partners to develop new competencies and solutions in the decisive action areas of the shift in energy policy.

One of the action areas is biomass. Researchers from 12 research institutions in Switzerland under the leadership of PSI have successfully applied for the SCCER in this action area. Oliver Kröcher, head of the Bioenergy and Catalysis Laboratory at PSI is Director of the competence centre.

Nomen est omen

The name SCCER BIOSWEET is the abbreviation for "**BIO**mass for **SW**iss **E**n**E**rgy fu**T**ure". It briefly expresses the ambitious goal of the Competence Centre: Biomass shall contribute an

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Objective

The aim of Switzerland's energy policy and its national Energy Strategy 2050 is to guarantee the energy supply for the country as a whole.

Expansion of the hydropower and renewable energy sectors, coupled with more energy-efficient buildings, appliances and transport are essential, all the more so given the decision to phase out to nuclear power.

Shortages or excessive demand will be covered by fossil fuel-based electricity production (combined heat and power plants, gas-fired combined cycle power plants) and imports.

SCCER BIOSWEET in Switzerland

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additional 100 PJ to the Swiss energy supply. In order to reach this goal a plethora of biomass resources must be tapped into. Besides dry, wood-like biomass, this particularly includes wet biomass like liquid manure, waste or crop residues.

The Competence Centre will also examine a vision for the future - the role of algae as a source of energy. High-grade fuels can be produced from algae, too, even after fine chemicals, for instance, for the cosmetics industry, have been extracted out of the algae. At the same time, algae are not competing with food and do not need agriculturally useable land. With this topic portfolio, SCCER BIOSWEET is perfectly aligned with the EERA Bioenergy Work Programme.

Diversity creates knowledge

There is a need for diversity, however, not only in types of biomass. They are often processed in varying ways as well and they all have to be researched further. Thermochemical paths – like the ones used for instance in methane production from wood – are to be equally at home in the Competence Centre as fermentative methods on which most biogas plants are based today. Research topics like the production of methane and liquid fuels from dry biomass (mainly timber) and the energy-efficient hydrothermal gasification of wet biomass are already being examined now in PSI in research projects and are to be given fresh impetus by the Competence Centre.

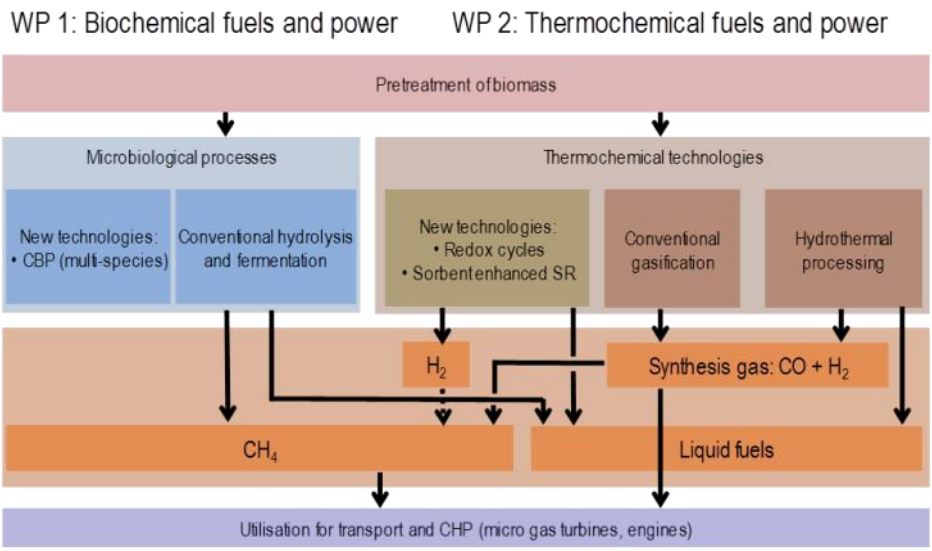

Figure 2: Research areas of SCCER BIOSWEET.

Today, almost only universities of the applied sciences are looking at biomass fermentation in Switzerland. Through the joint work on thermochemical as well as fermentative routes within the Competence Centre BIOSWEET, a more thorough mutual understanding shall be fostered and common developments shall be launched.

The BIOSWEET Competence Centre will also have the task of estimating the availability of biomass in Switzerland for the conversion pathways investigated in the SCCER. There are similar plans for the technical-economic assessment of the various bioenergetical processes in order to identify the optimum use of bioenergy in economic terms. Up to 2016 the SCCER BIOSWEET will receive funding totalling CHF 8 million from the Swiss government, used for increasing the research capacity in the involved research groups.

The first fruits of this close alliance are already visible: The Swiss biomass research scene has come together and joined its research forces. One of the main requirements for the Competence Centre is to come up with an innovation timeline

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"The Competence Centre will also examine a vision for the future—the role of algae as a source of energy."

SCCER BIOSWEET in Switzerland

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documenting how the various research topics from basic research to market-ready products, technologies or services will be covered. This involves strong cooperation with industry as well as collaborations with European partners to make SCCER BIOSWEET a success. Members of EERA Bioenergy and all other industrial, academic and private stakeholders in Europe, who are interested in contributing to this success, are kindly invited to become a cooperation partner of SCCER BIOSWEET.

ESI research platform open for cooperation partners

The work should also turn up tangible results. An Energy System Integration (ESI) platform is being set up at PSI, at which the different technologies within SCCER BIOSWEET will be investigated at a pilot and demonstration level. These technologies are interconnected with pilot setups at the same scale from other research areas, such as photovoltaics, electrolysis, carbon capture, etc. to also investigate power-to-gas concepts and particularly the dynamic interplay of different technologies. The ESI platform is an ideal playground for testing future energy systems at a small scale before implementation in the real world.

Figure 3: Mobile KONTI-C pilot plant for on-site gasification/methanation of wet biomass. The KONTI-C pilot plant will be part of the Energy System Integration platform at PSI.

Further information about SCCER BIOSWEET can be found here: http://www.sccer-biosweet.ch/.

Further information about the ESI platform can be found here: http://parkinnovaare.ch/en/innovation-priorities/energy/esip-en/

"Members of EERA Bioenergy and all other industrial, academic and private stakeholders in Europe, who are interested in contributing to this success, are kindly invited to become a cooperation partner of SCCER BIOSWEET."

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PAUL SCHERRER INSTITUT

PSI

bioliq®: Complete process chain is in operation

Nicolaus Dahmen
of the Karlsruhe Institute of Technology, Germany

Figure 1: The bioliq® pilot plant at Karlsruhe Institute of Technology (KIT).

The bioliq® pilot plant at Karlsruhe Institute of Technology (KIT) is now in operation along the complete process chain. All stages of the process have now been interconnected: Flash pyrolysis, high-pressure entrained flow gasification, hot gas cleaning and fuel synthesis. bioliq® converts residual biomass into ecofriendly and engine-compatible synthetic fuels.

The process accounts for the fact that raw materials not competing with food or feed production like straw and other biogenic residues arise in a widely distributed manner and possess a low energy content and, at the same time, allows for an economically efficient large-scale production. The process comprises four stages.

In the first stage, the dry residual biomass is subjected to decentralized flash pyrolysis to form a substance of high energy density similar to crude oil. This substance, the so-called biosyncrude, can be transported over long distances in an economically efficient way and is subjected to further central processing. The high-pressure entrained flow gasifier converts the biosyncrude into a tar-free synthesis gas at temperatures above 1200°C and pressures of up to 80 bar. This synthesis gas is mainly composed of carbon monoxide and hydrogen. By means of downstream hot gas cleaning, impurities, such as particulate matter, chlorine, sulfur, and nitrogen compounds, are separated from the syngas.

In the synthesis stage, this synthetic gas is converted into customized fuels or basic chemical products. The pilot plant produces gasoline of high quality that is ecofriendly and fully compatible with conventional gasoline. The plant output is about 1 t of fuel per day. In principle, the bioliq® concept also allows for the production of fuels for diesel engines and airplanes.

Investments in the bioliq® large-scale project totalled about EUR 64 million. About half of this sum was financed from funds granted by the Federal Ministry of Food and Agriculture (BMEL) (EUR 27 million), the Baden-Württemberg Ministry of

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“All stages of the process have now been interconnected: Flash pyrolysis, high-pressure entrained flow gasification, hot gas cleaning and fuel synthesis.”

bioliq®

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Figure 2: Taking a biofuel sample from the pilot plant. Pictured right, Professor Jörg Sauer, bioliq® spokesperson is shown together with two process engineers.

Figure 3: The bioliq® pilot plant at Karlsruhe Institute of Technology (KIT).

Science, Research, and the Arts (EUR 1 million), and the European Regional Development Fund (ERDF) (EUR 1 million). The BMEL funds were provided via the Fachagentur Nachwachsende Rohstoffe e.V. (FNR).
The funds of the ERDF were provided via the Baden-Württemberg Ministry of Finance and Economics (MFW). Of the remaining costs EUR 24 million have been paid by KIT and the Helmholtz Association, while the industry partners contributed EUR 11 million. The industry partners are the company Air Liquide Global E&C Solutions Germany GmbH, Frankfurt, for pyrolysis and syngas production, MAT Mischanlagentechnik GmbH, Immenstadt-Seifen, for the conditioning and storage of biosyncrude, MUT Advanced Heating GmbH, Jena, for hot gas cleaning, and Chemieanlagenbau Chemnitz GmbH for fuel synthesis.

The industry partners designed, delivered, assembled, and commissioned the bioliq® pilot plant and will also be involved in future research and development work. Following the commissioning of the complete process chain, the project now enters an optimization phase in order to further improve the stages of the process and the resulting products. The fuel produced by the pilot plant will be used for test purposes. It is also aimed at developing new fuels and fuel components to further improve the energy efficiency and emission rates of current and future combustion engines.

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Karlsruhe Institute of Technology

bioliq®
Biomass to Liquid Karlsruhe

Biotrade2020plus

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of CENER, Spain

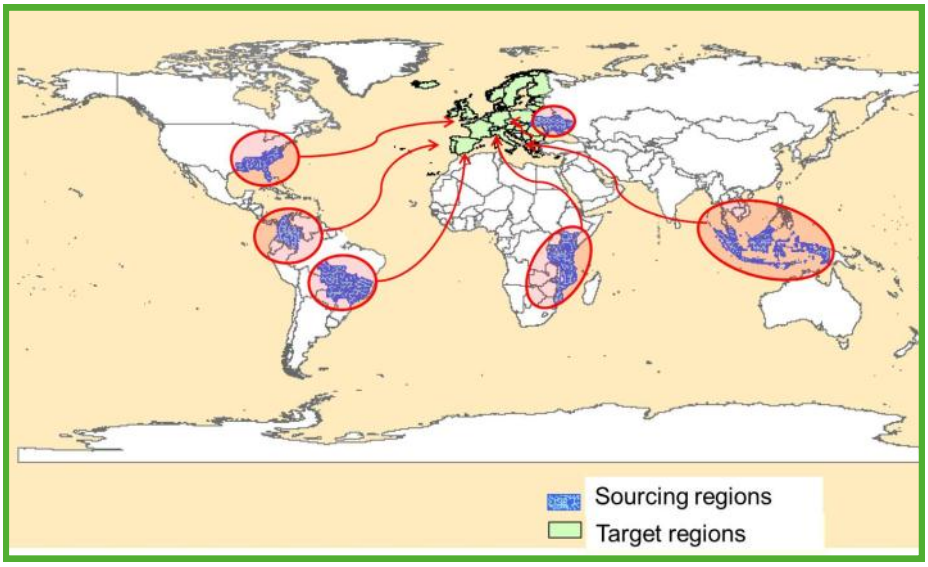

Figure 1: BIOTRADE2020+ geographical scope.

BioTrade2020plus paving the way to support a Sustainable European Bioenergy Trade Strategy.

European Renewable Energy targets to be achieved by 2020 and 2030 will require a serious increase in biomass demand for energy purposes that cannot be achieved using solely domestic biomass feedstocks. Several studies and official reports reveal that the quantity of woody biomass required to achieve 2020 targets is likely to be too large to be met by increased production within the EU.

For this reason several Member States will have to rely on imported biomass (especially woody products) from other parts of the world. However, importing this biomass from outside the EU should be done in the most sustainable and secure way to avoid distorting domestic markets as well as damaging ecosystems in other parts of the world.

In light of this, the BioTrade2020plus project aims to provide guidelines for the development of a European Bioenergy Trade Strategy for 2020 and beyond. This strategy will ensure that imported biomass feedstock is sustainably sourced and used in an efficient way, while avoiding distortion of other (non-energy) markets.

BioTrade2020plus will analyze the imported biomass potentials (technical, economical and sustainable) and assess the key sustainability risks of current and future lignocellulosic biomass and bioenergy carriers. Focus will be placed on wood chips, pellets (see Figure 2), torrefied biomass and pyrolysis oil from current and potential future major sourcing regions of the world (US, eastern Europe, Latin America, Asia and East and West Africa).

BioTrade2020plus will thus provide support to the use of stable, sustainable, competitively priced and resource-efficient flows of imported biomass feedstock to the EU – a necessary pre-requisite for the development of

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"BioTrade2020plus aims to provide guidelines for the development of a European Bioenergy Trade Strategy for 2020 and beyond."

Biotrade2020plus

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the bio-based economy in Europe.

In order to achieve this objective, close cooperation is being ensured with current international initiatives such as the International Energy Agency (IEA) Bioenergy Task 40 on 'Sustainable International Bioenergy Trade - Securing Supply and Demand' and European projects such as Biomass Policies, S2BIOM, Biomass Trade Centres, DIA-CORE, and PELLCERT.

The following main activities are implemented in the framework of the BioTrade2020plus project:

- Assessment of sustainable potentials of lignocellulosic biomass in the main sourcing regions outside the EU;
- Definition and application of sustainability criteria and indicators;
- Analysis of the main economic and market issues of biomass/bioenergy imports to the EU from the target regions;
- Development of a dedicated and user friendly web-based GIS-tool on lignocellulosic biomass resources from target regions;
- Information to European industries to identify, quantify and mobilize sustainable lignocellulosic biomass resources from export regions;
- Policy advice on long-term strategies to include sustainable biomass imports in European bioenergy markets;

Figure 2: Pellets.

- Involvement of stakeholders through consultations and dedicated workshops.

BioTrade2020plus is supported by the Intelligent Energy for Europe Programme of the European Commission and runs from March 2014 until August 2016. The consortium includes seven European partners:

- CENER (Spain, project coordinator);
- Imperial College London (UK);
- Stichting DLO (Netherlands);
- International Institute for Sustainability Analysis and Strategy– IINAS (Germany);
- VITO (Belgium);
- Utrecht University (Netherlands);
- WIP Renewable Energies (Germany).

More information is available at the BioTrade2020plus website: www.biotrade2020plus.eu

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CENER NATIONAL RENEWABLE ENERGY CENTRE
ADItech

International solid biofuels standards—published

Eija Alakangas
of VTT Technical Research Centre of Finland

Figure 1: A1-class wood pellets according to EN ISO 17225-2 standard.

ISO is currently preparing almost 60 standards for solid biofuels. Seven parts of Fuel specification and classes standards (EN ISO 17225 series) have been published in May 2014 and this series is replacing EN 14961 series. Part 8 – Graded thermally treated densified biomass fuels are under preparation.

General requirements – EN ISO 17225-1

This ISO standard includes the raw material classification of solid biofuels, which is based on their origin and source. Stating origin and source is mandatory for all biofuels. EN ISO 17225-1 includes the following raw materials:

1. Woody biomass;
2. Herbaceous biomass;
3. Fruit biomass;
4. Aquatic biomass;
5. Blends and mixtures.

Blends are intentionally mixed biofuels, whereas mixtures are unintentionally mixed biofuels.

Chemically treated wood (e.g. glued, lacquered, painted) shall not include halogenated organic compounds or heavy metals at levels higher than those in typical virgin material values or higher than typical values of the country of origin. If the raw material includes chemically treated biomass, then also nitrogen, sulphur and chlorine content have to be stated. This standard also has 15 tables for different kinds of solid biofuels, where each property class can be selected separately.

Graded wood pellets and non-woody pellets

EN ISO 17225-2 standard for graded wood pellets includes pellets for industrial and non-industrial use. Biomass pellets in EN ISO 17225-1 and industrial wood pellets in EN ISO 17225-2 also include property classes for particle size distribution for disintegrated pellets. Wood pellets for non-industrial use will also be specified according to EN ISO 17225-2. Non-industrial use means fuel intended to be used in smaller appliances, such as, in households and small commercial and public sector buildings.

Property class A1 for wood pellets represents virgin woods and chemically untreated wood residues with low ash and nitrogen content. Fuels with slightly higher ash content and nitrogen content fall within A2. In property class B, chemically treated industrial wood by-products and residues (1.2.2),

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International solid biofuels standards—published

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Figure 2: Small-sized whole tree (1.1.2) (EN ISO 17225-1).

and chemically untreated used wood (1.3.1) is also allowed, if threshold values for heavy metals are at the same level as for virgin wood.

Non-woody pellets include those made from blends and mixtures, including herbaceous, fruit or aquatic biomass. Blends and mixtures can also include woody biomass. ISO 17225-6 includes two classification tables: Table 1 for A and B class pellets produced from herbaceous and fruit biomass and blends and mixtures and Table 2 for straw, miscanthus and reed canary grass pellets.

Non-woody pellets have high ash, chlorine, nitrogen and sulphur contents, as well as major element contents, so non-woody pellets are recommended to be used in appliances which are specially designed or adjusted for this kind of pellet.

Comprehensive set of solid biofuels specification standards

In addition to the pellet standards, ISO 17225 series also includes the following product standards:

- Part 3. Graded wood briquettes;
- Part 4. Graded wood chips;
- Part 5. Graded firewood;
- Part 7. Graded non-woody briquettes.

Wood chips and hog fuel can be specified according to the standard EN ISO 17225-1 for general use and for wood chips for non-industrial use according to EN ISO 17225-4. Wood chips in EN ISO 17225-4 standard are classified into the following classes: A1, A2, B1 and B2.

Property classes A1 and A2 represent virgin woods and chemically untreated wood residues. A1 represents fuels with lower ash content indicating no or little bark, and lower moisture content, while class A2 has slightly higher ash content and/or moisture content. B1 extends the origin and source of class A to include other material, such as, short rotation coppice, wood from gardens and plantation etc., and chemically untreated industrial by-products and residues.

Property class B2 also includes chemically treated industrial by-products and residues and chemically untreated used wood. The threshold values (N, S, Cl and minor elements) for grade B1 and B2 are required, because they might include higher values of heavy metals and organic compounds as virgin wood.

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Firing up the oven with leftover bread

Alejandro Rodarte
Food Science Consultancy and Project Management, Germany

Figure 1: Freshness has its cost. Huge quantities of bread residues are commonplace in the industrial baking sector.

When does food finish its main nourishment purpose and become useful as a biomass resource for energy conversion? This was one of the core questions analysed within a study project of a pilot training of the project Q-BICON (http://www.q-bicon.eu/), co-funded by the European Lifelong Learning programme. The project, comprising partners from Austria, Germany, Hungary and Poland developed an innovative qualification scheme for biomass consultancy to build up the professional competences of multipliers and consultants in the field of bioenergy.

Is it possible to use residue bread biomass from industrial bakeries to save energy and fossil fuels? Currently, the German baking industry produces over 300 types of breads and more than 1200 baked goods. However, the highly competitive German baking sector is facing higher costs for ingredients and energy, and ironically produces around 300,000 tons (t) of left over bread a year. Driven by consumers' expectations for round-the-clock fresh products, retail contract specifications force industrial bakeries to supply retail stores with the complete bread assortment during the entire store opening hours. At the end of the day bakeries must pick up the unsold product. The residue bread, "*Altbrot*" in German, is generally offered to food banks or sold to farmers as swine feed. The rest must be disposed at the producer´s expense. White bread product residues within the industrial bakery are often channelled to breadcrumb production.

Furthermore, the energy consumption of industrial bakeries is one of the highest in the German food industry. Baking and cooling operations comprise over 70% of all energy costs. Efficient energy utilisation in bakeries focuses on optimising these operations to cut down energy cost e.g. by recovering oven heat.

With regards to waste, industry experts report that bakeries have between 8 and up to 20% of non-saleable bread leftovers. A bakery in Hilden, near the city of Düsseldorf, currently uses a biomass furnace feed with a mix of residue bread and wood pellets for its ovens. Furthermore, the technical potential of residue bread as an energy source has also been investigated at the University of Applied Sciences in Esslingen.

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Firing up the oven with leftover bread

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In the analysed real case scenario, 300 t/ month of residue bread (20%) could provide heat to cover 50% of energy costs. The former considering that the heating value of residue bread is comparable to that of wood pellets (4.8 kwh/ kg). Other feasible energy options for residue bread can be the production of biogas (yield of 254 m^3 CH_4/ t residue bread) for electricity used in processing, or even the production of bioethanol for transportation of goods.

In any case, cooperation between producers, retailers and consumers is needed to raise awareness on the huge quantities of unsold bread and look for common solutions for reducing waste. Secondly, industrial bakeries should implement a business-tailored mix of reutilisation options for residue bread including food banks, swine feed, and/or energy conversion to flow back in the production process.

The present case study was part of the bioenergy pilot training carried out in Germany by the qualification centre CQ Beratung+Bildung GmbH in Berlin and conducted by bioenergy sector expert Christian Schweitzer of bse engineering Leipzig GmbH. During the training he guided participants for the development of sustainable strategies and alternatives to best exploit the energetic potential of biomass.

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What is Q-BICON?

Q-BICON (Competences for tomorrow's energies: A Qualification scheme for BIomass CONsultancy) is an innovation project funded from 2012-2014 by the European Commission in its Leonardo da Vinci Programme.

Q-BICON targets at the development of a qualification framework for vocational training to become a bioenergy consultant. The training will provide state-of-the-art knowledge for a sustainable utilization of bioenergy regarding economical and ecological aspects.

Q-BICON involves expert institutions and training providers from Austria, Germany, Hungary and Poland.

What are the main goals of Q-BICON?

1. Detailed demand analysis for the partner countries.
2. Blended learning curriculum following latest teaching methods.
3. Elaboration of state-of-the-art teaching contents and materials.
4. Test of the new training in an open and free-of-charge pilot course certified according to ISO 17024.

Q-BICON institutions

- Fraunhofer Centre für Central and Eastern Europe, Leipzig (Germany)
- CQ Beratung+Bildung GmbH, Berlin (Germany)
- Kujawsko-Pomorski Agricultural Advisory Centre, Minikowo (Poland)
- Energiaklub Climate Policy Institute and Applied Communication, Budapest (Hungary)
- Berufsförderungsinstitut Steiermark, Graz (Austria)
- European Centre for Renewable Energy Güssing GmbH, Güssing (Austria)

Development of enzymes and microorganisms:

For the efficient hydrolysis of agricultural wastes and lignocellulosic raw materials

Yavuz Öztürk of the Scientific and Technological Research Council of Turkey (TÜBİTAK)

This project started in June 2013 for three years. Its aim is to find and develop more efficient and cost-effective enzymes to produce biofuel from agricultural waste and lignocellulosic biomass. For this purpose, a metagenomic approach was employed with a next generation sequencing facility (illumina HiSeq2000 and HiSeq2500 sequencing platform).

Lignocellulosic biomass, including waste materials from forestry, agriculture (straw) and wood-based industries, is attractive as a raw material for conversion to biofuel and bioethanol production. A major obstacle to industrial-scale production of fuel from lignocellulose lies in the inefficient deconstruction of plant material, owing to the recalcitrant nature of the substrate toward enzymatic breakdown and the relatively low activity of currently available hydrolytic enzymes. Retrieving enzymes from biomass-degrading microbial communities offers a promising strategy for the identification of new lignocellulolytic enzymes with potentially improved activities.

Figure 1: Sampling from a tea garden of the Black Sea.

Microorganisms represent the largest proportion of individual organisms with less than 1% being accessible through cultivation techniques. The genomes of these mainly uncultured species encode a largely untapped reservoir of novel enzymes and metabolic capabilities. Metagenomics bypasses the need for isolation or cultivation of microorganisms. Metagenomic approaches based on direct isolation of nucleic acids from environmental samples have proven to be powerful tools for comparing and for exploring the ecology and metabolic profiling of complex environmental microbial communities, as well as for identifying novel biomolecules by use of libraries constructed from isolated nucleic acids.

In this project, the sources of metagenome were the cow rumen, midgut of grasshoppers, sludge from agricultural and timber factories (Hayat Kimya Kastamonu entegre tesisleri), a tea garden of the Black Sea where plant materials were degraded intensively, sulphur springs, hot water springs and enrichment cultures grown on sterile straw incubated in sulphur springs and hot water springs. Environmental DNA and genomes from

Continued on next page

Development of enzymes and microorganisms

...continued

Figure 2: Metagenome preparation from microflora of grasshoppers.

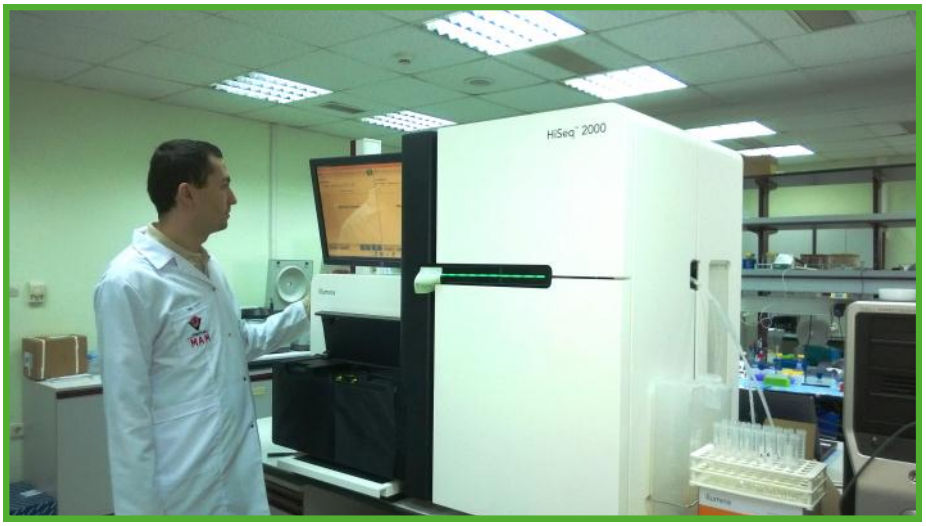

Figure 3: Illumina HiSeq2000 sequencing platform at TÜBITAK Marmara Research Centre (MRC) Genetic Engineering and Biotechnology Institute.

microorganisms were purified and sequenced successively by the illumine Hiseq 2500 system. Microbial diversity of all investigated samples was determined. Approximately 8200 Glycoside Hydrolase (GH) family genes and 2324 candidate cellulase genes (including hypothetical ones) were identified. So far, more than 40 cellulase genes were cloned to expression vector. The carbohydrate active enzymes produced will be characterized and selected ones will be used for process development for degradation of agricultural wastes and lignocellulosic biomass.

Contact

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TÜBİTAK Marmara Research Centre

Activities focus around advanced energy technologies and power electronics and control technologies.

Example advanced energy projects include:

Gas Technologies

- Gas Conditioning, Gas Separation and Fischer Tropsch Synthesis for Production of Liquid Fuel from Biomass and Coal Mixtures.
- High Added Value Materials from Waste Tyre Gasification Residues (TYGRE).

Combustion and Gasification Technologies

- Development of Circulating Fluidized Bed (CFB) Technology and Investigation of Biomass/ Lignite Coal Combustion.
- Liquid Fuel Production from Coal and Biomass Mixtures (Gasification and Gas Cleaning).
- The Production of Biogas from Agricultural and Animal Wastes and Utilization of Obtained Gases in Integrated Energy Conversion Technologies (Biogas).

Research centre on particulate solids, energy and environment

RAPSODEE - CNRS in Albi, France

Ange Nzihou
RAPSODEE-CNRS
Research Centre, France

RAPSODEE Centre UMR CNRS 5302 (**R**esearch in **A**lbi on **P**articulate **SO**li**D**s, **E**nergy and the **E**nvironment) is associated with the French National Centre for Scientific Research (CNRS) and is located at Ecole des Mines Albi.

It is composed of 110 staff (lecturers, engineers, support staff, PhD student and post-doctoral fellows) working on key issues in the following fields:

- Renewable energies;
- Biomass and waste valorization;
- Powder and particulate solid technologies.

The French government has granted RAPSODEE as a laboratory for excellence (LABEX) in science for Energy Conversion. This title has only been given to 5% of French laboratories. The Centre is organized into two research groups “energy and environment” and “particulate solids”.

Among the pre-treatment and treatment processes, the research centre has developed outstanding expertise on thermochemical conversion such as drying/dewatering, torrefaction, pyrolysis and gasification of biomass and waste for the production of energy and energy carriers in particular. These activities are carried out in collaboration with leading universities in Europe, USA, Japan and China, as well as with industry.

The “energy and environment” research group is focused on the production of energy carriers and added-value materials, by developing processes that are highly energy-efficient and environmentally friendly, either from purpose-grown biomass or from residual biomass that is - to a greater or lesser extent - contaminated by metal-based and/or organic pollutants.

The “particulate solids” research group develops and designs sustainable processes (more intensive, more cost-effective, more environmentally friendly and safer) using particulate solids and employing innovative

Continued on next page

Figure 1: Pilot plants: dryer, entrained flow reactor and pilot-scale rotary kiln.

Research centre on particulate solids, energy and environment

...continued

Save the Date: **WasteEng2016, May 23-26, 2016**

Following the WasteEng2014 event held in Rio de Janeiro (Brazil) in August 2014, we are happy to announce the WasteEng2016 Conference to be held from May 23 to 26, 2016 in the Episcopal and cultural city of Albi (France), a UNESCO World heritage site.

This 6th issue of the WasteEng Conference Series will feature cutting-edge R&D and address barriers related to the Conversion of Biomass and Waste to Energy to added-value materials. The conference will emphasize life cycle assessment and technologies/processes/practices that reduce emissions.

In addition, the WasteEng2016 summer school will be organized from May 19 to 20, 2016 offering exclusive programmes designed in close collaboration with leading experts.

The WasteEng Conference Series has reached outstanding international recognition with participations from over 50 countries for each issue during the last ten years.

www.wasteeng2016.org

Figure 2: The WasteEng Conference (www.wasteeng2016.org) will be held in the historical city of Albi, France.

methods of characterization, generation, transport, formulation, mixing and shaping of particles. The industrial pharmacy and food processing sectors are the primary beneficiaries of this research.

The Research Centre is equipped with tremendous and up-to-date characterisation equipment, as well as pilot scale facilities. The RAPSODEE Research Centre has established long-term and strong ties with a number of leading universities worldwide and with key companies.

The RAPSODEE Centre has taken part in the organization of a number of international conferences such as the International Workshop of Biomass Torrefaction for Energy (2012), the 7th Symposium on Industrial Crystallization and Precipitation (2013), the joint France-China International laboratory on Sustainable Energy symposium (2014) and the WasteEng Conference Series.

In May 2016, the 6th issue of the WasteEng Conference Series (www.wasteeng2016.org) will take place in the Episcopal and cultural city of Albi (France), a UNESCO World heritage site. See above advert for further details.

Contact

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www.wasteeng.org

Catalytic pyrolysis, intermediate deoxygenation and hydrodeoxygenation cascade (CASCATBEL)

David Serrano Granados of IMDEA Energy, Spain

A combination of three catalytic transformations. CASCATBEL is a European Commission 7th Framework Programme (FP7) project coordinated by the Spanish research institution IMDEA ENERGY. It aims to design, optimize and scale-up a novel multi-step process for the production of second-generation liquid biofuels from lignocellulosic biomass in a cost -efficient way through the use of next-generation high surface area tailored nano-catalysts.

The strategy proposed in CASCATBEL will lead to the preparation of advanced biofuels having composition and properties very similar to petroleum-derived fuels. This is a very relevant advantage regarding the commercial implementation of this technology, as it would not require any significant changes in the already existing infrastructures and engines.

The sequential coupling of catalytic steps will be an essential factor for achieving a progressive and controlled biomass deoxygenation and will reduce hydrogen consumption, avoiding the problems that hinder one/two-step bio-oil upgrading processes.

On the other hand, the use of tailored nano-catalysts will allow optimising reaction yields (increasing liquid yield and preventing bio-oil contamination) and facing limitations of current catalysts in terms of selectivity and deactivation rates.

Finally, the scaling-up of the process will be important for fully exploring and understanding the catalytic and reaction dynamics, assessing catalysts' life-cycles and demonstrating the viability of the CASCATBEL process in relevant environments, from both technical and economic perspectives.

Scientific activities were mainly devoted to the analysis of the European context of biomass availability and the selection and characterization of the optimum raw materials for bio-oil production as well as the pretreatment method.

For the bioresource-assessment, different types of lignocellulosic biomass were taken into account for each of the nine representative countries:

- Forestry residues;
- Agricultural crop residues;
- Energy crops;
- Industrial wood residues and waste.

Impact, cost, availability and chemical composition of different lignocellulosic species were studied and compared. Finally, two forestry residues, one agricultural residue and two energy crops were selected.

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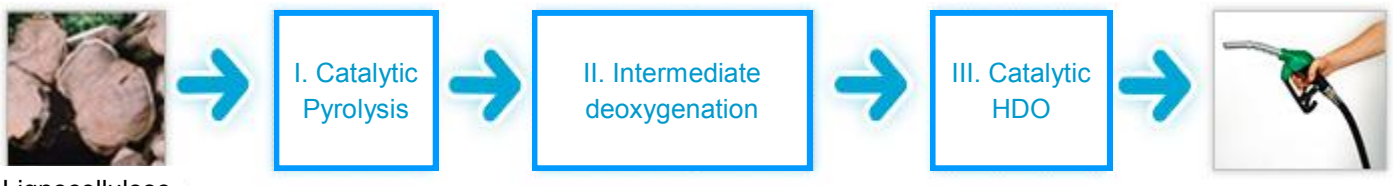

Figure 1: The CASCATBEL Process.

CASCATBEL - a combination of three catalytic transformations

...continued

Five CASCATBEL's scientific works have already been published in different peer reviewed journals as follows:

1. Two-Dimensional Zeolites: Current Status and Perspectives
Wieslaw J. Roth, Petr Nachtigall, Russell E. Morris and Jiří Čejka. Chemical Reviews, 114 (2014) 4807. ACS Publications.

2. Computational Investigation of the Lewis Acidity in Three–Dimensional and Corresponding Two-Dimensional Zeolites: UTL vs. IPC-1P.
Ho Viet Thang , Miroslav Rubeš , Ota Bludský , and Petr Nachtigall. J. Phys. Chem. A , 118 (2014) 7526. ACS Publications.

3. Theoretical investigation of layered zeolites with MWW topology: MCM-22P vs. MCM-56
M. Položij, Ho Viet Thang, M. Rubeš, P. Eliášová, J. Čejka and P. Nachtigall. Dalton Transaction, 43 (2014) 10443.

4. Ketonization of Carboxylic Acids in Biomass Conversion over TiO2 and ZrO2 Surfaces: A DFT Perspective
Gianfranco Pacchioni. ACS Catal., 2014, 4, pp 2874–2888.

5. Hydroxyapatite, an exceptional catalyst for the gas-phase deoxygenation of bio-oil by aldol condensation
E. G. Rodrigues, T. C. Keller, S. Mitchell and J. Pérez-Ramírez Green Chem., 2014, Advance Article.

Continued on next page

Table 1: During this first year of execution, CASCATBEL has fulfilled the following objectives:

Objective	Description	Deliverables/Milestones	
01	To set up the basis for the correct dissemination of the project results to the scientific and general public, as well as to foster relations with stakeholders.	D11.1 D10.1 D10.4	Project website. Dissemination plan. Summer School.
02	To lay the foundations for project results exploitation by facilitating its protection, analysis and transfer.	D10.2 D10.3	Standardization plan. Industrialization plan.
03	Selection of six different raw materials representative of the resources readily available across Europe.	D1.1 D1.2 MS1	Report on the availability of biomass resources in the EU. Supply and characterization of six biomass types. Representative biomass types.
04	Definition of the non-catalytic pyrolysis as the reference process for further comparison with the catalytic pyrolysis outcomes at laboratory scale.	D5.1 D8.1	Report on the biomass pyrolysis tests at laboratory scale. Assessment of the reference process.
05	Selection of the most adequate biomass pretreatment and bio-oil stabilization method.	D8.2 MS2	Assessment of the results obtained at laboratory scale in biomass pyrolysis to aid in the selection of the biomass pretreatment and bio-oil stabilization methods. Biomass pretreatment.

CASCATBEL - a combination of three catalytic transformations

...continued

Figure 2: CASCATBEL Partners.

The project brings together 17 partners from ten different European countries, as shown in Figure 2.

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The CASCATBEL Project has received funding from the European Commission Seventh Framework Programme FP7/2007-2013 under Grant Agreement number 604307.

Funded by the Seventh Framework Programme of the European Union

cascatbel

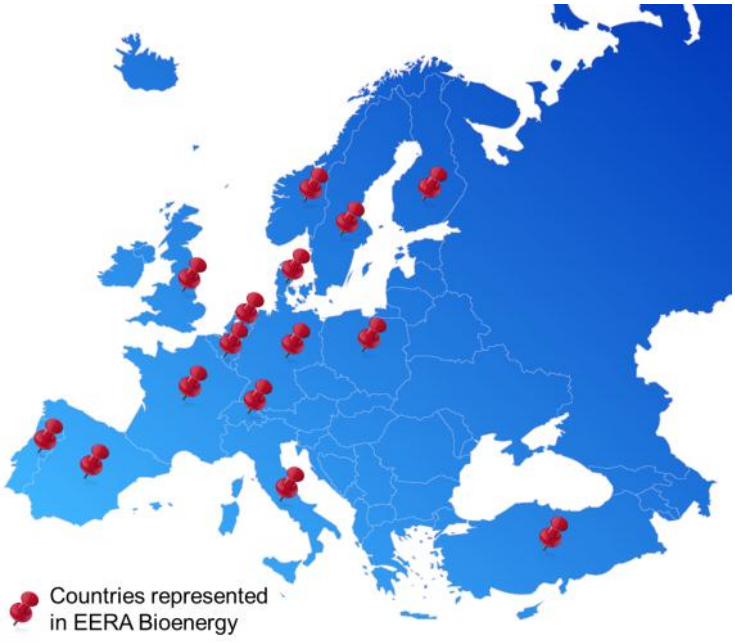
instituto IMdea energía

EERA Bioenergy: Participants and associate participants

EERA European Energy Research Alliance Bioenergy

The EERA Bioenergy Joint Programme consists of 20 participants and 14 associate participants from a total of 15 countries, as indicated on the map to the right.

See the last page of this newsletter for a full list of organisations and their contact details.



The ‘Biofuels’ project of the National Research Council of Italy (CNR)

Patrizio Massoli of the National Research Council of Italy (CNR)

The Department of Engineering, ICT and Technologies for Energy and Transportation of the National Research Council of Italy (CNR), is a partner of the Ministry of Economic Development of Italy, together with ENEA and RSE SpA, in a multi-year programme agreement for researchers in the fields provided by the "Electrical Research System" plan.

This agreement aims to contribute to the innovation of the Italian electricity system, improving its economic efficiency, safety and environmental compatibility, helping to provide Italy with the right conditions for sustainable development. Within this framework is the following funded project: *‘Evaluation and use of biofuels from residue or agricultural wastes of scarce intrinsic value and algae for the application in cogeneration plants based on micro turbines’*, also known simply as the *‘Biofuels’* project.

The generation of electricity from vegetable biomass, which involves the distributed generation in small and medium plants, is able to combine the demands of low carbon energy production and high efficiency electrical networks based on smart grids. The objective of the *‘Biofuels’* project is to study the utilization of fuels from different vegetable biomass feedstocks for the distributed generation of electricity and heat. The project aims to represent a link between the laboratory scale studies of biofuels and their application in practical energy conversion systems. In fact, on the one hand, the utilization of fuels from biomass complies with the reduction of CO2 emissions, and on the other hand, their utilization in engines typically designed for fossil fuels requires careful evaluation in terms of efficiency and emissions. The analysis of the utilization strategy is one of the most critical issues for the market penetration of any new fuel.

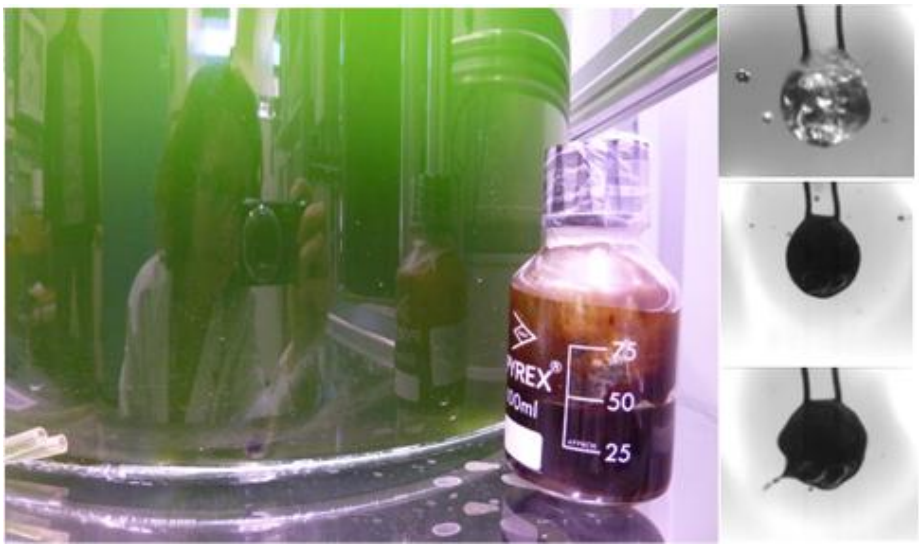


Figure 1: Left - Pyrolysis oil from algae, CIRSA Ravenna – University of Bologna; Right - Combustion phases of the algae pyrolysis oil, Istituto Motori - CNR.

The research, carried out by groups from numerous institutes of CNR and Italian universities (Polytechnic of Milan, Universities of Bologna, Ferrara and Florence), is organized into three Work Packages.

The first concerns the production of gaseous and liquid fuels from biomass by thermo-chemical processes, the upgrading of liquid bio-oils via catalysis reactions, the study of the fundamental combustion properties of liquid biofuels (vegetable oils, pyrolysis oils from algal biomass, emulsions and mixtures of bio-oils in fossil oils etc.), as well as surrogates of biogases, in laboratory scale reactors at pressures and

Continued on next page

The ‘Biofuels’ project of CNR

...continued

temperatures typical of a Micro Gas Turbine (MGT). It is also involved in the numerical and experimental study of the influence of the composition of biogases on the performances and emissions of a commercial 330kW_{fuel} MGT at full and partial load operation.

The second Work Package studies the performances of an integrated cycle of production and Moderate or Intense Low oxygen Dilution (MILD) combustion of biofuels derived from agricultural residues and wastes. The emphasis is on the destructurisation of biomass to produce biogases prone for use in a flameless combustion regime characterized by high temperature and high dilution of the reagents (MILD combustion) for high combustion efficiencies with low thermal NOx emissions (see Figure 2).

The third Work Package studies catalytic combustion processes for low emission gas turbines. It specifically involves the development of an innovative hybrid catalytic-diffusive burner for low emission combustion of biogases, as well as the realization and characterization of innovative catalysers which are able to optimize the hybrid combustion process (see Figure 3).

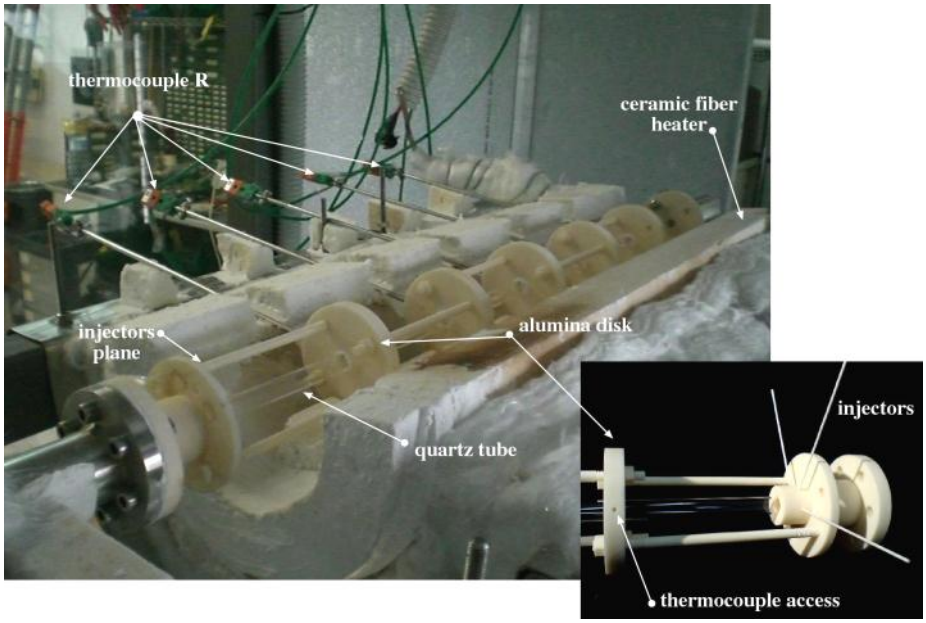


Figure 2: MILD combustion: tubular reactor and mixing section, Istituto Ricerche sulla Combustione - CNR.

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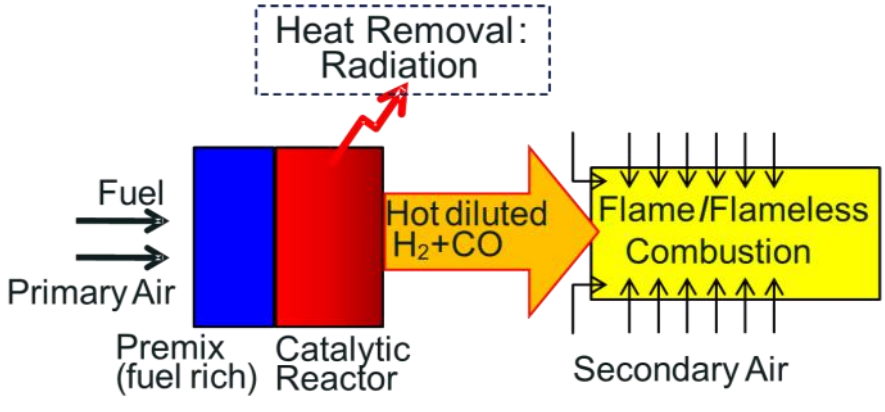
CONSIGLIO NAZIONALE DELLE RICERCHE

Istituto Motori



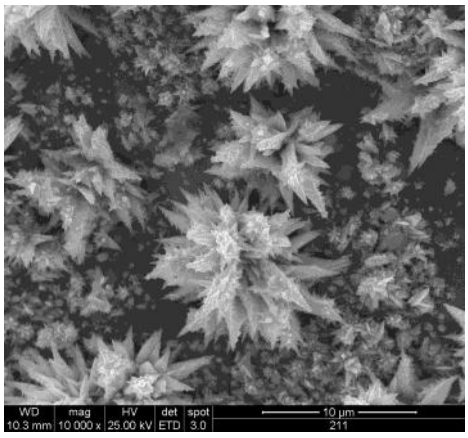


Figure 3: Left - Schematic of the hybrid catalytic burner, Istituto Ricerche sulla Combustione - CNR; Right - SEM image of foams of Fecralloy (Fe-Cr-Al metal alloys) modified with Palladium annealed at 600°C, Istituto per l'Energetica e le Interfasi - CNR.

Biofuel Research Opportunities

BRISK

Biofuels Research Infrastructure for Sharing Knowledge of Thermal Biomass Conversion and Biofuels

Apply Now

FREE ACCESS to laboratories

BRISK pays for the access costs to any of the facilities listed below.

GRANTS Available

A grant for travel and subsistence is available to help researchers visit the laboratories.

Technology	Partner(s) offering this technology
Aerosols	BIOENERGY 2020+
Analysis	Aston U, BIOENERGY 2020+, Paul Scherrer Inst, TU Wroclaw
Autoclave	Aston U
Biomass characterisation	Åbo Akademi U, Aston U, IFRF
Bio-oil upgrading	Aston U, SINTEF
Catalysts	SINTEF
Combustion	BIOENERGY 2020+, Cardiff U, TU Delft, TU Denmark, ECN, ETC Piteå, KTH, TU Munich, TUBITAK, TU Wroclaw
Fast pyrolysis	Aston U, CERTH
Fischer Tropsch synthesis and wax cracking	Aston U, CERTH, NTNU, TU Vienna
Fluid Catalytic Cracking	CERTH
Fuel cell	TU Delft
Gas clean-up	IFRF
Gas conditioning	SINTEF
Gasification	Aston U, CIUDEN, TU Delft, TU Denmark, ECN, ENEA, ETC Piteå, IFRF, KTH, TU Munich, Paul Scherrer Inst, TUBITAK, TU Vienna, U Zaragoza
Hydrodesulfurisation	CERTH
Hydrogen	ENEA
Hydrothermal processing	Paul Scherrer Inst, U Zaragoza
Methanation	Paul Scherrer Inst
Pyrolysis	Åbo Akademi U, ECN, SINTEF, UNINA
Spray cell	Cardiff U
Spray characterisation	ETC Piteå
Turbine simulation	Cardiff U

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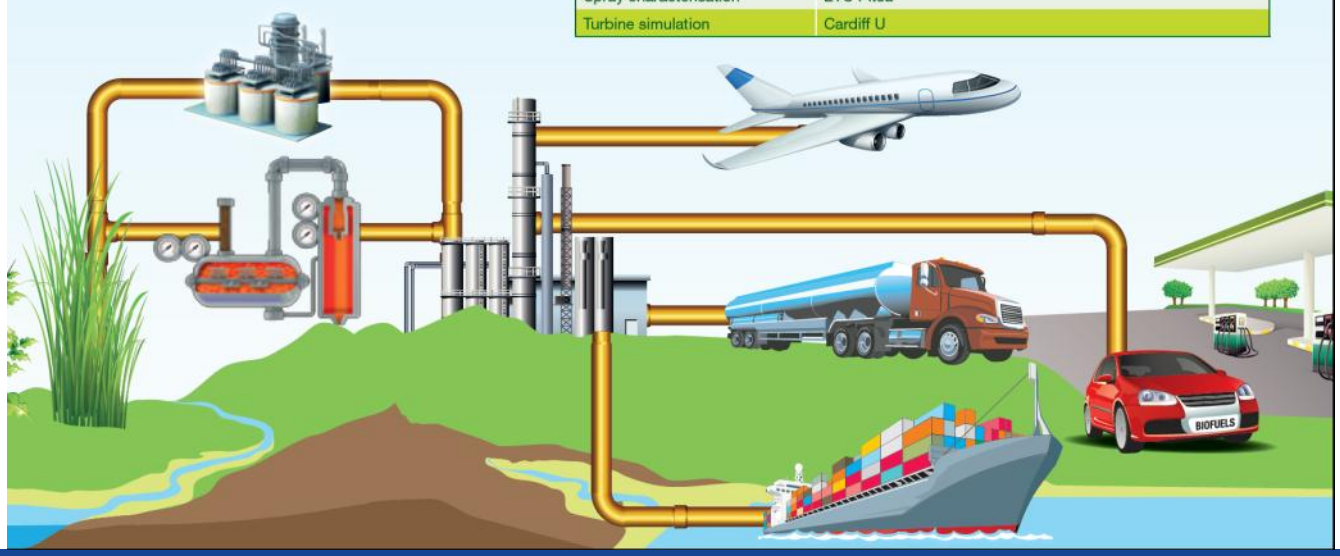
BRISK is funded by the European Commission Seventh Framework Programme (Capacities)

EUROPEAN COMMISSION

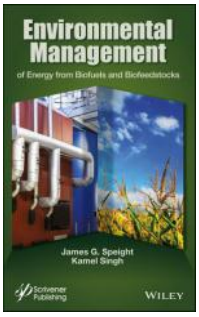
SEVENTH FRAMEWORK PROGRAMME



Publications

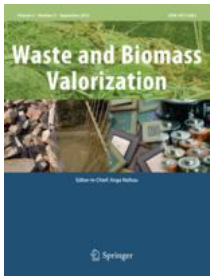
IEA Bioenergy News
The newsletter of the International Energy Agency (IEA)
September 2014

Biofuels, Bioproducts and Biorefining
Vol 8 (6 issues in 2014)
Editor: Bruce E. Dale
Publisher: Wiley
Published: 2014
ISSN: 1932-104X



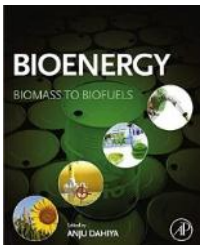
Environmental Management of Energy from Biofuels and Biofeedstocks
Editors: James G. Speight, Kamel Singh
Publisher: Wiley
Published: April 2014
ISBN: 978-1-118-23371-9

Biomass and Bioenergy: 21st European Biomass Conference
Volume 65 (Pages 1-182)
Editors: Wolter Prins and Ralph Overend
Publisher: Elsevier
Published: June 2014
ISBN: 978-0-444-59561-4

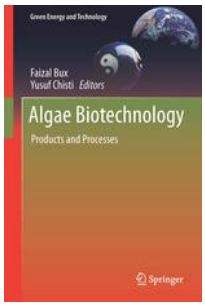


Waste and Biomass Valorization
Journal No: 12649
Editor: Ange Nzihou
Publisher: Springer
Publication date: 2014
ISSN: 1877-2641

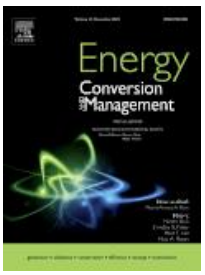
GCB Bioenergy
Volume 6
Edited by Steve Long
Publisher: Wiley
Published: 2014
Print ISSN: 1757-1693



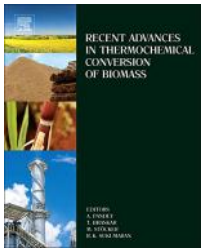
Bioenergy: Biomass to Biofuels
Editor: Anju Dahiya
Publisher: Elsevier
Published: November 2014
ISBN: 978-0-12-407909-0



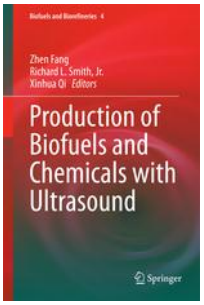
Algae Biotechnology
Editors: Faizal Bux, Yusuf Chisti
Publisher: Springer
Publication date: 2015
ISBN: 978-3-319-12333-2



Energy Conversion and Management
Volume 89
Editor: Moh'd Ahmad Al-Nimr
Publisher: Elsevier
Publication date: 1 January 2015
ISSN: 0196-8904



Recent Advances in Thermo-Chemical Conversion of Biomass
Editor: Ashok Pandey, Thallada Bhaskar, Michael Stocker, Rajeev Sukumaran
Publisher: Elsevier
Publication date: 2 February 2015



Production of Biofuels and Chemicals with Ultrasound
Editors: Jia Luo, Zhen Fang, Richard L. Smith, Jr and Xinhua Qi
Publisher: Springer
ISBN: 978-94-017-9623-1
Publication date: 2015

BRISK NEWS—Issue 6
December 2014
Editor: Irene Watkinson, Aston University
Published on behalf of the BRISK Consortium.

International Bioenergy Events

JANUARY 2015

19th-20th
Fuels of the Future
Berlin, Germany

21st-22nd
Lignofuels 2015
Madrid, Spain

FEBRUARY 2015

25th-27th
World Sustainable Energy Days 2014
Wels, Austria

MARCH 2015

2nd-5th
World Bio Markets
Amsterdam, Netherlands

25th-26th
Gasification Summit
Prague, Czech Republic

APRIL 2015

8th-10th
Plant Based Summit
Lille, France

22nd-23rd
European Algae Biomass
Amsterdam, Netherlands

25th-28th
Industrial Biotechnology (ibio-2015)
Nanjing, China

MAY 2015

4th-6th
European Bioenergy Conference 2015
Brussels, Belgium

7th-8th
Regatec 2015
2nd International Conference on Renewable Energy Gas Technology
Barcelona, Spain

19th
Mobilization of woody biomass for energy and industrial use
Rome, Italy

JUNE 2015

1st-4th
EUBCE 2015
(23rd European Biomass Conference and Exhibition)
Vienna, Austria

3rd-5th
RRB-11 Renewable Resources and Biorefineries
York, UK

10th-11th
Oleofuels 2015
Frankfurt, Germany

14th-17th
Fluidized Bed Conference (FBC)
Turku, Finland

15th-19th
Biobased World at Achema 2015
Frankfurt, Germany

AUGUST 2015

25th-27th
Biofuels 2015
Valencia, Spain

SEPTEMBER /OCTOBER 2015

27th September to October 2nd
Biorefinery I: Chemicals and Materials from Thermo-Chemical Biomass Conversion and Related Processes
Crete, Greece

Mobilization of woody biomass for energy and industrial use

Smart logistics for forest residues, pruning and dedicated plantations

19 May 2015, Rome, Italy

Improved logistics will help create a market for biomass feedstocks such as agricultural residues, forestry residues, and energy crops. In the three EU-funded projects INFRES, LogistEC and EuroPrunning (combined value €15 million; EU contribution €10 million) 63 organisations and companies, including many SME's, collaborate to develop such smart logistics. They field-demonstrate practical solutions implemented in rural communities to harvest, store and transport lignocellulosic biomass for the production of bioenergy and biomaterials.

Further to developing technologies and adapting machines, the three projects also assess the environmental, economic and social sustainability of the proposed supply chains, as well as the barriers to innovation in the respective sectors. The one day conference will showcase key results from the three projects.

Participation in the conference is free of charge and open to all.

Target Audience

Scientists, businesses, government policy makers and all other stakeholders including feedstock producers, equipment manufacturers, logistics companies, end-users of biomass, biomass project developers, rural communities, NGOs, etc.

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Biorefinery I: Chemicals and Materials from Thermo-Chemical Biomass Conversion and Related Processes

September 27 - October 2, 2015, Crete, Greece

Biorefinery I will provide an international forum for the presentation of commercial and emerging technologies and scientific advancements in the area of chemicals and materials production from renewable resources. The speakers and attendees will come from academia, industry or other research organizations (e.g., institutional and government).

There will be no parallel sessions in order to allow all participants to be exposed and contribute to all presentations. The format will be different from other conferences as follows:

- Morning Session with oral presentations (Session 1);
- Joint Lunch;
- Free Afternoon Break;
- Late Afternoon Session (Session 2);
- Joint Dinner followed by Poster Session including Social Hour (Session 3).

This new format is designed to enhance rapport among participants and promote dialogue on the development of the meeting.

Abstract submission

Participants are strongly encouraged to submit abstracts for the oral and poster sessions. The poster sessions will form an integral part of the meeting.

Key dates

January 31, 2015: Abstract deadline for oral and poster presentations

March 1, 2015: Notification to authors

July 31, 2015: Deadline for submission of poster-only contributions

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22nd International Conference

Fluidized Bed Conversion

The International Conference on Fluidized Bed Conversion (FBC) previously called the International Conference on Fluidized Bed Combustion, is held every three years. The conference has almost a 50 year tradition. The next conference will be held in Turku, Finland and will be hosted by Åbo Akademi University and co-organized with VTT Technical Research Centre of Finland and Foster Wheeler Energia Oy.

It will cover the latest issues in fluidized bed combustion technology for power production, co-generation and waste incineration including fundamental research, equipment design, application and performance experience in pilot and demonstration plants as well as in industrial sites.

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23-23 APRIL 2015 AMSTERDAM, THE NETHERLANDS

Maximising Commercial Successes in Algae Biomass by Combining Focussed R&D with Business Strategy.

ACI's 5th annual **European Algae Biomass Conference** will once again bring together senior executives from industry and academia to discuss the latest commercial and technical developments, challenges and research breakthroughs throughout the entire algae value chain.

The conference will have a heavy focus on case study examples of the latest technologies in operation in the global algae industry. It will:

- Discuss the technical challenges faced when optimising the cultivation of algae.
- Study the current and future commercial markets for algae products and the challenges faced during the commercialisation process including the views from three different end markets.

Exclusive LGem and AlgaPARC Dual Site Visit
During the afternoon of 21st April 2015, a limited number of conference attendees will receive a unique opportunity to visit both **LGem** and **AlgaPARC** facilities.

There is **no extra charge** to attend the site visit, but spaces are limited and allocated on a **first come first served basis**. Please register your attendance for the site visit when booking for the conference.

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EERA Bioenergy is open to new complementary RTD organisations. Please contact the Joint Programme Coordinator, Juan Carrasco for further details at juan.carrasco@ciemat.es

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