

Bioenergy News

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IEA Bioenergy
Technology Collaboration Programme

IEA Bioenergy Conference 2021 – wrapping up



Report by Luc Pelkmans
Technical Coordinator, IEA Bioenergy

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IEA Bioenergy Conference 2021 – wrapping up

Between 29 November and 9 December 2021, IEA Bioenergy held its triannual conference. The central theme of the conference was ‘The role of biomass in the transition towards a carbon neutral society’. The conference consisted of 10 technical sessions and 4 panel sessions, spread over two weeks. Each day was dedicated to a central topic such as feedstock mobilisation/sustainability governance; transport biofuels; green gas; circular economy and industry; and bioenergy in the energy system. Almost 1200 people participated in one or more of the conference sessions. They were from around 90 countries from all over the globe.

Overall highlights:

Bioenergy’s role in decarbonisation is substantial; BECCS is one of the critical options to remove CO₂ from the atmosphere

Reaching net-zero greenhouse gas (GHG) emissions globally requires an unprecedented transformation of the energy system. A portfolio of options will be needed; there are no silver bullets and we don’t have the luxury to dismiss good options. A strong boost will be needed for all relevant options, also for bioenergy. The role of bioenergy in net-zero scenarios of IEA, IRENA, IPCC, is substantial – up to 20% of total energy supply in 2050 at the global level, based on realistic sustainable biomass potentials.

Next to deep and rapid reductions of GHG emissions, carbon dioxide removal from the atmosphere (CDR) will be absolutely necessary to limit global warming. Bioenergy combined with stable geological storage of carbon (BECCS) is one of the critical CDR options.

Bioenergy is part of a broader bioeconomy; sustainability governance is a key requirement

Bioenergy should not be considered in isolation, but as part of a broader bioeconomy, which includes forestry, agriculture, the food industry, the wood processing industries, biomaterials & biochemicals production, waste management and the energy sector. It is by definition cross-



Overview of Speakers and moderators in the conference

cutting and requires a holistic approach over different policy fields.

Good practices show multiple co-benefits (beyond energy), for example, rural development, waste management, circular economy, soil improvement, or land restoration. Impacts on the different Sustainable Development Goals (SDGs) need to be considered; depending on the contextual conditions there can be synergies or trade-offs.

Sustainability governance is a key requirement. To de-risk investments there needs to be a clear understanding of what sustainable biomass means and how much biomass can be mobilized within sustainability constraints.

Transition is accelerating; biomass mobilisation is needed; priorities of biomass use will evolve

Company ambitions in terms of decarbonisation goals are growing fast, both in sectors which are relatively easy to transform (e.g. light industries, services), and in harder to abate sectors (e.g. aviation or heavy industries). Companies and sectors are taking concrete steps to handle the transition in practice. This requires major investments; companies are vulnerable during transition periods and need a stable policy framework.

There is a gradual shift of biofuels/biomass to difficult-to-electrify sectors (such as aviation, marine transport, industry), although short term displacement of fossil fuels in current systems (e.g. in road transport, heat systems) remains important.

With the trend towards lower value/underutilised heterogeneous biomass resources on the one hand, and higher value applications of biomass (advanced transport fuels, biobased chemicals) on the other hand, there is a need to connect the local and dispersed biomass feedstock base with centralised processing at scale. Biohubs, providing storage and pretreatment at the regional level, can be a tool to make such connections.

Flexibility is one of the key characteristics of bioenergy; there are important synergies with hydrogen

In the near future the integration of energy vectors (power, heat, gas) will be essential to facilitate variable renewables such as solar or wind energy, where dispatchable renewable energy sources such as bioenergy gain importance for grid balancing and cover seasonal fluctuations (particularly for heat). Fossil gas replacement requires much more attention, with biomethane being one of the major options.

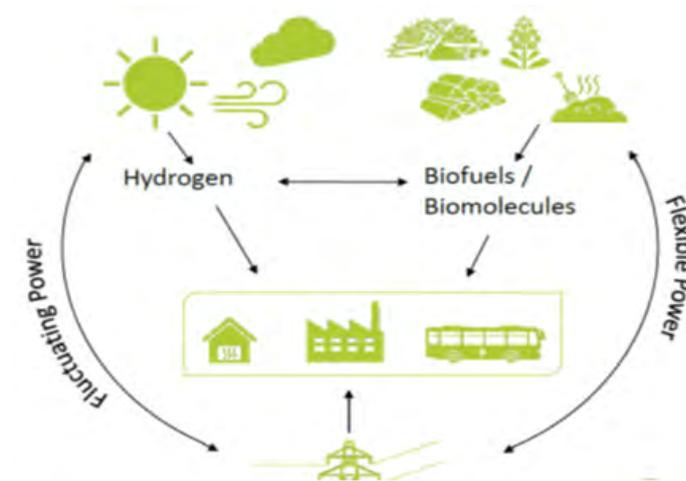
In an energy mix dominated by wind and solar, flexibility (short and long term) and bioenergy carbon capture utilisation and storage (Bio-CCUS) are expected to be two of the more important characteristics of bioenergy. There are important potential interactions and synergies between bioenergy and green hydrogen

deployment, for example to combine biogenic CO₂ (from biobased processes) with renewable hydrogen to produce e-fuels.

Reliable and coherent political framework conditions needed for the necessary scale-up

Reliable and coherent political framework conditions are of key importance to motivate investments and to scale up new technologies. The most important policy measures to support biomass applications are carbon pricing, support for RD&D to lower costs and obligations in specific markets.

Presentations, recording, highlights, and poll results of all sessions, as well as a full conference report are available on the conference website: <https://www.ieabioenergyconference2021.org>.



Biomass in the future energy system. Source: DBFZ



From the Secretariat



Pearse Buckley
ExCo Secretary

ExCo87, Virtual Meeting

With the continuing challenges posed by COVID-19, the IEA Bioenergy ExCo88 meeting was held as a Virtual Meeting in three separate sessions on 11, 13 and 14 October 2021 with Paul Bennett as Chair, Dina Bacovsky and Sandra Hermle as Vice-chairs and Pearse Buckley as Secretary.

Changes to Executive Committee

A new Member for Austria was Mr Hannes Bauer; a new Member for Denmark was Mr Mikael Pedersen; a new Member for Finland was Mr Jussi Mäkelä; a new Alternate Member for the United Kingdom was Dr Geraint Evans.

Progress with current Initiatives

Inter-Task project – The role of bioenergy in a WB2/SDG world

In addition to presentations on 'Governing a Sustainable Bioeconomy: Assessment and Monitoring (Experience and Perspective)' and 'Innovative Landscape Approaches for Sustainable Bioenergy' at the BBEST Biofuture II Summit (recorded presentations available [here](#)), a virtual workshop on 'How can biomass supply for bioenergy deliver multiple benefits and contribute to sustainable development goals' was held on 15-16 June 2021. The workshop focused on the relationships between the sustainable development goals (SDGs) and different biomass supply chains and regions, sharing best practice case studies from around the world. The presentations and recorded sessions are available [here](#). A series of publications are available on open access at [paper1](#), [paper2](#), [paper3](#), [paper4](#) and [paper5](#). This Inter-Task project also contributed to the [IEA Bioenergy Conference 2021](#).

Inter-Task project – Bioenergy for high temperature heat in industry

In addition to the four case studies already completed [here](#), two additional case studies are nearing completion. The policy synthesis report provides information on market opportunities and potential as well as effective ways to address technical and non-technical barriers to implement bioenergy based process heat. It builds upon the lessons learned in the case studies, but also provides a more generic analysis of the market potential, and how its implementation can be supported. The project results were presented at the [IEA Bioenergy Conference 2021](#).

Inter-Task project – Renewable Gas– deployment, markets and sustainable trade

This project aims to provide state-of-the-art overviews on prospects, opportunities and challenges for mechanisms that could help deploying biogas, biomethane and other renewable gases (RG) in IEA energy markets, and beyond. In looking at the status of regulatory issues for RG, the project builds on work carried out by Task 37 and Task 40 and on current approaches to regulating RG, especially in the European Union. It also looks at RG from non-biomass sources, with a focus on hydrogen and power-to-gas (PtG) production. The sustainable potentials for RG trade between Eastern Europe (Belarus, Ukraine), Russia, the US (via LNG) and the EU is addressed. In addition to work package papers and case studies, an overall synthesis report is in preparation and a webinar is being scheduled for the first quarter of 2022.

Task 41 Project II – Renewable Gas- Hydrogen in the grid

This project identified and discussed numerous challenges and hurdles for gradually replacing natural gas by renewable gas, with emphasis on H₂ injection into existing gas grids and on new dedicated H₂ grids. Its core objectives were:

- to bring together the expertise of IEA, IEA Bioenergy and national experts to showcase the role of renewable hydrogen and biomethane in the natural gas grid
- to analyse existing national strategies for greening the gas grid
- to assemble existing knowledge on hydrogen, natural gas and biomethane standards
- to identify possible challenges and hurdles for blending hydrogen and biomethane in natural gas grids.

A synthesis report is in preparation and a stakeholder workshop is under consideration. The main conclusions were presented at the IEA Bioenergy Conference 2021.

Inter-Task Project– Deployment of BECCUS Value Chains

The system studies on 'Carbon accounting across BECCUS supply chains' and on 'Bioenergy flexibility and carbon removal: trade-off or synergy', together with the two remaining case studies were due for publication in the last quarter of 2021 [here](#). The synthesis report of about 20 pages was also nearing completion and was informed by the five case studies that had been completed in this Inter-Task project.

Inter-Task Project– Lessons Learned – Biofuels

The project's program of work comprises six

work packages focused on studying national programmes and experiences of leading biofuels producer countries including but not limited to Brazil, Canada, Germany, Sweden and the USA. The analysis aims to compare and contrast different producer countries' framework conditions and policy approaches as well as levels and rates of biofuel production growth that these have enabled. Due to COVID-19 related impacts the final project report will be delayed to the end of March 2022.

Bioenergy Review Update

BEST – Bioenergy and Sustainable Technologies GmbH have been contracted by the IEA Bioenergy TCP to develop an update and an expansion of the 2009 report "Bioenergy – a sustainable and reliable energy source". The new report "[Bioenergy and its role in a future sustainable energy system](#)" will be a comprehensive, science-based, yet easily accessible document that will serve as an authoritative reference for policy makers, decision makers and the broader scientific community. It will cover all bioenergy value chains, address major issues, and provide an update on recent developments. Its electronic, web-ready format and a series of visualizations, including infographics, will make the content easy to access and serve to inform policy, educate decision makers and serve the broader scientific community alike. The draft of the final output is expected to be issued in the first quarter of 2022 with the full report being presented to ExCo89 in May 2022.

Communication Strategy

The Communications Team through regular online meetings oversees communications' activities and reviews progress with ETA Florence. Three IEA Bioenergy webinars have been presented since ExCo87 and these can be viewed along with all previous webinars at <https://www.ieabioenergy.com/iea-publications/webinars/>. Work on updating the Tasks' websites with the new IEA Bioenergy brand is continuing and is expected to be completed in the first quarter of 2022. The use of social media to disseminate TCP outputs continues to expand with increased numbers of followers.

Collaboration with other International Organizations

The collaboration with the IEA, other IEA TCPs and International Organisations continues to be an important focus. The IEA Bioenergy TCP Countries report [here](#), together with individual country reports [here](#), has been produced with important input from the IEA. Collaboration with other TCPs has continued to expand including, the ongoing engagement with the AMF TCP, the IETS TCP and deepening interaction with the Hydrogen TCP. The IEA Bioenergy TCP continues to work closely with the Global Bioenergy Partnership (GBEP), the International Renewable Energy Agency (IRENA) and the Biofuture Platform, among others.

New Secretary for IEA Bioenergy

The current IEA Bioenergy TCP Secretary, Pearse Buckley, is retiring from the role at the end of 2021. From the 1st January 2022 Andrea Rossi will become the new Secretary. Andrea is a bioenergy, bioeconomy and sustainability expert with over 15 years of international experience. From 2009 to 2018, he served as Bioenergy Officer at the Food and Agriculture Organization (FAO) of the UN, where he led the design and management of projects to assess the sustainable bioenergy potential and monitor related impacts in various countries. While at FAO, he also served, from 2014 to 2018, as Programme Officer of the Global Bioenergy Partnership (GBEP) Secretariat, leading activities on capacity development and sustainability. Since March 2019, Andrea has been supporting the IEA Secretariat in the coordination of the Biofuture Platform and of the related CEM Initiative established in 2020. The IEA Bioenergy TCP Executive Committee is very pleased to welcome Andrea as its new Secretary.



Andrea Rossi

Further information:

[IEA bioenergy.com](https://www.iea-bioenergy.com)

Task Focus:

IEA Bioenergy Task 37 – Energy from biogas



The work of the Task over the last year has dealt with the complexity of, and variability in, anaerobic digestion systems from the perspectives of agriculture and energy which are discussed below:

The role of anaerobic digestion and biogas in agriculture

In August 2020, IEA Bioenergy Task 37 published a report entitled *“Integration of Anaerobic Digestion into Farming Systems in Australia, Canada, Italy, and the UK”*. Energy and climate change policies have been the dominant drivers that have enabled growth across these 4 countries. In Canada, the potential for anaerobic digestion varies significantly by province, depending on the amount of collectible manure, the percentage of hydroelectricity in a province’s energy system, and renewable natural gas (RNG) policies and incentives. Upgrading biogas to RNG provides greater emission reductions but is only financially viable for large anaerobic digestion systems. In Italy, the adoption of the Biogasdoneright concept can significantly increase carbon sequestration in the soil, reduce farm GHG emissions to close to zero and offset GHG emissions from the energy system. Anaerobic digestion is a core technology in this concept that is complemented by the production and use of catch crops (fast growing crop grown between successive planting of main crop) and greater digestate production. Similarly, in the UK, emissions reductions in farming involves precision farming, anaerobic digestion and the appropriate use of digestate; all leading to more sustainable agriculture. The adoption of digestion at Australian piggeries and direct on-site use of biogas energy is financially profitable with pay back periods under 10 years. Off-setting on-farm energy costs (electricity, diesel, LPG) and selling surplus energy to the grid are critical to the financial bottom line and are more reliable than revenue from carbon credits that can disappear with a change in government policy.

In June 2021, IEA Bioenergy Task 37 published a report entitled *“Potential and utilization of manure to generate biogas in seven countries”*²⁷. This report examines the potential of manure for utilization in biogas facilities across seven countries: Germany; Australia; Austria; Norway; Canada, Ireland and the UK. These countries

have differing levels of biogas industry, very different farming practices and a range of climates. The major factors which define the suitability of manure for an economic anaerobic digestion process include: the biogas potential of the manure; the water content of the manure; unwanted and inhibitory materials in manure; the herd size where the manure is processed; and the resulting amount of manure available to the biogas facility.

If the manure has a very high water content (such as from pigs) this impacts greatly on the heat demand for processing and cost sustainability if transportation is necessary. Chicken manure on the other hand has a high solids content and is already transported in Europe for disposal over large distances. Both pig and poultry tend to be associated with more intensive farming, but the manures produced are not as amenable to digestion as cattle manure; chicken manure is nitrogenous and requires innovation in biological digestion or co-digestion with other substrates. Pig manure is dilute, with a low specific methane yield and as such is not ideal for long distance transport or mono-digestion.

Cattle manure is very amenable to digestion, with potentially the lowest cost of abatement; open storage of cattle slurry leads to significant levels of fugitive methane emission, which can be abated by biogas facilities. However, a very significant barrier to collection of cattle manure is an animal husbandry system whereby cattle are pasture grazed for the majority of the year (as is the case for Ireland: Figure 1). This form of husbandry may generate collectable manure only in the winter months when cattle are housed which leads to complexity in a biogas system that includes for cattle manure. Viability of manure-based biogas facilities depend on economies of scale. A herd of 50 dairy cows (close to average in many countries) housed in barns does not produce enough manure for an economic biogas operation.

To optimise the benefits of subsidies applied to biogas it is essential to maximise the potential impact on emission reductions and minimise the cost of abatement. This would suggest that incentives should focus on the manure types with high emission reduction potential and the lowest cost to treat; an example of this is liquid cattle manure (or slurry).

The role of anaerobic digestion, biogas and renewable gas in decarbonised energy systems

In August 2020, IEA Bioenergy Task 37 published a report entitled *“Integration of biogas systems into the energy system: Technical aspects of flexible plant operation”*²⁸. This report outlined the advantages of biogas as a versatile energy carrier which can be used to produce electricity, heat and after upgrading serve all functions of natural gas, including transport. Biogas systems are highly scalable in their energy output according to the demand from the particular energy sector. The flexibility of biogas systems can facilitate electricity production at a dynamic schedule to match an electricity demand profile, while facilitating voltage and grid stability. As a decentralised component of the overall energy system biogas systems can function as an infrastructure hub for local energy consumers in rural areas. Biogas can play an essential role (together with PV and wind) as part of a virtual power plant in local distribution energy grids. Biogas systems can operate as a biological battery in coupling the electricity and gas grids using surplus electricity to produce

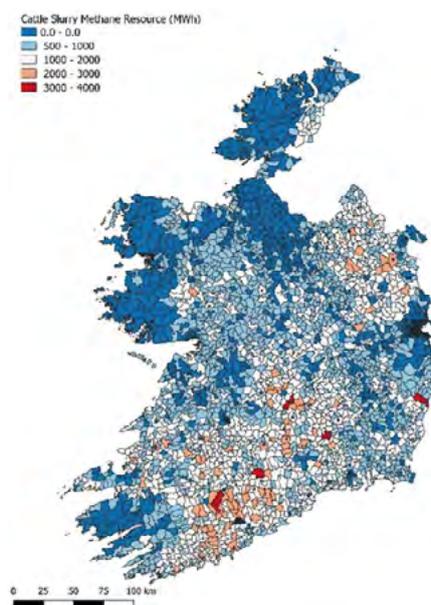


Figure 1. Geographically spread of cattle slurry methane resource in Ireland

1 McCabe, B., KroebeL, R., Pezzaglia, M., Lukehurst, C., Lalonde, C., Wellisch, M., Murphy, J.D. (2020). Integration of Anaerobic Digestion into Farming Systems in Australia, Canada, Italy, and the UK. Lalonde, L., Wellisch, M., Murphy, J.D. (Ed.) IEA Bioenergy Task 37, 2020: 8
2 Liebetrau, J., O’Shea, R., Wellisch, M., Lyng, K.A., Bochmann, G., McCabe, B.K., Harris, P.W., Lukehurst, C., Kornatz, P., Murphy, J.D. (2021) Potential and utilization of manure to generate biogas in seven countries, Murphy, J.D. (Ed.) IEA Bioenergy Task 37, 2021:6.
3. Liebetrau, J., Kornatz, P., Baier, U., Wall, D., Murphy, J.D. (2020). Integration of Biogas Systems into the Energy System: Technical aspects of flexible plant operation, Murphy, J.D. (Ed.) IEA Bioenergy Task 37, 2020:8

hydrogen to react with biogenic CO₂ in biogas producing biomethane and simultaneously increase the output of biomethane (typically by 70 %). Innovation and ingenuity will be required of biogas operators in future energy systems. This report highlights how the operator can match biogas supply and demand for energy as electricity, heat or transport biofuel across the larger future energy system.

In November 2021, IEA Bioenergy Task 37 published a report entitled **“Renewable Gas – discussion on the state of the industry and its future in a decarbonised world”**⁴⁹. This report outlined the complexities in decarbonisation, in particular the hard to abate sectors of: heavy transport; high temperature industrial heat; agriculture; fertiliser

are seen to have great potential for application as fuels of the future for hard to abate sectors such as hydrogen and associated electro-fuels.

Future support systems and development strategies and policy must create conditions to integrate renewable gases into a new climate neutral economy. Whilst incentives are required at present to compete with fossil fuels, a strategy on the role renewable gas plays in the future market must be devised. Sustainable renewable gaseous fuels will be required to substitute for the huge market in place which uses natural gas and upcoming demand in new energy systems.

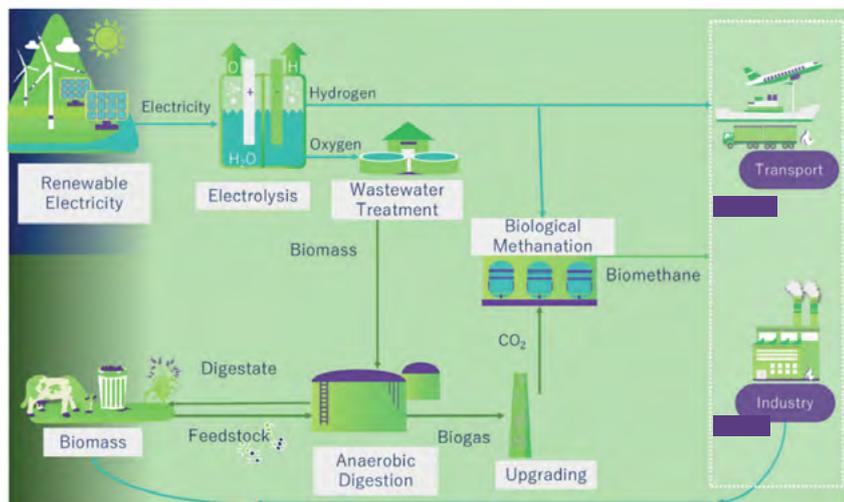


Figure 2: Renewable Gas production systems

and chemical production (Figure 2). It highlighted that at present in the EU and the USA, the natural gas grid provides more energy than the electricity grid and is often an essential component within specific industries for production of end products that range from ammonia to whiskey.

Traditional renewable gas technologies (such as biogas and biomethane) can be considered mature. In southern Sweden for example biomethane is used extensively as a transport fuel in buses, trucks and cars. Denmark has at times substituted natural gas in the grid with over 25% biomethane. The report discusses grey, blue and green hydrogen and how green hydrogen will become cheaper as renewable electricity and electrification become more widespread. Green hydrogen is seen as a plentiful resource of renewable gas that can meet many of the present functions of natural gas but at an elevated cost. Indeed cost is seen as the main barrier to uptake of renewable gas in future markets.

However we are comparing a green fuel to a fossil fuel where the present cost of carbon in no way takes account of the climate emergency. As such, it is preferable to contrast the cost of renewable technologies with the cost of other renewable technologies which are viable in that sector; for example we should not compare the cost of abatement of mature technologies in readily decarbonised sectors (say PV arrays) with that of an advanced transport fuel (such as hydrogen) that can power heavy transport but is at an early stage of development. We need to incentivise technologies at early market maturity and at low technology readiness levels (TRL) that

Conclusions

The biogas facility is multifaceted, complex and the design is bespoke depending on a wide range of geographic specific climatic, operational and policy variables. The biogas facility must be seen as an essential constituent in circular economy energy, environmental and agricultural systems. Its output includes for: energy in a range of forms (electricity, heat, transport fuel, renewable gas) which are dispatchable and furthermore flexible; but also valuable biofertilizer to be recycled back onto agricultural land. In designing a biogas system it is essential to redesign the system into which it fits, be this how a farm operates or how a local energy co-operative produces and sells energy. Biogas systems provide a niche service managing waste, improving the environment, reducing fugitive methane emissions, producing a range of flexible energy vectors amenable for use in hard to abate sectors and generate biofertilizer.

This article was prepared by Jerry D Murphy, Task Leader of Task 37.

For more information please visit:

<http://task37.ieabioenergy.com>

Notice board

Task 33 Gasification of Biomass and Waste

The current triennium is nearing its end and with good results. Task 33 organized a workshop titled "Gasification - a key technology in the energy transition and for the circular economy" on the 2nd of December. During this day a good overview was presented from industry/academia which shows the versatility of gasification technology to be applied in industry. Various pathways were described towards heat and power, chemicals, fuels and hydrogen. Various speakers also highlighted the possibilities of generating negative emissions by either sequestration of carbon from the process or via sequestration of CO₂ that results from processing biomass.

Amongst the long list of speakers, the CEO of the Swedish gasification company Meva Energy, Niclas Davidsson, announced their new agreements with IKEA Industry and the tissue producer Sofidel. Meva Energy will own and operate a gasification plant including a 2.4 MW power station within the premises of IKEA Industry's largest manufacturing unit in Zbaszynek, Poland as well as one plant with the capacity of generating at least 4.2 MW gas within the premises of Sofidel Sweden's tissue mill in Kisa, Sweden.

On the 10th of November, Task 33 leader Berend Vreugdenhil, gave a lecture on gasification of RDF and integration in existing naphta crackers at the Swedish Gasification Centre's annual Gasification Academy, with more than 40 participants from seven European countries.

In December Task 33 completed four different case studies on how gasification can be implemented in existing industries, transforming them into bio-refineries. These case studies show the versatility of gasification and also the potential for industry to transform in the energy transition we are going through. Keep an eye out for the launch of the reports.

Task 34 Direct Thermochemical Liquefaction

New country reports for activities around direct thermochemical liquefaction have been published featuring Canada, USA, and New Zealand.

<https://task34.ieabioenergy.com/country-report-2020/>

A new report has been published focussing on quantifying specific compounds that are relevant to comply with the REACH registration of fast pyrolysis bio-oil from lignocellulosic biomass and consequently its trading in the European market. Analytical methods have been found to agree well within the set limits and the investigated fast pyrolysis bio-oils from different origins complied with the applicable REACH dossier. This validates the use of different biomass types for production of marketable fast pyrolysis bio-oil in conjunction



with proven analytical means.

<https://task34.ieabioenergy.com/polar-and-non-polar-components-in-fpbo-in-relation-to-reach-registration/>



Task 36 Material and Energy valorisation of waste in a Circular Economy

IEA Bioenergy Task 36 participated in the conference Transitioning towards a decarbonised circular economy with focus on Waste-to-Energy at the SABIA National Biogas Conference 2021 in June 2021 (on-line event in South Africa).

Task 36 was represented by Daniel Roberts (CSIRO, Australia) who presented the Australian experience in the development of the "Hydrogen Economy" and in the insertion of next generation Waste to Energy technologies. Beau Hoffman (Dept. of Energy, USA) detailed the lessons learned by the United States' Government in developing the USA Waste to Energy Roadmap, and stressed the importance of a good stakeholder engagement in ensuring the success of the roadmap. Inge Johansson (RISE, Sweden), the Task Leader of IEA Bioenergy Task 36, spoke about the effectiveness of incentive schemes for the successful deployment of bioenergy from waste in Sweden and the EU. Cristina Trois (UKZN, South Africa) presented the key elements of the Waste to Energy roadmap that she is developing for the South African Department of Minerals, Resources and Energy. Read more about the event: [https://task36.ieabioenergy.com/publications/webinar-transitioning-towards-a-decarbonised-circular-](https://task36.ieabioenergy.com/publications/webinar-transitioning-towards-a-decarbonised-circular-economy-focus-on-waste-to-energy/)

[economy-focus-on-waste-to-energy/](https://task36.ieabioenergy.com/publications/webinar-transitioning-towards-a-decarbonised-circular-economy-focus-on-waste-to-energy/).

The presentations of the SABIA NBC 2021-Event 1 are available at: <https://sabia.org.za>

Task 39 Commercialising Conventional and Advanced transport Biofuels from Biomass and Other Renewable Feedstocks

Progress towards biofuels for marine shipping: Status and identification of barriers for utilization of advanced biofuels in the marine sector - published as an update of the 2017 IEA bioenergy Task 39 report: [Biofuels for the marine shipping sector](https://www.iea.org/reports/biofuels-for-the-marine-shipping-sector)

The report highlights the most significant barriers impacting the commercialization of biofuels for the marine sector. Interviews were conducted with seven key stakeholders who are involved with the marine freight transportation sector. The interviews demonstrated the considerable complexity and many considerations that relate to transitioning the marine fuels sector. Major barriers to increased biofuel investment included the lack of economic incentives, the overall level of uncertainty related to the price of biofuel feedstocks, the sustainability criteria that will be used plus onerous regulatory policies. Little concern was expressed regarding the technical barriers of scale-up, establishing supply chains, or adopting engine and fuel systems for new biofuels. Encouragingly, a number of the stakeholders highlighted biofuels as a most promising short- to mid-term solution for both reducing carbon emissions and meeting sulphur regulations. Also, with increasing international attention given to sulphur emissions and ship energy efficiency, the price gap between fossil- and biofuels is declining. The full report is available here [Task 39's website](https://www.iea.org/reports/biofuels-for-the-marine-shipping-sector).

Progress in commercialization of biojet/ Sustainable Aviation Fuels (SAF): Technologies, potential and challenges

The report provides an extensive analysis of the current and potential technologies for production of Biojet/SAF and summarizes the various technologies that are currently being pursued to produce Biojet/SAF. It also highlights several commercial-scale facilities that will come online over the next few years. As emphasized in the report, some of the Biojet/SAF processes have encountered high capital and feedstock costs while some are dealing with technology challenges. The report recognizes

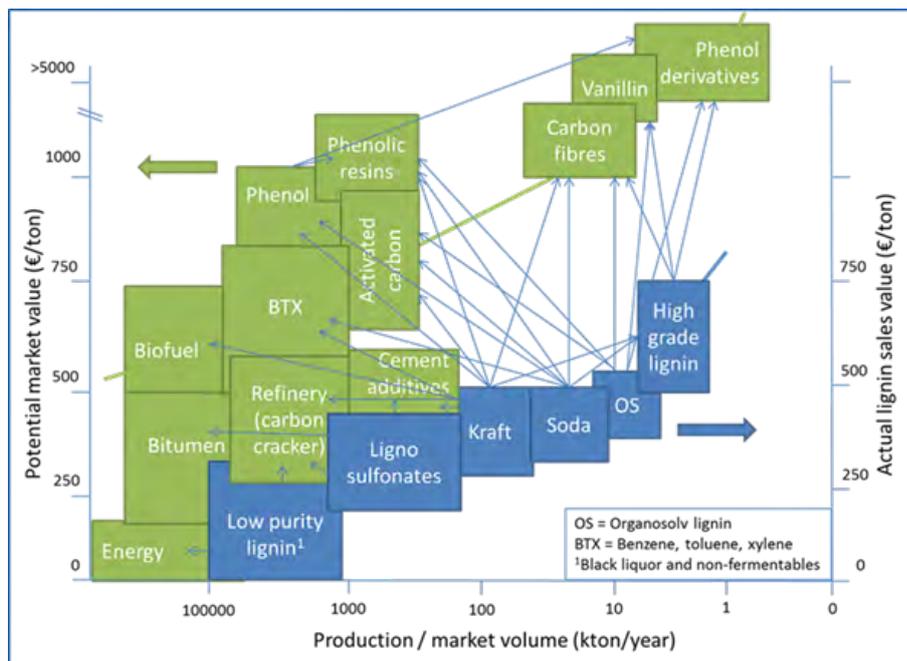
that, as Biojet/SAF fuel prices are likely to remain significantly higher than conventional jet fuel, the “right” policies will be needed to bridge the price gap and incentivize the production and use of biojet fuels. As concluded in the report, all of the technologies/pathways to Biojet/SAF will need to be pursued if we are to deliver the significant fuel volumes required to decarbonize aviation. However, although ongoing improvements and optimization of the various processes will continue to reduce the cost of Biojet/SAF production and use, meeting the sector’s decarbonisation targets will be challenging. The full report is available [here](#)

The webinar presenting the main finding of this report, including the recording and presentations, is available [here](#)

IEA Bioenergy Task 39/ BC-SMART Virtual Panel Discussion: “Decarbonizing the trucking sector using low carbon-intensive fuels”

Task 39 continues to actively organize and participate in virtual webinars and conferences with the goal of sharing the networks insights on how decarbonizing the transport sector can contribute to a “green economic recovery”. The panel members represented the key groups that will be needed to decarbonize the long-distance trucking sector (i.e., low carbon fuels suppliers, end users, LCA and policy development advisors). They shared their insights regarding the various potential pathways that will be needed to decarbonize the trucking sector, with a focus on low carbon intensive drop-in biofuels. The main takeaway message was that immediate decarbonization action is needed to minimize the compounding impact of GHG emissions. Fossil fuels used in the trucking sector are a major contributor and biofuels such as biodiesel and renewable diesel are readily deployable low carbon solutions. About 100 participants attended the webinar, mainly from North America, South America and Europe. The list of panel members and their short bios as well as the presentation slides and a recording of the panel discussion are available on the Task 39’s website ([here](#)).

[BBD - bio-based diesel; R - renewable diesel; B - biodiesel; P - petroleum diesel]



Connection between lignin types, volumes, sales values and market values of potential products from lignin

Task 40 - Deployment of biobased value chains

In recent months, Task 40 has produced a large number of results from its projects Regional transitions in existing bioenergy markets and Circular Bioeconomy Synergies as well as from the Inter-Task projects Renewable Gases, Bioenergy for High Temperature Heat in Industry and Deployment of Bioenergy with Carbon Capture and Storage/Utilization.

The respective outputs were presented by Task 40 members in several sessions of the IEA Bioenergy Conference 2021:

- Ric Hoefnagels and Fabian Schipfer each gave a presentation in the session [Setting up regional biohubs to enhance biomass mobilisation](#).
- Uwe Fritsche contributed to and moderated the session [Green Gas perspectives](#).
- Olle Olsson reported in the session [Biomass and renewable heat](#) and

- Christiane Hennig addressed the topic BECCU and Flexibility in the session [Bioenergy’s contribution to low-carbon energy systems](#).

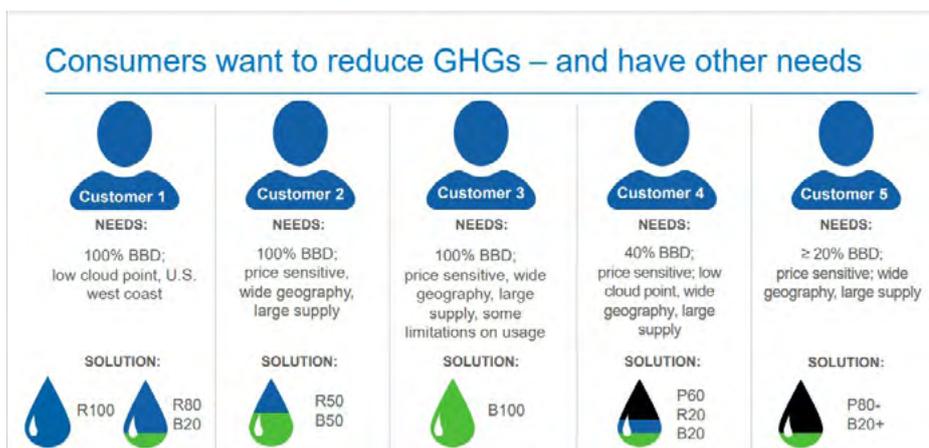
Task 42 Biorefining in a Circular Economy

Sustainable Lignin Valorization

An international webinar entitled “[Sustainable Lignin Valorization](#)” was held on 4 November 2021 to present the similarly titled [report](#) recently published by IEA Bioenergy Task 42 (Biorefining in a Circular Economy - <https://task42.ieabioenergy.com/>) in collaboration with the LignoCOST project (<https://lignocost.eu/>). The presenters included Isabella De Bari (ENEA, Italy, Italian representative in IEA BioenergyTask 42), Aristide Giuliano (ENEA, Italy), Dimitrios Ladakis (Agricultural University of Athens, Greece) and Heiko Lange (University of Milan-Bicocca, Italy).

The webinar highlighted various aspects related to the use of lignin as a feedstock for the production of many aromatic chemical compounds and building blocks. Despite the huge availability of technical lignins typically from the pulp and paper industry and the great potential for biobased materials, the complex structure of lignin represents one of the main obstacle to its full exploitation. Based on the report, presentations covered, among other topics, market data and forecasts, technology readiness levels (TRL) of the technologies, techno-economic analysis, process design and the recurring issues in capitalizing the potential lignin valorization (fig. above).

The audience expressed some scepticism in the use of technical lignins from pulp and paper processes for value added applications despite the numerous on-going European projects using these lignins. Important challenges identified were the development of lignin fractionation



Biofuels producers such as Renewable Energy Group (REG) have been developing various biofuels blending approaches to meet the needs of their customers in the trucking sectors (Source: Renewable Energy Group (REG), 2021 - click [here](#)).

processes aimed at obtaining streams with standardized quality, and the development of novel biorefining processes yielding lignin of higher quality.

The webinar was attended by more than 450 participants from India through Europe to the Americas.

Task 44 Flexible Bioenergy and System Integration

Report on Technologies for Flexible Bioenergy

Task 44 released a report [Technologies for Flexible Bioenergy](#) in June 2021. The report highlights a number of technologies which make the inherent flexibility of sustainable bioenergy usable. Technologies are categorized into three dimensions: (i) positive ancillary services, (ii) negative ancillary services, and (iii) long term flexibility. With the further increasing share of variable renewables like PV and wind in the energy system, the flexibility of bioenergy will become more and more necessary and therefore more valuable. In particular, the upcoming hydrogen strategies in several countries will open many new options for synergies, as can be seen from the multiple options to include renewable hydrogen in bioenergy value chains. The report concludes that the broad use of bioenergy flexibility, i.e. positive and negative ancillary services for the electricity grid and options for storage and transport within existing infrastructure, will depend on a suitable market design and for some period also support schemes to anticipate upcoming higher flexibility needs in the energy system and allow the stakeholders to decide on better investments.

Five cornerstones to unlock the potential of flexible bioenergy

The discussion paper [Five cornerstones to unlock the potential of flexible bioenergy](#), published in November 2021, is a summary of findings from IEA Bioenergy Task 44 from the past three years. It aims to encourage collaboration and knowledge sharing, to raise awareness for the important potential of flexible bioenergy in sustainable energy system integration, and to explore issues and solutions to fully realise this potential. The target audience of the paper are people interested in energy policy, renewable energy, energy networks, as well as energy industry, fuel producers, regulators, operators, scientists and informed stakeholders.

Task 45 Climate and Sustainability Effects of Bioenergy within the broader Bioeconomy

Publication: Blair et al. (2021) Contribution of Biomass Supply Chains to the Sustainable Development Goals – Land 2021, 10 (2), 181; <https://doi.org/10.3390/land10020181>.

This paper, developed as part of the IEA Bioenergy strategic inter-task project on the role of bioenergy in a well-below two degrees (WB2) and SDG world, illustrates the role different biomass supply chains can play in achieving the SDGs while simultaneously highlighting precautions to avoid adverse effects. Using the

SDGs as a normative framework, the authors reviewed 37 best practice case studies from 18 nations worldwide. The paper builds on existing research to increase our understanding of both the potential positive and negative impacts biomass supply chains developed specifically for bioenergy can have socially, environmentally and economically.

More information and a summary publication are available [here](#). The full report, providing more information about each case study, is available [here](#):

Publication: Sustainability governance of bioenergy and the broader bioeconomy

This paper provides an overview of the status and recent developments of bioenergy and bioeconomy governance for the Sustainability Task of the Global Bioenergy Partnership, IEA Bioenergy, and the interested public. In particular, the paper (i) provides an overview of the status of bioenergy and bioeconomy particularly in terms of expected demand and respective impacts; (ii) defines what governance is and summarizes the status of bioenergy and bioeconomy governance; (iii) identifies promising sustainability governance approaches for the bioeconomy; and (iv) presents perspectives on sustainability governance of the bioeconomy. More information is available [here](#):

Expert workshop: How can biomass supply for bioenergy deliver multiple benefits and contribute to sustainable development goals?

This workshop was organized by IEA Bioenergy Task 43 and Task 45 as part of the IEA Bioenergy strategic inter-task project on the role of bioenergy in a well-below two degrees (WB2) and SDG world. The workshop examined how biomass supply for bioenergy can contribute to SDGs beyond renewable energy supply and provide multiple co-benefits. The workshop focused on the relationships between the SDGs and different biomass supply chains and regions, while sharing best practice case studies from around the world. The workshop also built on these case studies to situate discussions between participants on how governance can further contribute to ensuring the sustainability of biomass supply chains and contributions to the SDGs. Presentations (pdf) and recorded sessions are available [here](#):

IEA Bioenergy Webinar Series

The IEA Bioenergy Webinar Series is continuing with 36 completed. All of the webinars, including recording and presentation slide-deck, can be viewed [here](#).

Publications

Five cornerstones to unlock the potential of flexible bioenergy

This discussion paper "IEA Bioenergy Task 44 Five cornerstones to unlock the potential of flexible bioenergy" describes the current role of flexible bioenergy in the energy system and identifies potentials and bottlenecks, future pathways and five cornerstones for the successful implementation of flexible bioenergy systems.



[Read more](#)

Treatment of pigment wastewater and generation of natural gas standard biomethane in Hangzhou, China

This case story describes a biogas plant treating pigment wastewater in Hangzhou, which is a typical project for environmental protection in China's coastal industry.



[Read more](#)

Biogas production from kitchen wastes in Jinhua, China

This case story describes the Jinhua Kitchen Waste Biogas Plant with the primary goal of treating kitchen wastes and producing biogas in the process.



[Read more](#)

Corn straw biogas production in cold northern region of China

This case story describes the Fuyu corn straw biogas plant. The biogas plant located in a state-owned farm is the first biogas CHP facility to use pure yellow corn straw as feedstock in the alpine region of China.



[Read more](#)

Renewable Gas – discussion on the state of the industry and its future in a decarbonised world

This report is produced by members of IEA Bioenergy Task 37 (energy from biogas) to discuss the state of renewable gas and its future in a decarbonized world.



[Read more](#)

Progress towards biofuels for marine shipping

This report seeks to uncover the largest barriers for the commercialization of biofuels for the marine sector, as identification of the current barriers will excel concrete actions from various stakeholders advancing the employment of sustainable biofuels in the maritime sector.



[Read more](#)

Sustainable lignin valorization

The present review includes the analysis of the available technical lignins with a special focus on novel lignins stemming from new technologies and producers, including market volumes at the global level.



[Read more](#)

Positioning the biofuel policy in the bioeconomy of the BioEast macro-region

The article summarizes a study carried out in the frame of IEA Bioenergy Task 43 (Biomass Feedstocks). It outlines and reviews the concerted biofuels' policy for transport in the BioEast* region, which includes 11 countries in central and eastern Europe.



[Read more](#)

2021 Country Reports

This summary report together with the separate country reports, was prepared from IEA statistical data, combined with data and information provided by the IEA Bioenergy Executive Committee and its Tasks.



[Read more](#)

Biomass supply chains and their contribution to the Sustainable Development Goals

37 best practice case studies from 18 countries were selected by members of the IEA Bioenergy Technology Collaboration Programme to demonstrate how biomass supply chains could be implemented to support sustainable bioenergy production, while simultaneously contributing to the United Nations Sustainable Development Goals (SDGs)



[Read more](#)

Woody Biomass and Climate workshop

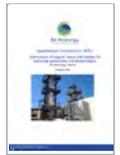
The meeting provided an opportunity to learn about the Joint Research Centre (JRC) report 'The use of woody biomass for energy production in the EU' and to discuss with the report authors.



[Read more](#)

Hydrothermal Carbonization (HTC) – Valorisation of organic wastes and sludges for hydrochar production and biofertilizers

This is the second of a case study compilation to explore lessons on material and energy valorisation of waste within the framework of IEA Bioenergy Task 36. The central technology in this case study is Hydrothermal Carbonization (HTC).



[Read more](#)

Round Robin tests on Biomass Liquefaction Oils – Archive

This archive contains 19 reports/publications on the round robin test campaigns on biomass liquefaction oils carried out by Task 34 members in the past 28 years.



[Read more](#)

Strategic deployment of riparian buffers and windbreaks in Europe can co-deliver biomass and environmental benefits

The study presented in the paper modelled three scenarios of large-scale deployment for two multifunctional biomass production systems, riparian buffers and windbreaks, across over 81,000 landscapes in Europe, and quantify the corresponding areas, biomass output, and environmental benefits.



[Read more](#)

Contribution of Biomass Supply Chains to the Sustainable Development Goals When Implemented for Bioenergy Production

This paper, developed as part of the IEA Bioenergy strategic inter-task project on the role of bioenergy in a well-below two degrees (WB2) and SDG world, illustrates the role different biomass supply chains can play in achieving the SDGs while simultaneously highlighting precautions to avoid adverse effects.



[Read more](#)

Sustainability governance of bioenergy and the broader bioeconomy

This paper aims to provide an overview of the status and recent developments of bioenergy and bioeconomy governance for the Sustainability Task of the Global Bioenergy Partnership, IEA Bioenergy, and the interested public.



[Read more](#)

Circular economy system integrating biogas into process to produce high quality products from recycled paper

This short case story outlines the incorporation of anaerobic digestion into a facility producing 450,000 t of paper and board (from recycled paper).



[Read more](#)

Polar and non-polar components in Fast Pyrolysis Bio-Oil in relation to REACH registration

It was decided to have a dedicated effort within IEA Bioenergy Task 34 to combine and share the experiences of VTT and BTG on this subject which is expected to be beneficial for producers, end-users, project developers and researchers in this field.



[Read more](#)

Minhe Chicken Manure Biogas Plant: Circular economy management of chicken manure

This biogas plant generates multiple benefits in a circular economy system over and above energy (power and heat).



[Read more](#)

Potential and utilization of manure to generate biogas in seven countries

IEA Bioenergy Task 37 published this report which examines the potential of manure for utilization in biogas facilities across seven countries: Germany; Australia; Austria; Norway; Canada, Ireland and the UK.



[Read more](#)

Technologies for Flexible Bioenergy

This report, produced by IEA Bioenergy Task 44 (Flexible Bioenergy and System Integration), highlights a number of technologies which make the inherent flexibility of sustainable bioenergy usable.



[Read more](#)

Supply chain resilience during a pandemic – Lessons from the Southeast United States wood-pellet supply chain response to COVID-19

This paper provides a rare, in-depth analysis of the financial sustainability and resilience of a bioenergy supply chain during the COVID pandemic, offering valuable insights for improving resilience of this and other supply chains.



[Read more](#)

Progress in the Commercialization of Biojet / Sustainable Aviation Fuels: Technologies, potential and challenges

This report, prepared by IEA Bioenergy Task 39, provides an extensive analysis of the current and potential technologies for production of biomass based sustainable aviation fuels (Biojet/SAF).



[Read more](#)

All IEA Bioenergy publications are available at <https://www.ieabioenergy.com/iea-publications/>

IEA Bioenergy Events

Executive Committee

ExCo89 will be held online in May 2022

Task Events

2nd International Conference on Negative CO2 Emissions

14-17 June 2022 - Göteborg, Sweden

The purpose of the conference is to bring together a wide range of scientists, experts and stakeholders, in order to engage in various aspects of research relating to negative CO2 emissions. This will include various negative emission technologies, climate modelling, climate policies and incentives.

<https://www.ieabioenergy.com/blog/ieaevent/event-the-2nd-international-conference-on-negative-co2-emissions>

Webinars

The following topics are considered for webinars in the first half of 2022:

- **Sustainability compliance and verification for forest biomass;**
- **Gasification in biorefineries;**
- **The role of bioenergy in a WB2/SDG world;**
- **Waste-to-Energy and material recycling in a circular economy**

Exact dates and titles will be announced in due course.

Other Events

Refer to <https://www.ieabioenergy.com/iea-bio-energy-task-events/other/>

Other Items

Fuels of the Future 2022

24-28 January 2022, Online

[website](#)

Lignofuels 2022

2-3 February 2022, Helsinki (FI)

[website](#)

12th ISCC Global Sustainability Conference

8 February 2022, Online

[website](#)

EU-INDIA-BCE

2-3 March 2022, Online

[website](#)

World Biogas Summit

2-3 March 2022, Birmingham (UK)

[website](#)

Gasification 2022

9-10 March 2022, Lyon (FR)

[website](#)

2022 International Biomass Conference & Expo

14-16 March 2022, Jacksonville (US)

[website](#)

Biofuels International / International Biomass & Biogas Conference & Expo

15-16 March 2022, Brussels (BE)

[website](#)

ABLC 2022

16-18 March 2022, Washington, DC (US)

[website](#)

Bio360 Expo

30-31 March 2022, Nantes (FR)

[website](#)

RNG Forum

5-7 April 2022, Drummondville (CA)

[website](#)

World Sustainable Energy Days

6-8 April 2022, Wels (AT)

[website](#)

Value of Biogas East Conference

12-13 April 2022, Toronto (CA)

[website](#)

tcbiomass 2022

19-21 April 2022, Denver, CO (US)

[website](#)

30th European Biomass Conference & Exhibition (EUBCE)

9-12 May 2022, Marseille (FR) & Online

[website](#)

All-Energy - DCarbonise Exhibition & Conference 2022

11-12 May 2022, Glasgow (UK)

[website](#)

PYRO 2022

15-20 May 2022, Ghent (BE)

[website](#)

REGATEC 2022

17-18 May 2022, Malmo (SE)

[website](#)

Oleofuels 2022

18-19 May 2022, Marseille (FR)

[website](#)

RRB 2022 - Renewable Resources & Biorefineries

1-3 June 2022, Bruges (BE)

[website](#)

Elmia Wood 2022

2-4 June 2022, Vaggeryd (SE)

[website](#)

Expo Biogaz

8-9 June 2022, Bordeaux (FR)

[website](#)

Biodiesel & Renewable Diesel Summit - Fuel Ethanol Workshop

13-15 June 2022, Minneapolis, MN (US)

[website](#)

WasteEng 2022

27-30 June 2022, Copenhagen (DK)

[website](#)

Key IEA Bioenergy Contacts

Postal Address: Viale Giuseppe Garibaldi, 10 - 50026 San Casciano in Val di Pesa (FI), Italy - Website: www.ieabioenergy.com

Secretary

Andrea Rossi
Tel: +39 340 392 0625
Email: arossi@biosmartstrategies.com

Executive Committee

AUSTRALIA

Dr Mark Brown
Forest Ind. Research Group (ML16)
Locked Bag 4
University of the Sunshine Coast
MAROOCHYDORE DC, QLD 4558
Tel: +61 (0) 488 123 155
Email: mbrown2@usc.edu.au

AUSTRIA

Mr Hannes Bauer
Austrian Federal Ministry for Climate Action,
Environment, Energy, Mobility, Innovation and
Technology
Radetzkystrasse 2
1030 WIEN
Tel: +43 1 711 62 652924
Email: hannes.bauer@bmk.gv.at

BELGIUM

Dr Thibaut Masy
Centre wallon de Recherches agronomiques
Bâtiment Francini
Chaussée de Namur 146
5030 GEMBLoux
Tel: +32 0 8162 6771
Email: tmasy@cra.wallonie.be

BRAZIL

Dr Pietro Adamo Sampaio Mendes
Director of Biofuels
Ministry of Mines and Energy
Espanlada dos Ministérios, Bloco U, 9º Andar
70 065-900 - BRASÍLIA - DF
Phone: +55 61 2032 5029
Email: pietro.mendes@mme.gov.br

CANADA

Mr Oshada Mendis
Office of Energy Research & Development
Natural Resources Canada
580 Booth Street
OTTAWA, Ontario K1A 0E4
Tel: +1-613-324-9777
Email: oshada.mendis@canada.ca

CHINA

Dr Dongming Ren
Center for Renewable Energy Development
(CRED) of ERI
B1418, Guohong Mansion, Jia No. 11 Muxidi Beili
Xicheng District
BEIJING 100038
Email: rendm@eri.org.cn

CROATIA

Mr Andro Bacan
Head of Dept. for Renewable Energy Sources
Energy Institute 'Hrvoje Pozar'
Savska 163, P.B. 141
ZAGREB, 10001
Tel: +385 1 6040 588
Email: abacan@eihp.hr

Tasks

Task 32: Biomass Combustion

Morten Tony Hansen
Ea Energy Analyses
Denmark
Tel: +45 31 39 39 92
Email: mth@eaqa.dk
Web: www.task32.ieabioenergy.com/

Task 33: Gasification of Biomass and Waste

Berend Vreugdenhil
Nederlandse Organisatie voor toegepast-
natuurwetenschappelijk onderzoek (TNO)
The Netherlands
Tel: +31 6 10 1111 76
Email: berend.vreugdenhil@tno.nl
Web: www.task33.ieabioenergy.com/

Task 34: Direct Thermochemical Liquefaction

Axel Funke
Fast Pyrolysis Group
Karlsruhe Institute of Technology (KIT)
Germany
Tel: +49 721 608-22391
Email: axelfunke@kit.edu
Web: www.task34.ieabioenergy.com/

Technical Coordinator

Luc Pelkmans
Tel: +32 492 97 79 30
Email: luc.pelkmans@caprea.be

DENMARK

Mr Mikael Pedersen
Danish Energy Agency - Centre for Energy
Administration
Niels Bohrs Vej 8D
6700 ESBJERG
Tel: +45 3395 0952
Email: mlpn@ens.dk

ESTONIA

Ms Liisa Mällo
Ministry of Economic Affairs &
Communications
Energy Department
Harju Street 11
15072 TALLINN
Tel: +372 625 6321
Email: liisamallo@mkm.ee

FINLAND

Mr Jussi Mäkelä
Senior Advisor
Business Finland
Kalevantie 2
FI 33100 Tampere
Tel: +358 50 396 5166
Email: jussi.makela@businessfinland.fi

FRANCE

Mde Emilie Machefaux
Service Forêt, Alimentation et Bioéconomie
20 avenue du Grésillé - BP 90406
F - 49004 ANGERS Cedex 01
Phone: +33 2 41 20 43 27
Email: emilie.machefaux@ademe.fr

GERMANY

Mr Birger Kerckow
Fachagentur Wachsende Rohstoffe
e.V. (FNR)
Hofplatz 1
18276 GÜLZOW-PRÜZEN
Phone: +49 3843 6930 125
Email: B.Kerckow@fnr.de

INDIA

Shri Sunil Kumar
Ministry of Petroleum & Nat. Gas
Shastri Bhawan
NEW DELHI - 110001
Phone: +91 11 2338 6935
Email: jsr.png@nic.in

IRELAND

Mr Matthew Clancy
Sustainable Energy Authority of Ireland
Wilton Park House
Wilton Place
DUBLIN 2
Phone: +353 1 808 2152
Fax: +353 1 808 2002
Email: matthew.clancy@seai.ie

Task 36: Material and Energy valorisation of waste in a Circular Economy

Inge Johansson
RISE Research Institutes of Sweden
Sweden
Tel: +46 (0)10 516 58 64
Email: Inge.Johansson@rise.se
Web: www.task36.ieabioenergy.com/

Task 37: Energy from Biogas

Jerry Murphy
Bioenergy and Biofuels Research
Environmental Research Institute
School of Engineering, University College Cork
Ireland
Tel: +353-86-0554493
Email: jerry.murphy@ucc.ie
Web: www.task37.ieabioenergy.com/

Task 39: Commercialising Conventional and Advanced Transport Biofuels from Biomass and Other Renewable Feedstocks

Jim McMillan
NREL
USA
Tel: +1 303 384 6861
Email: jim.mcmillan@nrel.gov
Web: www.task39.ieabioenergy.com/

Newsletter Editor

Marco Luschi
Tel: +39 055 500 22 80 (int. 212)
Email: marco.luschi@etaflorence.it

ITALY

Mr Luca Benedetti
Gestore dei Servizi Energetici - GSE S.p.A.
Viale Maresciallo Pilsudski, 92
00197 ROME
Phone: +39 06 8011 4572
Fax: +39 06 8011 2040
Email: lucabenedetti@gse.it

JAPAN

Mr Shinji Furukawa
NEDO
Muza Kawasaki Central Tower 20F
1310 Ohmiyacho, Saiwai-ku, Kawasaki,
KANAGAWA 212-8554
Tel: +81 44 520 5271
Email: furukawasnj@nedo.go.jp

REPUBLIC OF KOREA

Dr In-Gu Lee
Biomass and Wastes to Energy Laboratory
Korea Institute of Energy Research (KIER)
152, Gajeong-ro, Yuseong-gu
DAEJONG, 34129
Phone: +82 42-860-3559
Email: samwo04@kier.re.kr

THE NETHERLANDS

Ir Kees Kwant
NL Enterprise Agency
PO Box 8242
3503 RE UTRECHT
Tel: +31 88 602 2458
Email: keeskwant@ryonl.nl

NEW ZEALAND

Dr Paul Bennett
Scion
Private Bag 3020
ROTORUA
Tel: +64 7 343 5601
Email: paul.bennett@scionresearch.com

NORWAY

Mr Per Arne Karlsen
The Research Council of Norway
Department of Energy Research
Postboks 564
1327 LYSAKER
Phone: +47 22 03 75 80
Email: pak@rcn.no

SOUTH AFRICA

TBC
SANEDI (South African National Development
Institute)
Block C, Upper Grayston Office Park
152 Ann Crescent, Strathavon
SANDTON, 2146

Task 40: Deployment of biobased value chains

Uwe R. Fritsche
IINAS - International Institute for Sustainability
Analysis and Strategy
Germany
Tel: +49 (6151) 850-6077
Email: uf@iinas.org
Web: www.task40.ieabioenergy.com/

Task 42: Biorefining in a Circular Economy

Bart Annevelink
Wageningen Food and Biobased Research
(WFBR)
The Netherlands
Tel: +31 317 488 700
Email: bartannevelink@wur.nl
Web: www.task42.ieabioenergy.com/

Task 43: Sustainable biomass supply integration for bioenergy within the broader bioeconomy

Mark Brown
Forest Industries Research Group (ML16)
University of the Sunshine Coast
Australia
Tel: +61 (0) 488 123 155
Email: mbrown2@usc.edu.au
Web: www.task43.ieabioenergy.com/

SWEDEN

Mr Jonas Lindmark
Swedish Energy Agency
P.O. Box 310
ESKILSTUNA, SE-631 04
Tel: +46 16 544 2294
Email: jonas.lindmark@energimyndigheten.se

SWITZERLAND

Dr Sandra Hermle
Swiss Federal Office of Energy (SFOE)
Mühlestrasse 4
3063 ITTIGEN
Tel: +41 58 465 8922
Email: sandra.hermle@bfe.admin.ch

UNITED KINGDOM

Mr Peter Coleman
Department of Business, Energy & Industrial
Strategy
1 Victoria Street
LONDON, SW1H 0ET
Tel: +44 300 068 8270
Email: peter.coleman@beis.gov.uk

UNITED STATES OF AMERICA

Mr. Jim Spaeth
Bioenergy Technologies Office
System Development & Integration, Program
Manager
Energy Efficiency and Renewable Energy
U.S. Department of Energy
15013 Denver West Parkway
GOLDEN, CO 80401
Tel: +1 720 356 1784
Email: jimspaeth@ee.doe.gov

EUROPEAN COMMISSION

Ms Maria Georgiadou
Senior Expert
European Commission, Directorate-General
for Research and Innovation
Unit Clean Energy Transition
Rue Champ de Mars 21, 1050 Brussels, CDMA
03/003
Tel: +32 2 295 9846
Email: Maria.GEORGIADOU@ec.europa.eu

Task 44: Flexible bioenergy and system integration

Elina Mäki
VTT Technical Research Centre of Finland Ltd
Finland
Tel: +358 40 648 6799
Email: elina.maki@vtt.fi
Web: <http://task44.ieabioenergy.com/>

Task 45: Climate and sustainability effects of bioenergy within the broader bioeconomy

Göran Berndes
Department of Space, Earth and Environment
Chalmers University of Technology
Sweden
Tel: +46 31 772 3148
Email: goran.berndes@chalmers.se
Web: <http://task45.ieabioenergy.com/>

For full Task contact details please visit:

[IEA bioenergy.com](http://IEAbioenergy.com)