IEA Bioenergy Work Programme 2019-2021 Triennium

This publication provides an overview of the IEA Bioenergy Tasks' Work Programmes for the triennium 2019-2021.

IEA Bioenergy

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Introduction

The IEA Bioenergy Technology Collaboration Programme (IEA Bioenergy TCP – www.ieabioenergy.com) is a global government-to-government collaboration on research in bioenergy and is the main initiative under the auspices of the International Energy Agency (IEA – www.iea.org) to develop and deploy bioenergy in a sustainable way in order to achieve a low carbon economy. While the TCP is made up mainly of OECD countries, there are also non-OECD members participating. As of the 1st March 2019, 24 countries and the European Commission are participating in IEA Bioenergy: Australia, Austria, Belgium, Brazil, Canada, Croatia, Denmark, Estonia, Finland, France, Germany, India, Ireland, Italy, Japan, the Republic of Korea, the Netherlands, New Zealand, Norway, South Africa, Sweden, Switzerland, the United Kingdom, the USA, and the European Commission.

The mission of IEA Bioenergy is to increase knowledge and understanding of bioenergy systems in order to facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive bioenergy systems and technologies, and to advise policy and industrial decision makers accordingly. The TCP provides platforms for international collaboration and information exchange on bioenergy research, technology development, demonstration, and policy analysis with a focus on overcoming the environmental, institutional, technological, social, and market barriers to the near- and long-term deployment of bioenergy technologies.

The work programme of IEA Bioenergy, which is carried out through Tasks and strategic projects, covers the full value chain from biomass feedstocks to final energy products. The programme for Tasks is defined for a triennium with clear objectives and budgets. The current triennium commenced on the 1st January 2019 and will run to the end of December 2021. Special projects are treated separately, as they are designed to address specific topics and operate in a timeframe not necessarily related to the triennium of the Tasks.

This document describes the scheduled activities of the 11 Tasks of IEA Bioenergy for the triennium 2019-2021, as well as the Special projects. It includes the objective and work programme of each individual Task, with its expected results. The Task Leader for each Task is identified, together with the participating members of IEA Bioenergy.

Task 32 – Biomass Combustion

http://task32.ieabioenergy.com/

1. Definition and Objective

Definition

'Biomass Combustion' refers to both dedicated combustion and co-firing of biomass for the production of usable energy and includes market introduction and optimisation of biomass combustion technologies. Biomass combustion has always been one of the dominant renewable energy sources for generation of renewable heat and power.

Objectives

The objective of Task 32 is to collect, analyse, share, and disseminate strategic, technical and non-technical information on biomass combustion and co-firing applications, leading to further acceptance and performance in terms of environment, costs and reliability, and to support the existing momentum in market introduction of improved combustion and co-firing systems and finally find its role in the future energy system in its member countries.

Skærbækværket Wood Chip Power Plant, Denmark

2. Work programme

The Programme of Work will comprise the following focus areas:

- Improvement of small scale biomass combustion:
  - **a.** Emissions and real-life performance – *Testing methods and real-life performance of pellet stoves*
  - **b.** New biomass combustion technologies with almost zero emissions – *Technical guidelines for design of low emission stoves (primary and secondary measures)*
  - **c.** Future of small-scale combustion & policy strategies – *Inventory of national strategies for reducing the impact on air quality from residential and commercial wood combustion*
  - **d.** Workshop on *Improved combustion in stoves and small biomass boilers for residential and commercial heating* (for developers, engineers, manufacturers, scientists and/or associations)
- Biomass combustion in industry:
  - **a.** *Bioenergy for high temperature heat in industry* – lead Inter-Task project
- Integration and deployment of efficient and flexible large-scale biomass CHP:
  - **a.** *Bio based CHP for balancing an energy system with a large portion of uncontrollable production* – contribution to Task 44 work
  - **b.** Workshop on *experiences with combustion of pulverised non-woody solid biofuels* (for power producers)
  - **c.** Workshop on *experiences with wood chips for CHP production*
- Communication and dissemination activities (web page, newsletter, contributions to conferences, webinars)

3. Task leadership and participants

Task Leader: Morten Tony Hansen,
Ea Energy Analyses (Denmark),
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Participating countries: Austria, Canada, Denmark, Germany, Japan, The Netherlands, Norway, Sweden, and Switzerland

Task 33 – Gasification of Biomass and Waste

http://task33.ieabioenergy.com/

1. Definition and Objectives

Definition

'Gasification' means the thermal destruction of biomass in a reducing atmosphere of steam or air (or both) to produce a medium- or low-calorific value gas, which can subsequently be converted to other fuel forms, chemicals, hydrogen, and other products.

Objectives

The objectives of Task 33 are (1) to promote commercialisation of biomass gasification, including gasification of waste, to produce fuel and synthesis gases that can be subsequently converted to substitutes for fossil fuel based energy products and chemicals, and lay the foundation for secure and sustainable energy supply; (2) to assist IEA Bioenergy Executive Committee activities in developing sustainable bioenergy strategies and policy recommendations by providing technical, economic, and sustainability information for biomass and waste gasification systems.

Enerkem biofuels plant in Edmonton, Alberta, Canada

2. Work programme

The Programme of Work will comprise the following:

- Task Projects focused on technical and commercialisation aspects of gasification. These reports will be targeted towards policy makers, technology developers, industrial end users, researchers and the general public. The following Task projects have been identified for the current triennium:
  - **a.** *Emerging gasification technologies for biomass and waste*
  - **b.** *Status report gasification* update
  - **c.** Contribution to Inter-Task project on *Bioenergy for high temperature heat in industry*
- Semi-annual workshops organised by the Task targeting researchers and industrial end users and promoting information dissemination and discussion among technology experts. The following workshop topics have already been identified: (1) *Economics of biomass gasification based on operational experiences from pilot, demo and commercial gasifiers*, (2) *Gas cleaning; experiences, new developments, analytics and diagnostics.*
- Continued updates of Task website and biomass gasification facility database
- Publication of semi-annual Task newsletter
- Task meetings to exchange results from relevant national R&D programmes
- Updated Country reports from member countries

3. Task leadership and participants

Task Leader: Berend Vreugdenhil, ECN part of TNO (The Netherlands), berend.vreugdenhil@tno.nl

Participants: Austria, Germany, The Netherlands, Sweden, UK and United States of America

Task 34 – Direct Thermochemical Liquefaction

http://task34.ieabioenergy.com/

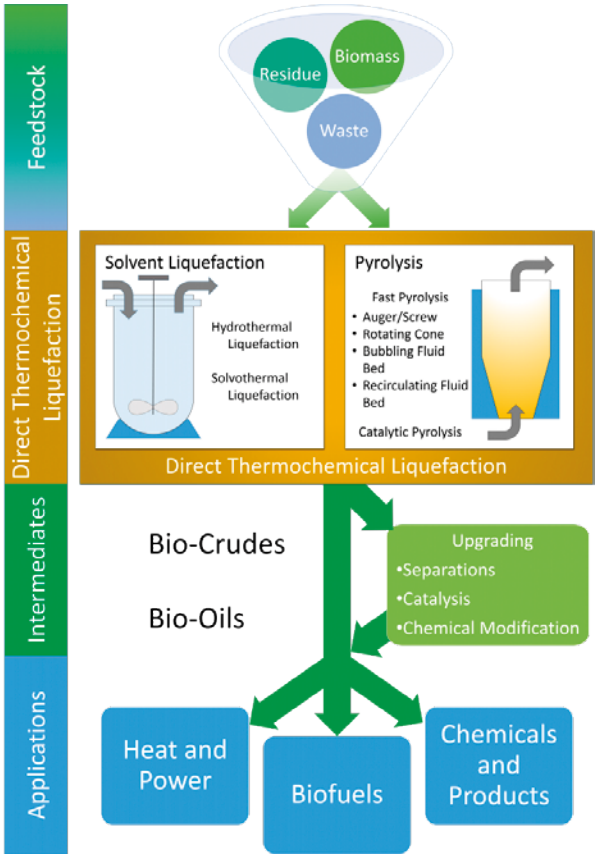
1. Definition and Objective

Definition

'Direct Thermochemical Liquefaction' is the controlled thermal degradation of biomass in any form to derive valuable energy and chemical products. It includes thermal and catalytic fast pyrolysis, hydrothermal and solvo-thermal liquefaction.

Objective

The objective of Task 34 is to advance the international implementation of bioenergy technology through strategic information analysis and dissemination in the areas of direct thermochemical liquefaction of biomass (including bio-based waste) for bioenergy applications such heat, power, transportation fuel, and the production of chemicals.



2. Work programme

The Programme of Work will comprise the following focus areas:

- Support technical and economic assessment of biomass liquefaction technologies:
  - **a.** *Techno-economic assessment of technologies for direct thermochemical liquefaction*
  - **b.** *Co-processing bio-oil/biocrudes in petroleum refineries* – cooperation with Task 39
- Validate applicable analytical methods for bio-oil/biocrude product evaluation:
  - **a.** *Validation of analytical methods* e.g. by a Round Robin (report or journal article)
  - **b.** Workshop/webinar on *advanced analytical techniques*
- Support commercialisation through standards and lessons learnt:
  - **a.** Report on *standardisation of bio-oil/biocrude analysis and application*
  - **b.** Technical notes on *R&D and commercialisation experiences*
- Facilitate information exchange with stakeholders:
  - **a.** Six issues of PyNe Newsletter
  - **b.** Direct thermochemical liquefaction technologies brochure
  - **c.** Website content refresh
  - **d.** Five workshops, seminars and/or site visits with key stakeholders
  - **e.** Success stories report
  - **f.** Country reports describing latest developments in each member country

3. Task leadership and participants

Task Leader: Axel Funke,
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Participants: Canada, Denmark, Finland, Germany, The Netherlands, New Zealand, Norway, Sweden, and United States of America

Task 36 – Material and Energy Valorisation of Waste in a Circular Economy

http://task36.ieabioenergy.com/

1. Definition and Objectives

Definition

Waste is the one biomass resource that is routinely produced in urban environments. In 2012, the World Bank estimated that around 1.3 billion tonnes of municipal solid waste (MSW) are generated each year globally, and it is estimated that will rise to 2.2 billion tonnes by 2025 due to increased urbanisation in developing and emerging economies and the associated increase in per capita production of waste. MSW can be used to provide energy that is integrated into the lives of the population. Its management and use is very relevant to growing cities; and its management changes as the needs of the local population evolve. In addition waste is generally regarded as a sustainable biomass source. It can therefore play an integral role in security of sustainable energy supply.

Skövde Värmeverk Combined Heat and Power Plant, Skövde, Sweden

Objectives

The objective of Task 36 is to collect, analyse, share, and disseminate best practice technical and strategic non-technical information on the material and energy valorisation of waste in a circular economy. This includes the valorisation of the biomass/biogenic fraction of waste into different bioenergy products (heat, power cooling, liquid and gaseous biofuels) but also the possibility of producing renewable chemicals.

2. Work programme

The Task will produce different reports and organise specific international workshops in conjunction with the Task meetings, to cover different aspects of waste management and energy from waste (EfW) as well as its role in a circular economy. The Programme of Work will comprise the following focus areas:

- The role of waste and energy from waste (EfW) in circular economy
  - **a.** *Policies directed towards a Circular economy* – summary report for the member countries
  - **b.** Role of Energy from waste and material recycling in the circular economy
    - **i.** *Valorisation of ashes/residues from EfW* – workshop & topic report
    - **ii.** *Nutrient recovery* – workshop & topic report
    - **iii.** *Carbon material recycling through traditional mechanical methods and through feedstock recycling – workshop & topic report*
  - **c.** *Digitalisation and implications for waste management and energy from waste* – workshop & topic report
  - **d.** Is there a place for decentralised solutions in the circular economy?
- *Co-processing of waste to lower the cost of "raw materials"/low quality feedstocks* – topic report
- Flexibility
  - **a.** contribution to Inter-Task project on *BECCS/U*
  - **b.** contribution to Inter-Task project on *Bioenergy for high temperature heat in industry*
- Communication and dissemination activities (webpage, newsletter, contributions to conferences, webinars)
- Country updates and developments on policy and best practice
- Task meetings to exchange results from relevant national R&D programmes and participant
- Field trips associated with the Task meetings. Presentation of information from these visits will be made available on the Task 36 website

3. Task leadership and participants

Task Leader: Inge Johansson, RISE Research Institutes of Sweden, inge.johansson@ri.se

Participants: Australia, Germany, Italy, Norway, South Africa, Sweden, and United States of America

Task 37 – Energy from Biogas

http://task37.ieabioenergy.com/about-task-37.html

1. Definition and Objectives

Definition

'Anaerobic digestion' (AD) is a microbial process in which microorganisms break down biodegradable material in an oxygen-free environment to produce a solid digestate along with biogas. Task 37 covers the anaerobic digestion (AD) of biomass feedstocks including agricultural residues (e.g. manure and crop residues), energy crops, organic-rich waste waters, the organic fraction of municipal of solid waste (OFMSW) and industrial organic wastes.

Biogas facility at Gösser brewery, Austria

Objectives

The main objective of Task 37 is to to communicate and advance the knowledge of anaerobic digestion systems and their application via circular economy processes to decarbonisation and environmental improvement. The specific objectives include i) providing expert advice on the optimal role of biogas in future energy systems; ii) informing policy makes and developers on sustainability of biogas systems and on methods to ensure good practice; iii) providing expert advice on the integration of anaerobic digestion into processes; iv) providing technical support to policy makers and to the public.

2. Work programme

The Programme of Work will comprise the following focus areas:

- The optimal role of biogas in future energy systems:
  - **a.** *Biomethane as a transport fuel*
  - **b.** *Technical requirements for integration of biogas into the energy system* – in cooperation with Task 44
- Sustainability of biogas systems and methods to ensure good practice:
  - **a.** *Green gas certification & sustainability criteria* – this project will be embedded into the Inter-Task project on deployment of renewable gas.
  - **b.** *Good Management Practice of the anaerobic digestion facility*
- Integration of anaerobic digestion into processes:
  - **a.** *Integration of anaerobic digestion into the agricultural sector*
  - **b.** *Increasing the range of feedstocks for anaerobic digestion*
  - **c.** *Integration of anaerobic digestion into biorefineries* – in cooperation with Task 42
- In collaboration with national organisations workshops will be held at least once each year.
- At least once each year country updates presented by the members will be published on the website.
- The general public will be informed through webinars and evidence of exemplar technologies in case stories.
- The Task website will be regularly updated with news, publications and Task reports.
- Regular newsletter will be produced (nominally 4 per year)

3. Task leadership and participants

Task Leader: Jerry Murphy,
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Participants: Australia, Austria, Brazil, Canada, Denmark, Estonia, Finland, France, Germany, Ireland, Korea, The Netherlands, Sweden, Switzerland and the United Kingdom

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

http://task39.ieabioenergy.com/

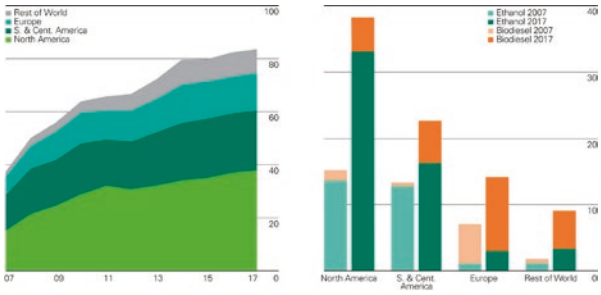
1. Definitions and Objectives

Definitions.

'Conventional biofuels' have reached technological and market maturity and are commercially available; however, advancements in feedstock generation, logistics and pre-processing can further reduce costs and achieve greater environmental performance. Typical conventional biofuels include sugarcane ethanol, starch-based or 'corn' ethanol, biodiesel and virgin or pure plant or vegetable oils. 'Advanced biofuels' use pre-commercial technologies and are produced from non-food crops, agricultural and forest residues and other renewable feedstocks such as organic fractions of municipal solid waste (MSW) and carbonaceous industrial waste gases.

'Drop-in biofuels' are defined as liquid bio-hydrocarbons that are functionally equivalent to petroleum fuels and are fully compatible with existing petroleum infrastructure.

'Electrofuels' are an emerging class of replacement fuels that are made by storing electrical energy from renewable sources in the chemical bonds of liquid or gaseous fuels.



Global biofuels production 2007-2017 (in Mtoe) (BP Statistical Review of World Energy, 2018)

Objectives

The objective of Task 39 is to facilitate commercialisation of conventional and advanced transport biofuels (spanning technical, policy and sustainability considerations) produced from biomass and other renewable feedstocks that contribute to sustainable mobility and transport-related emissions reduction.

2. Work programme

The Programme of Work will comprise the following focus areas:

- Technology and Commercialisation
  - **a.** Extend assessment of drop-in biofuels – focus on *refinery integration and bio-intermediates standards* – cooperation with Task 34
  - **b.** *Decarbonisation strategies for long distance transport sectors*
  - **c.** Assessment of *large-scale demonstration plants* (database)
  - **d.** Successes and lessons learned for *advanced biofuel technologies commercialisation*
  - **e.** *Advanced biofuels in advanced engines – cooperation with Advanced Motor Fuels TCP*
  - **f.** The potential for "*generation 1.5" type feedstocks*
  - **g.** Update on status of *algal biofuel technologies*
- Policy, Markets, Implementation and Sustainability
  - **a.** Update Implementation Agendas report *comparing member country policies and deployment successes*
  - **b.** *Policies to promote drop-in biofuels for highly international aviation and marine sectors* – cooperation with Task 40
  - **c.** Feedstock-to-biofuel *supply chain analysis* for cost reduction
  - **d.** Status of biofuel production and consumption in *emerging markets*
  - **e.** Assessment of the *sustainability of biofuels pathways focused on energy balances and estimated GHG emissions reductions potential for advanced biofuels*
  - **f.** Evaluate *certification schemes* and recommend *improvements for oleochemical and lignocellulosic feedstock-to-biofuel supply chains*
- Communication Strategy to facilitate knowledge transfer and disseminate information
  - **a.** Organise 3 to 5 biofuels relevant workshops/ conferences
  - **b.** Organise 2 business meetings each year with one of the meetings to update Task 39 participants on the biofuels-related developments and activities carried out in their respective member countries
  - **c.** Continued improvements and updating of the Task 39 website;
  - **d.** Publishing 2-3 newsletters per year.

3. Task leadership and participants

Task Leaders: Jim McMillan, NREL (USA), Jim.McMillan@nrel.gov and Jack Saddler, University of British Columbia (Canada), jack.saddler@ubc.ca

Participants: Australia, Austria, Brazil, Canada, Denmark, Germany, India, Ireland, Japan, Korea, The Netherlands, New Zealand, Norway, Sweden, the United States of America and the European Commission

Task 40 – Deployment of biobased value chains

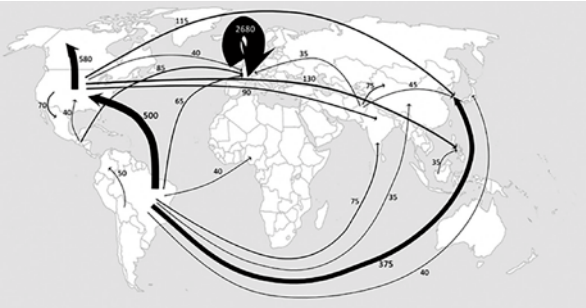
http://task40.ieabioenergy.com/

1. Definition and Objectives

Definition

Within scenarios limiting global temperature increase to well below 2°C – and possibly even 1.5°C, bioenergy as well as bioenergy combined with carbon capture and storage (BECCS) for the removal of CO_2 from the atmosphere may play a vital role. In terms of numbers, a larger amount of energy from biomass may be needed. Furthermore, various countries have targets on the share of energy from renewable sources around the 2030 timeline. Thus, both monitoring progress towards achieving these targets (evaluation of failures and challenges) and assistance for the governance and design of policies for 2030 and beyond are needed during the 2019-2021 triennium.

This will also have to include increased trade of sustainable bioenergy and biomass for the bioeconomy.



Net ethanol trade streams (≥35kt) used for all end-uses (in kt) in 2015.

Objectives

The core objective of Task 40 is to support the deployment of viable, efficient and biobased value chains in the context of

(1) sustainable regional, national and international markets,

(2) reflecting on policy developments, and economic aspects, including financing,

(3) international, national and regional trade of biomass, recognising the diversity in biomass resources, value chains and competitive applications for bioenergy, biobased materials and products (bioeconomy context).

2. Work programme

The Programme of Work will comprise the following focus areas:

- Market developments
  - **a.** *Market perspectives and deployment guidance for aviation and marine biofuels* – Collaborative Inter-Task project with Task 39
  - **b.** *Global and new regional bioenergy markets* – key actors, policies and regulation, and technological challenges regarding deployment, and trade of different feedstocks
  - **c.** *Regional transitions in existing bioenergy markets*
  - **d.** *Synergies between bioenergy and the bioeconomy*
- Industrial Heat and Processes
  - **a.** *Industrial heat and processes* – Contribution to strategic Inter-Task project led by Task 32
  - **b.** *BECCS/U – industries and technologies suitable for BECCS applications, considering deployment requirements* – Collaborative Inter-Task project, led by Task 40
- Deployment Strategies
  - **a.** *Deployment guidance regarding technological barriers, economic aspects & financing*
  - **b.** *Renewable gas – deployment, markets and sustainable trade* – Strategic Inter-Task project, led by Task 40
  - **c.** *Role of bioenergy in a 2°C/SDG world* – Contribution to Strategic Inter-Task project led by Task 45
  - **d.** Financing of sustainable bioenergy projects – supporting coherent standards
- Communication and dissemination activities: 2-3 joint workshops and webinars per year, contribute to conferences and workshops through presentations, panel discussions etc., bi-annual newsletters, website, cooperate with other (EU/international) projects and international organisations (e.g. FAO, GBEP, IRENA, BioFuture Platform, etc).

3. Task leadership and participants

Task Leaders: Uwe R. Fritsche,
IINAS – International Institute for Sustainability Analysis and Strategy, (Germany),
uf@iinas.org in collaboration with
Olle Olsen, SEI – Stockholm Environment Institute (Sweden) and
Christiane Hennig, DBFZ – Deutsches Biomasseforschungszentrum (Germany)

Participants: Belgium, Denmark, Germany, Japan, The Netherlands, Sweden, and the United States of America

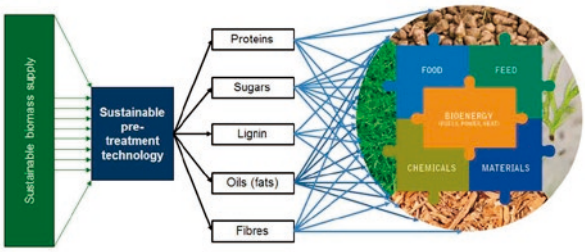
Task 42 – Biorefining in a Circular Economy

http://www.task42.ieabioenergy.com/

1. Definitions and Objectives

Definitions

Biorefining, the sustainable processing of biomass into a spectrum of marketable biobased products and bioenergy/biofuels, is an innovative and efficient approach to use available biomass resources for the synergistic coproduction of power, heat and biofuels alongside food and feed ingredients, pharmaceuticals, chemicals, materials, minerals and short-cyclic CO_2. It is one of the key enabling strategies of the Circular Economy. The Circular Economy is defined as an economy that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological-cycles [Ellen MacArthur Foundation]. The Circular Economy mainly focuses on the efficient use of finite resources and ensures that these resources are re-used as long as possible.



Objectives

The objective of Task 42 is to facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive biorefinery systems and technologies, and to advise policy and industrial decision makers accordingly. Task 42 provides an international platform for collaboration and information exchange. Gaps and barriers to deployment will be addressed to successfully promote sustainable biorefinery systems market implementation.

2. Work programme

The Programme of Work will comprise the following focus areas:

- Provide quantitative, scientifically sound, and understandable data on the technical, economic and environmental added value of biorefining to co-produce bioenergy and bio-products in a sustainable way
  - **a.** Selection of biorefineries for Technical, Economic and Environmental (TEE)-assessment
  - **b.** TEE-assessment of selected biorefineries using Task42's Biorefinery Assessment Platform (BAP)
  - **c.** Preparation of Biorefinery Fact Sheets (BFSs)
  - **d.** Creating IEA Bioenergy broad support for using Task 42's BAP for TEE-assessment integrated biorefineries
- Monitor the biorefineries deployment and market potential, incl. non-technical deployment barriers, in the Circular Economy
  - **a.** Case studies on Barriers and Incentives for the Market Diffusion
  - **b.** Biorefinery Country Reports (slide decks)
  - **c.** Publish a Global Biorefinery Status Report (GBSR)
  - **d.** Global mapping scheme and database on Biorefineries
  - **e.** Reports on markets for biobased products to get insight in deployment strategies – Sustainable Lignin Valorisation
  - **f.** Monitor international developments biobased products standardisation/certification (slide decks)
- Provision of an international platform for cooperation and information exchange: up-to-date Task 42 website, biannual Task 42 newsletters, lecturing at international conferences, using new social media, organising a Thematic Stakeholder Workshops, organising national Task 42 stakeholder events, and contributing to Biorefinery Training Schools.

3. Task leadership and participants

Task Leader: Bert Annevelink,
Wageningen Food and Biobased Research (the Netherlands),
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Participants: Australia, Austria, Denmark, Germany, Ireland, Italy, The Netherlands and Sweden

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

http://task43.ieabioenergy.com/

1. Definition and Objectives

Definition

To sustainably support the repositioning of biomass supply for bioenergy within the broader bioeconomy, significant advances in the methods, technologies and systems deployed for biomass production, supply and logistics are needed. The provision of available biomass will need to increase through improved production and mobilisation systems, greater and more efficient use of residue streams, better overall recovery of available biomass, and resource efficiency in all sectors. Further gains are possible through increased emphasis on biomass composition and quality, including aiming at enhanced cascading use, to allow production and logistics that ensure biomass properties are well suited to given use allowing production at the highest efficiency that delivers more functionalities from less. At the foundation of supply chains, a clear understanding of value is needed to ensure the right biomass is delivered to the best use and provides the best value across the supply chains, fostering sustained low-carbon economic growth.

Objectives

The Task will explore technical and economic strategies to increase the quantity of biomass available, improve the quality of the biomass delivered for different energy purposes, and explore strategies to increase the value and foster confidence in biomass supply, for both direct and cascade use of biomass for bioenergy. The Task focus will be on the production and supply of biomass feedstock for energy leading to value creation within the broader context of bioeconomy. It will look for innovative biomass supply chains that would facilitate the transition of the bioenergy sector towards the bioeconomy.

2. Work programme

The Programme of Work will comprise the following focus areas:

- Biomass production systems for sustainable bioenergy within the bioeconomy
  - **a.** *Strategies to integrate innovated biomass crops to leverage and expand existing residue and co-product supply chains* – workshop & report
  - **b.** *Scale of different biomass crops to economically supply bioenergy production as sole source and as an integrated contribution to residue supply chains* – report
  - **c.** *Quantifying the socioeconomic values of biomass crops as a part of local, regional and national renewable energy strategies* – workshop & report
  - **d.** *Influencing biomass sustainability through strategies to increase volume, value and quality of biomass supply* – workshop & report
- Integrated supply chain and logistics for sustainable bioenergy within the bioeconomy
  - **a.** Key *biomass quality drivers as they relate to bioenergy technology needs* – workshop & report
  - **b.** Identifying and managing *technology bottlenecks in biomass supply chains* – workshop & report
  - **c.** Opportunities to economically *extend the range of biomass supply chains through new and emerging biomass technology* – workshop & report
  - **d.** *Improving biomass quality and value with pre-processing or pre-treatment within the supply chain* – report

- Engagement and communication: prepare statements on topics of key public interest; engage with renewable energy policy development; facilitate dialogue amongst researchers, industry and policymakers through participation in workshops and online discussion forums; engage with industry to provide guidance on production and supply chains to deliver quantity and quality biomass and improve understanding on the critical aspects of biomass supply and logistics; highlighting how socio-economic values vary across and between the biomass supply chains; assess and communicate the uncertainty in projections of biomass feedstock potentials and seek to close knowledge gaps around integrated biomass production, supply chain and logistics

3. Task leadership and participants

Task Leader: Mark Brown,
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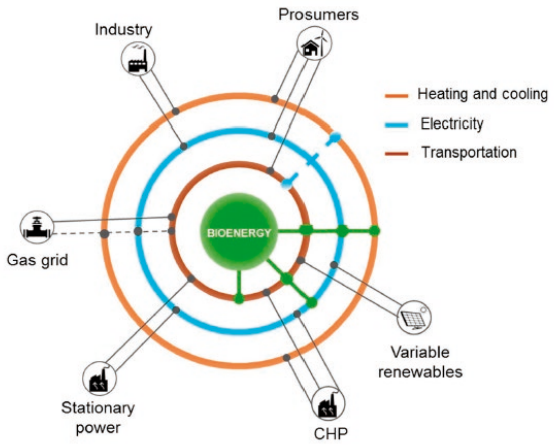
Participants: Australia, Belgium, Canada, Croatia, Finland, Germany, Sweden, and the United States of America

Task 44 – Flexible bioenergy and system integration

http://task44.ieabioenergy.com/



1. Definition and Objectives

Definition

'Flexible bioenergy and system integration' refers to technologies, approaches and strategies that rely on bioenergy to facilitate large-scale introduction of variable renewable energy (like wind and solar) to the energy system. Bioenergy has some unique properties that can address many of the problems related to the rapid transition to a low-carbon energy system. When sustainably sourced and used, bioenergy can (i) operate as a key element in the coupling of different energy sectors; (ii) provide low-carbon energy to complement wind and solar (residual load and grid stabilisation); (iii) store electricity chemically into fuels to enable more efficient use of wind and solar; (iv) provide sustainable fuels for sectors where other decarbonisation options are not available or exceedingly expensive; (v) provide high temperature heat to industry, and low temperature heat for buildings (and sanitary water) during dark and cold seasons; (vi) coproduce heat, electricity, fuels and other products in a single high-efficiency processing plant.

Objectives

The objective of Task 44 is to contribute to the development and analysis of flexible bioenergy solutions for a low carbon energy system. The aim is to improve understanding on the types, quality and status of flexible bioenergy, and identification of barriers and future development needs in the context of the entire energy system (power, heat and transport).

2. Work programme

The Programme of Work will comprise the following focus areas:

- *Flexible bioenergy concepts* for supporting low-carbon energy systems
- Acceleration of implementation
  - **a.** *State of the art of flexible bioenergy*
  - **b.** *RDD&I Roadmap* (focussing on bottlenecks, and required key actions for different stakeholders)
- System requirements for bioenergy concepts
  - **a.** Workshop report and/or webinar on "*Renewables integration*" (focussing on the role and added value of flexible bioenergy
  - **b.** Workshop report and/or webinar on "*Role of bioenergy in a low-carbon energy system*"
  - **c.** Contribution to Inter-Task project on the *Role of bioenergy in a WB2/SDG world*
- Communication and dissemination: website update, social media, workshops, scientific publishing.

3. Task leadership and participants

Task Leader: Ilkka Hannula,
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Task 45 – Climate and sustainability effects of bioenergy within the broader bioeconomy

http://task45.ieabioenergy.com/

1. Definition and Objectives

Definition

Ambition to limit global warming is potentially a major driver of biomass demand growth. Biomass contributes significantly to the energy supply in most modelling scenarios that keep global warming below 2°C. Bioenergy and bioeconomy development has the potential to contribute to nearly all the United Nations Sustainable Development Goals (SDGs). Furthermore, bioenergy can play a role in reclamation and improved land management in pursuit of Land Degradation Neutrality (LDN), which aims to avoid or reduce degradation as well as restore degraded land.

Regardless of whether biomass is used to displace fossil fuels in response to climate and energy policies or used for other applications in response to policies that are designed to promote innovation and growth in the biobased industry, science-based sustainability assessment will be essential to support responsible use of biomass resources. Implementation strategies for sustainable bioenergy, supported by science-based information, will be essential to avoid or mitigate negative effects and to incentivise sustainable supply and promote innovation.

Sustainability standards and certification systems are tools that can play an important role, especially for internationally traded biomass and biofuels, along with best practice guidelines and principles of adaptive landscape management applied at a local level.

Objectives

The objective of Task 45 is to identify and address critical issues related to the climate and other sustainability effects of bioenergy and biobased products and systems. The aim is to promote sound development for bioenergy as an integral component of the overall bioeconomy. This objective will be achieved by providing analyses that support well-informed decisions by land owners, communities, businesses, governments and others.

A key goal is to increase understanding of the environmental, social and economic impacts of producing and using biomass for bioenergy, within the broader bioeconomy. A central aspect concerns the development and application of science-based methodologies and tools for assessing the effects of biobased systems.

2. Work programme

The Programme of Work will comprise the following focus areas:

- Metrics, methods, and tools for assessing climate change effects of bioenergy
  - **i.** Scientific workshops (2) on *assessment of climate effects*
  - **ii.** *Scientific papers, technical reports, policy briefs, webinars*
- Metrics, methods and tools for assessing sustainability effects of bioenergy (excluding climate change effects)
  - **i.** Scientific workshops (2) on *assessment of sustainability effects*
  - **ii.** *Scientific papers, technical reports, policy briefs, webinars*
- Sustainability stakeholders and implementation approaches (governance)
  - **i.** *Stakeholder Identification, Analysis, and Mapping*
  - **ii.** *Implementation Strategies*: support decision makers in identifying and promoting biomass-based value chain implementation strategies adapted to local/regional context, including supply chain relations.
  - **iii.** *Stakeholder Interaction, Outreach and Steps towards Implementation: options to de-risks bioenergy investment, and discuss how IEA Bioenergy can be helpful for designing and initiating novel and coherent implementation strategies for sustainable bioenergy.*

- Contribution to Inter-Task projects:
  - **i.** *Applied sustainability assessments* – interaction with other Tasks
  - **ii.** *Bioenergy in a 2°C/SDG world* – lead by Task 45
  - **iii.** *Renewable gas – lead by Task 40*
- Strategic outreach: Update IEA Bioenergy FAQ on climate effects of bioenergy, prepare statements on topics of key public interest; engage with climate change and renewable energy policy development and sustainability certification processes; facilitate dialogue amongst researchers through participation in workshops; engage with industry to provide guidance on assessment methods and to improve understanding on the critical aspects of the climate impact analyses of bioenergy; assess and communicate the uncertainty in projections of potential land use change and sustainability effects; communicate the findings on quantifying and qualifying sustainability effects to inform governance.

3. Task leadership and participants

Task Leaders: Göran Berndes, Chalmers University of Technology (Sweden), goran.berndes@chalmers.se; WP1 Lead: Annette Cowie, NSW Department of Primary Industries (Australia); WP2 Lead: Floor van der Hilst, Utrecht University (Netherlands); WP3 Lead: Uwe Fritsche, IINAS (Germany)

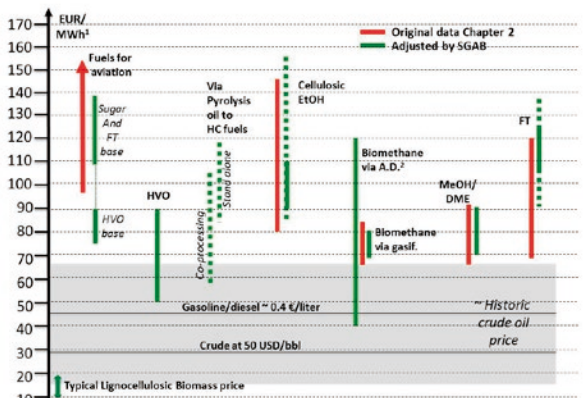
Participants: Australia, Brazil, Denmark, Finland, France, Germany, Ireland, The Netherlands, Norway, Sweden, the United Kingdom and the United States of America

Special Project 9 – The potential for cost reduction for novel and advanced renewable and low carbon Fuels

1. Definitions and Objective

Background:

The IEA *Technology Roadmap: Delivering Sustainable Bioenergy* highlights the important role that bioenergy needs to play in low carbon scenarios such as the IEA's 2DS Scenario, and emphasises particularly the role of biofuels in the transport sector. In the 2DS the contribution of biofuels in transport rises 10-fold by 2060 approaching 30 EJ and provides around 30% of the sectors total energy needs, with particularly important roles in aviation, shipping and other long-haul transport. New biofuels which can be effective in these end uses and which have very low greenhouse gas emissions will be needed to supply these needs in addition to the more established conventional biofuels. A range of interesting technologies and fuels which promise to meet these needs are under development but are not yet fully commercialised or produced at scale, although recent progress has been encouraging. Inevitably the costs of such fuel are currently high – 2-3 times those of their fossil fuel competitors, and also of conventional biofuels, on an energy basis. It is important to understand the potential for cost reduction through R&D, through scaling up plant sise and through experience of building and operating large-scale production plant. Like other technologies there is likely to be important scope for cost reduction due to learning effects, but the situation for biofuels is perhaps more complex as the scope for reduction in feedstock costs may be limited. From a policy perspective it is important to understand whether and under what conditions these novel advanced biofuels could become cost competitive with other fuels relevant to their sector. This can help to understand the likely support costs that will be required to "buy-down" the costs and the policy implications of the developments of such fuels.



Summary of biofuel production costs (European Sub Group on Advanced Biofuels, 2017)

Objective:

The objectives of this Strategic Project will be to:

- identify the scope for cost reduction for novel advanced biofuels,
- to develop a model for likely costs as deployment grows,
- to compare these costs with likely trends in fossil fuel prices, and those of conventional biofuels,
- to examine the impact of policy measures, including carbon pricing, on the competitiveness of novel biofuels.

The project will consider the range of promising technologies and fuels based on biomass which are under development, along with a range of other low carbon fuels including those based on recovered carbon rich industrial gases.

2. Work programme

The Programme of Work will comprise the following:

- Collect industry information on current costs and scope for cost reduction
- Normalise and rationalise the data on current costs and compare with 2017 study of the EC Sub Group on Advanced Biofuels (SGAB)
- Evaluate potential for cost reduction
  - **a.** For next x plants based on data from industry
  - **b.** Extrapolate to large scale deployment
- Compare with future fossil fuel price scenarios with and without policy support

3. Leadership and participants

Coordination: Adam Brown,
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Participants: European Commission, Sweden, Germany and The Netherlands

Special Project 10 – The contribution of Advanced Renewable Transport Fuels to transport decarbonisation in 2030 and beyond

1. Definition and Objective

Definition

The 2017 IEA Bioenergy Technology Roadmap emphasttes particularly the role of biofuels in the transport sector. In the 2DS scenario the contribution of biofuels in transport rises 10-fold by 2060 approaching 30 EJ and provides around 30% of the sectors total energy needs, with particularly important roles in aviation, shipping and other long-haul transport. New biofuels which can be effective in these end uses and which have very low greenhouse gas emissions will be needed to supply these needs in addition to the more established conventional biofuels. There is also a high demand for advanced renewable transport fuels in a shorter perspective, with renewable energy and greenhouse gas emission targets currently being set for 2030 (e.g. in the EU). For instance, Finland has a national target of reducing transport CO_2 emissions by 50% by the year 2030, and Sweden has an even higher target, 70% by 2030. To meet the deep decarbonisation targets, a combination of energy efficiency measures, renewable fuels and electrification is necessary. However, as electrification is progressing rather slowly, and is not suited for every transport application, it is obvious that significant amounts or advanced renewable transport fuels will be needed by 2030.

Objective:

The objectives of this Strategic Project will be to:

- Bring together the expertise of the IEA AMF TCP, IEA Bioenergy TCP and national experts to showcase the role of advanced renewable transport fuels to transport decarbonisation in 2030 and beyond.
- Analyse national strategies for transport decarbonisation.
- Identify possible challenges and hurdles for the implementation of advanced renewable transport fuels (both regarding fuel production and end-use in vehicles)
- Identify policy gaps and provide recommendations how to overcome them

The project will assess the potential of advanced renewable transport fuels from three different angles: policy, markets and technology.

2. Work programme

The Programme of Work will comprise the following:

- Identify 5-7 countries/markets to be analysed in-depth. In particular, the project should examine the policies of the European Union, Sweden, Finland, USA, Brazil and India as well as others that wish to contribute resources to the project.
- Obtain the key strategies for transport decarbonisation and introduction of alternative fuels in selected countries, with targets for CO_2 reductions in transport up to as high as 50% (Finland) and 70% (Sweden) by 2030.
- Assess the need for renewable fuels to reach the CO_2 emission reduction targets in various countries.
- Consider the availability of robust technologies for the production of biofuels and evaluate the projections for fuel supply and vehicle technology towards 2030.
- Consider combinations of energy efficiency, electrification and renewable liquid and gaseous fuels.
- Explore the potential market share of biofuels and renewable fuels in 2030.

3. Leadership and participants

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Participants: European Commission, Finland, Brazil, Germany, India, and the United States of America

Carried out in cooperation with the IEA AMF TCP.

IEA Bioenergy

Further Information

IEA Bioenergy Website
www.ieabioenergy.com

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www.ieabioenergy.com/contact-us/