



IEA Bioenergy
Technology Collaboration Programme

IEA Bioenergy

Work Programme

2022-2024 Triennium





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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 August 2022, 25 countries and the European Commission are participating in IEA Bioenergy: Australia, Austria, Belgium, Brazil, Canada, China, 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.

IEA Bioenergy's vision is that modern bioenergy is, and will continue to be, a leading type of renewable energy, making an important contribution in reaching an energy secure and net-zero energy mix. Bioenergy is an integral part of developments towards a circular biobased economy. By accelerating the sustainable production and efficient use of biomass, economic and environmental impacts will be optimised resulting in more cost-competitive bioenergy and biobased applications and reduced greenhouse gas emissions.

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, low-carbon bioenergy systems and technologies, and to advise policy and industrial decision makers accordingly. IEA Bioenergy realises the mission by providing platforms for international collaboration and information exchange in bioenergy research, technology development, demonstration, and policy analysis—including through network development, information dissemination, and the provision of science-based analysis and advice.

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 2022 and will run to the end of December 2024.

This document describes the scheduled activities of the 11 Tasks of IEA Bioenergy for the triennium 2022-2024. 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

<https://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.

Objective

The objective of Task 32 is to collect, analyse, share, and disseminate strategic, technical and non-technical information on biomass combustion applications, leading to further acceptance, deployment 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 to describe its role in future energy systems in the member countries, especially in a future with focus on net negative CO₂ emissions.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Substituting fossil fuels in industry
- Sustainable large scale biomass CHP with net negative CO₂ emissions
 - Biomass combustion and carbon capture (With Task 36 and Task 40)
 - Biomass combustion and Power-to-X (With Task 44)
 - Role of biomass power in future energy systems
 - Public perception of CO₂-neutrality and sustainability of bioenergy from biomass combustion (With Task 45)
 - Operational experiences of large biomass combustion plants
 - Workshop on experiences with combustion of pulverised non-woody solid biofuels
 - Workshop on experiences with wood chips for CHP production
 - Prospects of replacing coal in the energy system in developing countries (conditional)
- Innovative low emission biomass heating plants
 - Reducing NO_x emissions from biomass combustion
 - Study of the nitrogen cycle in biomass combustion plants
 - Optimising efficiency and reducing emissions
 - Options for small scale bioenergy with carbon capture and storage (BECCS)

- Low emission residential appliances
 - State-of-the-art biomass boiler systems
 - Sustainable low emission stoves
 - Future emission policy strategies inventory part II
- Dissemination

The results from the work in Task 32 will be disseminated through the Task 32 and IEA Bioenergy websites as well as via a semi-annual newsletter. The various reports of task projects will be made available online, along with task newsletters and workshop reports. Task members will promote news from Task 32 via their national networks. Task 32 also plans to generate input for IEA Bioenergy's website, social media accounts and webinars.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

Task Leader:

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TASK 33 | Gasification of Biogenic Residue and its Applications

<http://task33.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

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.

Objective

The objectives of Task 33 are:

- to be a visible and accessible platform for various industrial stakeholders that utilize gasification;
- to showcase the various applications where gasification plays a crucial role (CHP, SNG, fuels, chemical and H₂) and underline the role of carbon capture and storage (CCS) in these applications; and
- assist and support IEA Bioenergy ExCo in developing sustainable bioenergy strategies and policy recommendations by providing technical, economic, and sustainability information for biomass and waste gasification value chain.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Developing Task content
 - Website updates
 - Implementation strategy on synthetic natural gas (SNG)
 - Implementation Strategy on chemicals
 - Factsheet on negative emissions

The focus will be on the applications of gasification, with the goal of clearly identifying all possible applications and describing the advantages of each route.

The following topics will be addressed: CHP, SNG; Fuels; Chemicals; Hydrogen; and CO₂. For each of these topics (excluding CO₂), the following elements will be developed:

- Description of the technology
- Outline of the commercial activities
- Company overview
- Discussion on threats and opportunities
- Suggested R&D topics
- Suggested implementation strategy

- Dissemination
 - Workshop report on SNG
 - Workshop report on chemicals
 - Webinars

The various reports for Task Projects will be published on the web-sites of Task 33 and of IEA Bioenergy, and they will be publicized on social media. Each new result will be accompanied by a 2 pager with a concise summary focused on the specific target audience.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

Task Leader:

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TASK 34 | Direct Thermochemical Liquefaction

<https://task34.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

‘Thermochemical liquefaction’ is the controlled thermal degradation of biomass in any form to derive valuable energy and chemical products.

Objective

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

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Deployment of marketable commodities from DTL
 - (Pathways to) Transportation fuels from hydrothermal liquefaction (HTL) and fast pyrolysis (FP)
 - Production of chemicals and materials from HTL and FP oil (science and industry)
 - DTL oils for gasification
- DTL system services for a future circular economy
 - DTL in the context of flexible power supply
 - Fast pyrolysis as BECCS/U technology
- Support commercialization through knowledge transfer
 - Round Robin for validation of analytical method
 - Lessons learnt from fast pyrolysis bio-oil (FPBO) REACH & GHS registration
 - Update commercial DTL facilities
- Facilitate information exchange with stakeholders
 - Six issues of PyNe Newsletter
 - Six Workshops/ Seminars
 - Three Country Report Updates
- Dissemination

In addition to the above, the knowledge and outcomes of the Task will be disseminated by National Team Leaders in their own countries. These dissemination activities aim to: attract new members to join the task; maintain an expert network; and, most importantly, increase the knowledge of commercial stakeholders on direct thermochemical liquefaction technologies to accelerate their deployment.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

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TASK 36 | Material and Energy Valorisation of Waste in a Circular Economy

<https://task36.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

A 'circular economy' is an industrial system that is restorative or regenerative by design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.

Objective

Task 36 follows the integration of the Energy from Waste (EfW) in a circular economy by means of material and energy valorisation of waste, and its contribution to the global deployment of bioenergy. The Task is designed to facilitate exchange of information on strategic technical and non-technical issues related to the integration of energy into waste management decision-making and operations. While stakeholders contributing to this exchange of information include researchers, the waste and recycling and recovery industry, the energy from waste sector, policy makers and local decision makers. The Task proposes to prioritise information for policy and decision makers. The Task is aware of issues that influence energy from waste that are covered in other Tasks in IEA Bioenergy as well as by other international organisations in the field and is working together with them.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- The role of EfW in the circular economy
 - Integration of EfW and material recycling/recovery into industry
 - Potential synergies between EfW and material recycling
 - Resource recovery from residues generated by EfW
 - The potential of Carbon capture and utilisation (CCU) within EfW
- Sustainability
 - Sustainability metrics and public acceptance
 - Environmental performance of different waste management strategies
 - Impact of new technologies: economical and societal aspects
- Evaluation of new technology pathways
 - Hydrogen from waste
 - High value products from waste
 - Organic waste - current options and solutions under development
 - Sewage sludge valorisation
 - Mixed waste plastics recycling and utilization

- Future scenarios: new waste streams, composition, and amounts
- Smart technologies for waste sorting
- Dissemination
The Task will use different channels to spread out the information gathered during the triennium, namely: the Task 36 website; Newsletters; participation in webinars under the IEA Bioenergy umbrella and organization of a series workshop to focus on local/regional topics; communication platforms to increase visibility of the Task and reach a new and wider audience; and short films on the main outcomes of key deliverables. In addition, Task members will spread the information collected by the Task in conferences and relevant national and international events.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

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**contingent upon ministerial approval*



TASK 37 | Energy from Biogas

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

1. DEFINITION AND OBJECTIVE

Definition

‘Energy from biological conversion of organic waste’ refers to recovering energy from anaerobic digestion of municipal solid waste (MSW), sewage sludge, energy crops or agricultural residues (in conjunction with MSW or organic industrial waste) using engineered reactors.

Objective

The main objective of the Task 37 work program is to address the challenges related to the economic and environmental sustainability of biogas production and utilization. This overall objective will be pursued mainly through the collection, communication and advancement of knowledge of anaerobic digestion systems and their application. AD systems will be discussed in the context of circular economy processes and improvement of environment, decarbonisation of energy provision, waste management and agricultural processes.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Role of anaerobic digestion in agriculture
 - Assessment of co-benefits of biogas in a circular economy system
 - Detailed assessment of an optimised utilization of manure
 - Role of biogas in decarbonisation of industry
 - Decarbonisation of food and beverage industry
 - Biogas in the energy system
 - Energy and transport fuels from renewable gases
 - Emissions, process development and monitoring
 - Efficacy of continuous tests
 - How to treat and reduce the methane slip at biogas systems and landfill
 - Best Practice and knowledge sharing
 - Economics and GHG marginal abatement costs
 - Dissemination
- Further to the above, dissemination will be effected through symposia, workshops, webinars, case stories, publication of technical reports, and social media. Task members will engage in face-to-face communication with regional and national biogas associations, national governments, governmental agencies and energy utilities.

3. TASK LEADERSHIP AND PARTICIPANTS

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**contingent upon ministerial approval*



TASK 39 | Biofuels to Decarbonize Transport

<https://task39.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

‘Liquid Biofuels’ means liquid fuels derived from biomass, such as ethanol and biodiesel, used primarily in the transportation sector. ‘1st generation biofuels’ means liquid biofuels derived primarily from food- or food-related feedstocks, including sugar, starch, and oilseeds. ‘2nd generation biofuels’ means liquid biofuels derived from structural components of plants and trees. ‘Sustainable Deployment’ means deployment of technologies on a long-term renewable basis.

Objective

The overall objective of Task 39 is to facilitate commercialization of biogenic derived, sustainable, low-CI biofuels for transport. This includes conventional and advanced biofuels produced through various technology routes such as oleochemical, biochemical, thermochemical and hybrid conversion technology pathways. The main goal is to help speed decarbonization of the multi-faceted transport sector with an increasing focus on the more difficult to electrify long-distance transport sector.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Technology and commercialization
 - Update assessment of potential and growth of drop-in biofuels, particularly co-processing of lipids, biocrudes and bio-intermediates in petroleum refineries and its potential to reduce final fuels’ CI. Plus, progress on the development of standards for bio-crudes/intermediates.
 - Extend development of decarbonization strategies for long distance aviation transport sector.
 - Extend assessment of decarbonization of the long-distance marine transport sector and evaluate the commercial production and use of biofuels in the marine sector.
 - Assess and map demonstration plants and commercialization progress.
 - Evaluate successes and lessons learned for commercialization of advanced biofuels technologies, including cellulosic ethanol.
 - Synergies of green hydrogen and bioenergy deployment.
- Sustainability, Policy, Markets and Implementation
 - Update Implementation Agendas compare-and-contrast report of each member country’s biofuels policies that have been/are being used to develop, deploy and expand biofuels production and use. Assess policy successes regarding decarbonizing transport.
 - Extend assessment of the sustainability of biofuels pathways, including review and evaluation of how much existing biofuels policies incorporate social and environmental aspects of sustainability, the specific impact of various proposed “new/advanced” feedstocks on the CI of biofuels, and also further compare and harmonize leading LCA models being used to support biofuels categorization and regulation.

- Review existing and emerging/proposed certifications for both oleochemical and lignocellulosic feedstock-to-biofuel supply chains, and other potential renewable fuels, identifying opportunities to improve and extend supply chain certification schemes.
- Extend analysis of status of biofuel production and use potentials in emerging countries/markets.
- Dissemination
The Task will facilitate knowledge transfer and dissemination of information between IEA Bioenergy members and other transport biofuels and low CI fuels stakeholders/organizations. It will continue to publish 3 Newsletters per year, and to maintain a database of advanced biofuels production facilities. The Task will continue to organize and participate in virtual webinars and conferences. In addition, it will organize Inter-Task workshops.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

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**contingent upon ministerial approval*



TASK 40 | Deployment of Biobased Value Chains

<https://task40.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

With solar and wind becoming cost-effective globally, the electrification of energy and transport systems and their integration (sector coupling) gained prominence, and a “green” hydrogen economy appeared as a long-term vision, in parallel to a “renewable carbon economy” which not only reduces CO₂ emissions but makes use of carbon, beyond burning for energy. With continued cost reductions for solar, wind and batteries, but only little improvement expected for bioenergy, it is unlikely that bioenergy will be long-term competitive with other renewables in bulk electricity and low-temperature heat markets. Yet, increased electricity from solar and wind implies rising needs for system services such as flexibility which bioenergy can deliver - but this requires respective market designs. The circular sustainable bioeconomy is increasingly recognized as the “umbrella” concept (paradigm) under which bioenergy has a role to play, and this role needs to be elaborated in consideration of the transformation of bioenergy systems towards this role.

Objective

The core objective of the Task is to support the deployment of viable, efficient, and profitable biobased value chains and their respective system services and value created in the context of:

- sustainable, regional, national and international markets, including trade issues;
- reflecting on policy developments and economic aspects, e.g., carbon markets and financing; and
- long-term climate and sustainability requirements.

Task 40 sees its role and mission in clarifying the conditions of deploying biobased value chains - especially bioenergy - within the bioeconomy, considering the longer-term climate and sustainability requirements, and the role of bioenergy and bioderived high value co-products in carbon management as part of a future circular carbon economy. Task 40 provides orientation in this complex field of deployment:

- Where and for what bioenergy can be used most effectively and efficiently, given limited sustainable resources?
- How could transitioning towards future uses of biogenic carbon to provide energy services in synergy with ecosystem-, material-, nutritional- and environmental services look like, and how could those become profitable?

In short, the Task will work on deploying sustainable biomass for energy in the context of the larger bioeconomy and a future renewable carbon economy.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Market developments
 - Regional bioenergy markets and transitions
 - Sustainable biobased value chains in the circular bioeconomy context

- BECCUS & carbon markets/valorization
 - Industrial processes: technologies, markets, and deployment - exploring technical options and industrial markets that can be targeted in the short and medium term (focus on high temperature heat).
 - Management of Biogenic CO₂: BECCUS Inter-task Phase 2 (follow-up Inter-task project).
- Deployment Strategies
 - Guidance on sustainable financing
 - Synergies of green H₂ and Bioenergy deployment (new Inter-task project)
 - Role of bioenergy in a well-below-2° C/SDG world - follow-up Inter-task project (tentative)
- Dissemination

The Task will organize 2-3 joint workshops and webinars on Task and Inter-task projects per year (average). In addition, it will contribute to conferences and workshops, mainly through presentations and panel discussions. The Task will continue to publish two Newsletters per year. Task Leaders will actively communicate Task activities and results through their social media accounts and websites, and they will communicate selected results via peer-reviewed journal articles.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

Task Leader:

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TASK 42 | Biorefining in a Circular Economy

<https://task42.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

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 co-production of power, heat and biofuels alongside food and feed ingredients, pharmaceuticals, chemicals, materials, minerals and short-cyclic CO₂. 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. Biorefining is one of the key enabling strategies of the Circular Economy, closing loops of raw biomass materials (re-use of forestry, agro, process and postconsumer residues), minerals, water and carbon. Therefore, biorefining is the optimal strategy for large-scale sustainable use of biomass in the BioEconomy. It will result in cost-competitive co-production of food/feed ingredients, biobased products and bioenergy combined with optimal socio-economic and environmental impacts (efficient use of resources, reduced GHG emissions, etc.).

Objective

The aim of IEA Bioenergy Task 42 ‘Biorefining in a Circular Economy’ 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 between industry, SMEs, GOs, NGOs, RTOs and universities concerning biorefinery research, development, demonstration and policy analysis. This includes the development of networks, dissemination of information, and provision of science-based technology analysis, as well as support and advice to policy makers, involvement of industry, and encouragement of membership by countries with a strong biorefinery infrastructure and appropriate policies. 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:

- Techno Economic Environmental (TEE) assessment of biorefinery and dissemination of results
 - Update and maintain TEE assessment methodology
 - Factsheets
- Global Biorefineries Atlas portal with Web Map Service (WMS) and Web Feature Service (WFS) services
 - Update and maintain Global Biorefineries Atlas portal
- Current status of biorefinery deployment and best practice identification
 - Biorefinery country reports (slide decks)
 - Green biorefinery status report
 - Barriers and incentives for market diffusion

- BIOCarbon-to-Chemicals by Integration of biorefineries and green hydrogen (BIOCCI)
 - Integration of biorefineries with renewable electricity systems
- Dissemination & Communication

The main Task 42 deliverables will be actively disseminated to all target groups, through: the Task web-site, lectures at international conferences, webinars, a broad Stakeholder Workshop, and articles in scientific journals. Efforts will be made to organize a Special Issue in a Scientific journal. Furthermore, the possibility to initiate a new journal on Biorefineries and related topics will be investigated.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

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Participants: Australia*, Austria, Denmark, Germany, Ireland, Italy, The Netherlands, and United States of America

**contingent upon ministerial approval*



TASK 43 | Biomass Supply in Sustainable and Circular Economies

<https://task43.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

To sustainably support the repositioning of biomass supply for bioenergy within the broader sustainable and circular bioeconomy, significant advances in the methods, technologies and systems deployed for biomass production, recovery, supply and logistics are needed. The provision of available biomass will need to increase through improved production, recovery, and mobilization systems, greater and more efficient use of residue streams, better overall recovery of sustainable 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.

Objective

Address barriers to sustainably-sourced biomass supply chains by:

- analyzing and quantifying current opportunities;
- improving supply chain efficiencies; and
- biohubs for high value, integrated biomass supply in sustainable and circular economies.

All three items involve documenting strategies for adapting biomass supply to support thriving bioeconomies and contribute to multiple SDGs through improved land, forest and materials management providing renewable resources to sustainable and circular economies.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Biomass production systems for sustainable bioenergy within sustainable & circular bioeconomies.
 - Strategies for transition to circular business models that quantify, produce, and expand supplies of sustainably-sourced biomass for bioenergy, while considering cascading biomass use principles.
 - Document current best practices and applications for quantifying socioeconomic values of biomass crops and crop residue as a part of local, regional and national sustainable and circular economy strategies.
- Biomass supply material handling strategies & advanced recovery systems for waste and residue biomass.
 - Case studies in best practice and technology for biomass waste and residue recovery from primary production (agriculture and/or forestry), biobased manufacturing industries, and post-consumer (MSW) biomass waste.
 - Identifying and managing technology bottlenecks in handling a mix of waste/residue biomass and primary sourced biomass.

- Biohubs for high value, integrated biomass supply in sustainable & circular economies.
 - Improved biomass supply quantity, quality and reliability through effective sustainable and circular economy based biohubs.
 - Characterization of biomass (inputs) and commodities (outputs) through innovative biohubs.
- Dissemination
 The Task aims to support overall IEA Bioenergy communications with periodic summary reports, country reports and T43 highlights in newsletters (at least one communication document per quarter). Additionally, the Task will expand outreach to current and future researchers and students through virtual learning courses and collaborations on sustainable biomass resource assessments and best practices with universities and the “Global Challenges University Alliance”.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

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**contingent upon ministerial approval*



TASK 44 | Flexible Bioenergy and System Integration

<https://task44.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

‘Flexible bioenergy and system integration’ refers to technologies, approaches and strategies that rely on bioenergy to facilitate large-scale introduction of wind and solar to the energy system.

Objective

The task contributes to the development and analysis of bioenergy solutions that can provide flexible resources for a low-carbon energy system. The objective is to improve understanding on the types, quality and status of flexible bioenergy and its future role, and identification of barriers and future development needs in the context of the entire energy system (power, heat and transport). This can be seen through three high level objectives:

1. To identify and evaluate viable flexible bioenergy concepts for supporting low-carbon energy systems
2. To identify system requirements for flexible bioenergy concepts
3. To accelerate the implementation of flexible bioenergy concepts

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Flexible bioenergy concepts - Best Practice examples
 - Expert workshop on flexibility provision from bioenergy and workshop report / Technical Tasks, external experts
 - Best Practice descriptions on flexible bioenergy, collection and presentation in cooperation with technical Tasks / Project developers, energy utilities
 - Report on “Technologies for Flexible Bioenergy” - Update on the 2021 version / Project developers, policy makers
- Flexible bioenergy integration in energy systems
 - Workshop on flexibility in energy system modelling and a workshop report / Energy system modellers
 - Joint workshop with IEA-TCPs / IEA, other IEA TCPs (tbc)
- Acceleration of flexible bioenergy concepts implementation
 - Report on “Flexible bioenergy policies” / Policy makers
 - Report on “Value of flexibility” / Project owners, policy makers
- Inter-task projects and collaborative projects
 - Leadership of Inter-task project “Synergies of green hydrogen and bioenergy deployment”
 - Contribution to Inter-task project “Management of Biogenic CO₂: BECCUS Inter-task Phase 2”

- **Dissemination**

A major instrument for dissemination will be the Task website, along with social media and especially the LinkedIn group “Flexible Bioenergy”. Scientific publications and communication of results are foreseen, and at least two workshops and inter-TCP workshop(s) will be organized. Task members will continue to play a key role in communicating to their national target groups, through workshops and other events, and through social media.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

Task Leader:

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Participants:

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**contingent upon ministerial approval*



TASK 45 | Climate and Sustainability Effects of Bioenergy within the broader Bioeconomy

<https://task45.ieabioenergy.com/>

1. DEFINITION AND OBJECTIVE

Definition

The demand for land and biomass is expected to increase, as a growing and wealthier global population requires more food, paper, construction wood, bioenergy and other biobased products. Ambitions to limit global warming is potentially a major driver of biomass demand growth. As summarized in IPCC reports, biomass contributes significantly to the energy supply in most modelling scenarios that keep global warming below 1.5 or 2°C. It is also emphasized that bioenergy and bioeconomy development has the potential to contribute to, or have positive effects on, 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 prevent unacceptable impacts and to incentivize 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.

Objective

Promote sound development for bioenergy as an integral component of the overall bioeconomy. One 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. Analyses will be made that support well-informed decisions by land owners, communities, businesses, governments and others.

2. WORK PROGRAMME

The Programme of Work will comprise the following focus areas:

- Metrics, methods, and tools for assessing climate change effects of bioenergy
 - Climate change mitigation of biomass and bioenergy systems in the context of systems transformation towards Paris climate goals
 - Bioenergy systems that provide negative emissions (soil carbon sequestration, biochar, BECCS)
 - Comparison of climate change outcomes from forests managed for conservation vs production of wood products including bioenergy
- Metrics, methods and tools for assessing sustainability effects of bioenergy (excluding climate change effects)

- Enhance knowledge in possible environmental and socio-economic consequences of meeting projected bioenergy demand; biomass potentials when subject to various environmental and socio-economic constraints, and possible measures to overcome constraints, promote synergies, and manage trade-offs
 - Bottom-up assessment of bioenergy potentials and collection of good practice examples
 - Assessment of environmental and socio-economic effects of agricultural and forestry residue removal, how these effects vary across geographically varying biophysical and economic conditions, and how site-specific recommendations and management practices can support sustainable mobilization of residue resources
 - Assessment of bioenergy and other land based GHG mitigation options concerning their contribution to various SDGs, separately and when combined
- Sustainability stakeholders and implementation approaches (governance)
- Dissemination
The dissemination will include scientific publishing and communication with the scientific community as well as publishing and communication targeting stakeholder outside the scientific community. The Task will put considerable efforts in social media dissemination.

3. TASK LEADERSHIP AND PARTICIPANTS

Task Leadership

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IEA Bioenergy
Technology Collaboration Programme

Further Information

IEA Bioenergy Website
www.ieabioenergy.com

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