Task 40 – Deployment of biobased value chains

Newsletter

June 2022

Welcome NEW TRIENNIUM!

We are pleased to welcome you to the **first Task 40** newsletter in the **new triennium 2022-2024.**

Preparations for new or ongoing projects are already in full swing. In mid-February 2022 we had our online kick-off meeting, in March and May further meetings. In the **first part** of this newsletter we will give a short overview **on results** from task and intertask projects of the last triennium (2019-2021). Some general facts about Task 40 and the work plan for the **new triennium 2022-2024** are presented in the **second part**. We are happily looking forward to a physical meeting later this year. Stay tuned!

Here in this issue:

Triennium 2019- 2021

TASK ACTIVITIES

Task 40 Programme of Work in 2019- 2021 had three core areas of operation: *Market developments*, *Industrial Heat and Processes* and *Deployment*

Strategies. These topics were implemented in **two internal projects** as well as through collaboration in **five intertask projects**, i.e. cooperation with other IEA Bioenergy tasks and **one special project**. In the following, the latest results of some projects are presented.

INTERNAL PROJECT: REGIONAL TRANSITIONS IN EXISTING BIOENERGY MARKETS

Ric Hoefnagels, Damon Hartley, Chenlin Li, Fabian Schipfer, Michael Wild, Christiane Hennig, Pralhad Burli, Christopher Schmid, Alexandra Pfeiffer

Introduction

Bioenergy is an essential component of the transition towards a climate-neutral energy sector by 2050 to meet global climate targets. However, rather than a single homogenous sector, bioenergy is a complex and diverse network of regional, national and international value chains part of the larger bioeconomy. A better understanding is needed of how the bioenergy sector will develop in the context of the energy transition and development of the circular (bio)economy. In the **Regional Transitions** project, experts from IEA Bioenergy Task 40 have explored possible strategies to develop sustainable biobased value chains in a regional dynamic market context. The main focus was on feedstock supply chains, which is a cornerstone for the deployment of sustainable and reliable biobased value chains and organized in three activities as summarized below.

Activity 1: The interplay of local biomass sources and international tradeable biomass commodities

In Activity 1, Utrecht University and DBFZ assessed current and future bioenergy markets in the European Union and a specific case study for Germany. Model-based scenario projections largely support policies that aim toward high(er) value applications, including flexible power generation, high-temperature heat, aviation and shipping, and biobased materials and chemicals. One aspect that remains underexplored is how regional biobased value chains can be developed that, on the one hand, effectively mobilize low-value underutilized biomass sources while, on the other hand, meet the needs of high-value end-users. These include also new centralized demand markets such as power stations with BECCS, high temperature heat in industry and advanced biofuels. The case study for Germany revealed that regulations and measures regarding the development of biobased value chains are still highly fragmented and limited to specific products or sectors. A more holistic, cross-sectoral regulation framework will be required to move towards a circular biobased economy. An analysis of scenario projections for Germany showed that biomass is expected to be shifted towards sectors or applications that are indispensable or irreplaceable and where no renewable alternatives are applicable or available. This means that biomass will fill the "gaps" applying to both material and energy use. These include bio-based materials and chemicals as well as special energy services like flexible power provision, process heat generation or fuel provision for special transport applications. The actual development depends on multiple and interdependent factors that are not sufficiently covered in available studies. More detailed knowledge about current biomass use and the future development of bioenergy as part of the larger bioeconomy is needed to facilitate the transition at the national level.

Activity 2: Strategies to increase the mobilization and deployment of local (endemic) low value heterogenous solid biomass resources

In Activity 2, Technische Universität Wien and DBFZ assessed possible mobilization strategies for local, low-value and heterogenous biomass sources. To this purpose, knowledge of IEA Bioenergy Task 40 on international bioenergy trade, on the current provision of bioenergy, and biomass mobilization measures was used to develop strategies for the future feedstock provision of the circular bioeconomy. Topics were clustered in three categories, namely: legislative framework, technological innovation and market creation. A common denominator across these assessment levels was that supply from primary economic sectors of the bioeconomy have to be strengthened while other primary economic sectors, including fossil fuel extraction, must be abandoned. The last remaining primary economic sectors will provide valuable resources from the biosphere to the technosphere while creating jobs , the participation of diverse stakeholders and meaningful activities, strengthening the resource democratic significance of rural areas.

Activity 3: Adoption of bioenergy by existing biomass feedstock suppliers (agriculture, forestry)

In Activity 3, Idaho National Lab (INL) evaluated the adoption of herbaceous and woody biomass supply by existing biomass feedstock suppliers including agriculture and forestry. A detailed Agent Based model (ABM) was used including, amongst others, spatial explicit land data and farmer's

characteristics. ABM models are useful in determining the conditions under which grower participation is higher and enables identification of levers that result in adoption at faster and higher rates. The study included case studies for two types of biomass in the USA: A case study for agricultural biomass in Colorado, Nebraska, and Kansas and a case study for woody biomass in Georgia. Results for the herbaceous case indicate that farmers' credibility has the highest impact on the adoption of crop residue harvest and crop cultivation. Media influence has a low impact on crop residue harvest, but has a substantial impact on energy crop grower adoption caused by high risks, access to information and best practice examples of other farmers which are less applicable to crop residue harvests. Results for the woody biomass case are found to be very different from the herbaceous case studies. The availability of forest residue is linked and therefore highly dependent to the production of primary products. Alternative forest management approaches could increase forest residue availability, but the incentives to drive this behavior are yet unclear.

Publications see last page of this newsletter or Task 40 library.

Contact: Ric Hoefnagels, r.hoefnagels[at]uu.nl

INTERNAL PROJECT: CIRCULAR BIOECONOMY SYNERGIES PROJECT

Fabian Schipfer, Uwe Fritsche, Chenlin Li, Pralhad Burli, Michael Wild, Christiane Hennig

The goal of this project was to explore the Task 40 concept of flexible bioeconomy supply networks - in contrast to the bioenergy supply chains considered so far. To this end, three work packages were defined in early 2020:
1. to estimate the importance of biomass supply networks for food, material and energy use, it was important to build a common energy and material flow database.
2. a qualitative analysis of the current degree of interconnectedness of selected biomass flows (wood, proteins and biogenic waste streams) should provide insights where food, material and energy use compete and where there are synergies between the forms of use.
3. Finally, recommendations for (a) policy actions, (b) strategic direction of Task 40, and (c) scientific modeling of supply networks in the bioeconomy need to be derived.

For WP1, publicly available datasets of European material, energy and food flows as well as circular economy indicators could be merged into a common, interactive flow diagram (Sankey diagram). The results are currently under peer review in a scientific journal. The findings derived from this primarily relate to methodological challenges which will be discussed more broadly in WP3c.

In WP2, contributions from the project partners were collected and discussed. Based on the contributions, it was found that the joint (holistic) consideration of all bioeconomy flows reveals something about the overall efficiency and stability of the technosphere. Additional, theoretical work is needed to formulate and possibly functionalize appropriate system properties and dynamics.

Much of the project resources and additional time were ultimately devoted to **WP3**. The orientation of Task 40 in the current triennium (2022-2024) is based on the results and internal discussion documents of WP3b. More decisive for the Austrian delegation itself, however, was a Fulbright Schuman grant resulting from WP3c. During Dr. Schipfer's stay at Lawrence Berkeley National Laboratory in 2021-2022, the project ideas and identified research gaps were exploited in a grant proposal.

Contact: Fabian Schipfer,
fabian.schipfer[at]tuwien.ac.at

INTERTASK PROJECT: RENEWABLE GAS - DEPLOYMENT, MARKETS AND SUSTAINABLE TRADE

Uwe Fritsche, Hans-Werner Gress, Christiane Hennig

This intertask project led by Task 40 gathered experts from Task 37 (Energy from Biogas), 43 (Sustainable Biomass Feedstocks), 44 (Flexible Bioenergy and System Integration) and Task 45 (Climate and Sustainability Effects of Bioenergy within the broader Bioeconomy). The main objective of the project was to enable more deployment of renewable gases and to underpin their sustainability. The project provides decision makers and the research community with a comprehensive overview of what is currently known on renewable gases, considering both technology development and infrastructure, and which mechanisms exist and are considered to fulfil the important role of renewable gases in global climate scenarios for a well-below 2°C world. It was carried out in collaboration with IEA Hydrogen and industrial partners, and was completed in March 2022.
Four reports are published:

- Biomethane – factors for a successful sector

development. Synthesis Report of WP1
- Renewable gas and CCU – Contribution to WP1
- Status and perspectives of non-biogenic renewable gases – Synthesis Report of WP2
- Sustainable potentials for renewable gas trade – Synthesis Report of WP3

and also, a summary report.

More information and publications at project page, in Task 40 library or at last page of this newsletter.

Contact: Uwe Fritsche, uf[at]iinas.org and Christiane Hennig, christiane.hennig[at]dbfz.de

INTERTASK PROJECT: DEPLOYMENT OF BECCUS VALUE CHAINS

Olle Olsson, Christiane Hennig, Christian Bang, Pralhad Burli, Richard Hess

The objective of this intertask project was to analyze technological, political and economic aspects related to near- to medium term deployment of systems used for capture and utilization or storage of biogenic CO_2. The project was led by Task 40 with participation also from Task 36 (Material and Energy Valorization of Waste in a Circular Economy), Task 44 (Flexible Bioenergy and System Integration) and Task 45 (Climate and Sustainability Effects of Bioenergy within the broader Bioeconomy). The project outputs can be divided into two categories: a) system studies and b) case studies, where the case studies are brief but focused analyses of conditions in a specific sector whereas the system studies analyze issues that cut across sectors.

The three system studies are:
- Scoping report (Task 40)
- Carbon accounting across BECCUS supply chains (Task 45/40)
- Bioenergy flexibility and carbon removal – finding the balance (Task 44/40)

The five case studies are:
- Waste-to-energy (Task 36)
- Biomass-based CHP (Task 40)
- Biomass-based electricity generation (Task 45)
- Cement (Task 45/40)
- Bioethanol (Task 40)

More information and publications at: https://www.ieabioenergy.com/blog/task/deployment-of-beccus-value-chains/, in Task 40 library or at last page of this newsletter.

Contact: Olle Olsson, olle.olsson[at]sei.org and Christiane Hennig, christiane.hennig[at]dbfz.de

SPECIAL PROJECT: HYDROGEN IN THE GRID

Uwe Fritsche

The activity was funded by the European Commission with contributions from Germany, Sweden, and the Netherlands. The report provides a synthesis of existing data, performance indicators, information on RG studies & projects and analyzed national strategies. It also identified and discussed the numerous challenges and hurdles for the gradual replacement of natural gas by renewable gases, with emphasis on H_2 addition to the natural gas grid, and dedicated H_2 grids.
Overall take-away: biomethane and renewable synthetic methane can already be carried by the existing gas network infrastructure without any problems, and injection of a limited amount of renewable hydrogen (H_2) in the gas grid is also feasible. The injection of larger quantities of H_2 and the transition to 100% H_2 will require step-by-step technical modifications or further development of the gas distribution networks and the customer facilities connected to them.

More information here, in Task 40 library or last page of this newsletter.

Contact: Uwe Fritsche, uf[at]iinas.org

INTERTASK PROJECT: BIOENERGY FOR HIGH TEMPERATURE HEAT IN INDUSTRY

Olle Olsson, Fabian Schipfer

This intertask project was led by Task 32 (Biomass Combustion) and involved Tasks 33 (Gasification of Biogenic Residue and its Applications), 34 (Direct Thermochemical Liquefaction), 36 (Material and Energy Valorisation of Waste in a Circular Economy) and 40.

It resulted in four separate case study reports that illustrate good examples of integration of bioenergy in industry for the delivery of high temperature heat, and a policy strategy report (by Task 40) which highlights the opportunities for bioenergy technologies to deliver heat in industry, and compares it with alternatives for decarbonization such as CCS, electrification and hydrogen. Specific policy recommendations are provided to accelerate its adoption.

More information and publications at https://itp-hightemperatureheat.ieabioenergy.com/, in Task 40 library or at last page of this newsletter.

Contact: Olle Olsson, olle.olsson[at]sei.org

IEA BIOENERGY TRIANNUAL CONFERENCE 2021 BIOENERGY – A CRITICAL PART OF THE PATH TO CARBON NEUTRALITY

Bioenergy – a critical part of the path to carbon neutrality

The triannual conference (29 November – 9 December 2021) was held in a series of online sessions. The central theme was the role of biomass in the transition to a carbon neutral society. Task 40 was represented with presentations and moderation in four sessions.

Ric Hoefnagels and **Fabian Schipfer** each gave a presentation in the session *Setting up regional biohubs to enhance biomass mobilisation*. Biomass supply chains need to be sufficiently agile to handle frequent changes in price, quality requirement and demand. One strategy to connect biomass supply and demand is the use of regional logistics units (biohubs). This session discussed challenges of biomass mobilisation and provide examples of practical biohubs at the global level.

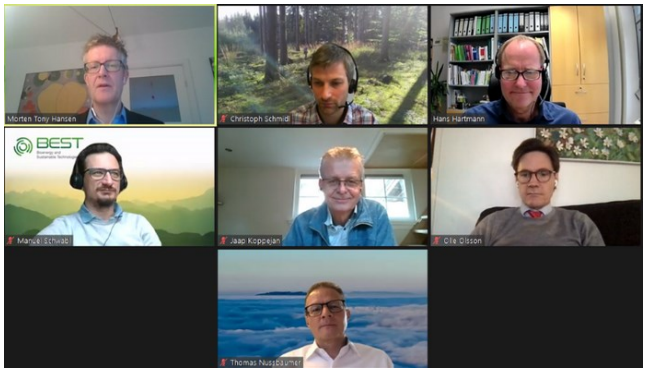
Top left to right: Mohammad R. Ghaffariyan, Biljana Kulisic, Fabian Schipfer.
Bottom left to right: Ric Hoefnagels, Wolter Elbersen, Mark Brown.

Uwe Fritsche contributed to and moderated the session *Green Gas perspectives.*

Top left to right: Uwe Fritsche, Sam Lehr, Maria Michela Morese.
Bottom left to right: David Chiaramonti, Renjie Dong.

It is important to consider that biogas is not just a renewable energy solution, but provides a strong contribution to circular and biobased economy, mostly starting from waste and residual flows and, amongst others, circulating nutrient and organic material flows, providing sanitation of treated material and contributing to development of rural areas. This session discussed perspectives of biogas and biomethane in different parts of the world – Europe, North America, China and developing countries – and the role of policy frameworks for further deployment.

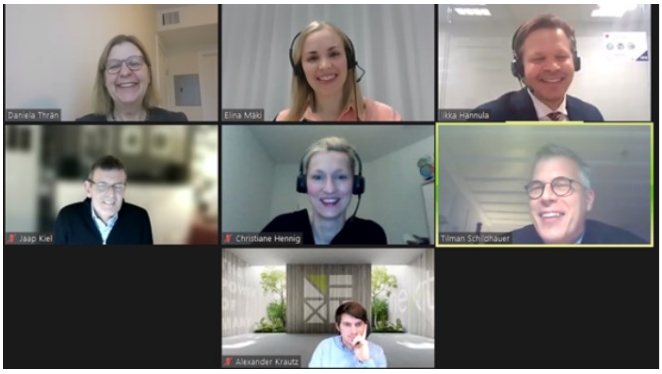
Olle Olsson reported in the session *Biomass and renewable heat.*
Bioenergy is still the dominant type of renewable heat and has some unique assets; for example, it has the potential to provide renewable heat at high temperature for use in process industry and it can be produced from by-products.
This session showed relevant cases of biobased heat and dug deeper into emission abatement, which is a critical issue for biomass combustion.



Top left to right: Morten Tony Hansen, Christoph Schmidl, Hans Hartmann.
Middle row left to right: Manuel Schwabl, Jaap Koppejan, Olle Olsson.
Bottom: Thomas Nussbaumer.

Christiane Hennig addressed the topic BECCUS and Flexibility in the session *Bioenergy's contribution to low-carbon energy systems.*
Bioenergy systems can provide multiple services and benefits to a low-carbon energy system.
Examples include technologies and concepts providing grid stability for a power system with large amounts of variable wind and solar energy; dispatchable production of energy and other products according to market demand; integrated poly-generation systems combining the production of heat, power, fuels and/or chemicals; long-term storage options such as biofuels and biochemicals; or ancillary services to support system reliability. Moreover, bioenergy can be combined with carbon capture and storage or utilisation (CCUS) providing opportunities for net negative emissions. Bio-CCS and flexibility - in the form of flexible bioenergy - are expected to be two of the more important characteristics for bioenergy systems of the future and services for a low-carbon energy system. Thus,

it is important to find strategies for how these interactions can come in the form of synergies rather than trade-offs.



Top left to right: Daniela Thrän, Elina Mäki, Ilkka Hannula.
Middle row left to right: Jaap Kiel, Christiane Hennig, Tilman Schildhauer.
Bottom: Alexander Krautz.

GOOD BY OLLE

After many years of cooperation in Task 40 and three years of co-leadership, we unfortunately had to say goodbye to Olle Olsson (NTL Sweden) at the end of December 2021. He will continue to be associated with the Task and will certainly contribute his expertise from time to time. Many thanks to Olle for his leadership of the intertask project BECCUS as well as his collaboration in the intertask project High temperature heat.

New Triennium 2022- 2024

TASK OVERVIEW

Lead Team

- Mr Uwe Fritsche, Task Leader, IINAS, Germany
- Ms Christiane Hennig, co-Task Leader, DBFZ, Germany
- N.N., co-Task Leader, Sweden
- Ms Nora Lange, Task Secretary, DBFZ, Germany
- Mr Birger Kerckow, Operating Agent, FNR, Germany

Participating countries:
Austria, Denmark, Germany, The Netherlands, Sweden, USA
We hope that Finland and possibly Turkey will join during the triennium.

OVERVIEW OF PROJECTS AND INTERTASK PROJECTS

The scope of Task 40 work is on how to sustainably **maintain or transform** biobased value chains. For this, barriers and drivers for sustainable biomass deployment will be identified, and policy developments reflected that could foster biomass uptake in existing and new (emerging) markets.

A **key new** issue to be addressed will be the impact of developing carbon markets and limited CO_2 emission budgets, on the deployment of biogenic energy carriers, products, and services.

Within this scope of work, international, national, and regional biomass **trade remains** an issue.

Work programme and projects

WP1: Market developments

- **Regional bioenergy markets and transitions** (follow-up project)
- **Sustainable biobased value chains in the circular bioeconomy context** (follow-up project)

WP2: BECCUS & carbon markets/valorization

- **Management of biogenic CO_2: BECCUS intertask phase 2** (follow-up intertask project)

WP3: Deployment Strategies

- **Guidance on sustainable financing** (collaborative project with Task 45)
- **Synergies of green hydrogen and bio-based value chains deployment (**new intertask project)

Detailed information intertask projects

Task 40 will lead the follow-up intertask project **"Management of biogenic CO_2: BECCUS phase 2"**. A kick-off meeting will be held online on June 22, 2022. Where the first BECCUS intertask project was heavily built around a series of case-based publications, the follow-up will be more diverse in its scope, with a stronger emphasis on cross-sector and cross-country learning about implementation of BECCUS using different energy conversion processes. A further goal of this intertask project is to shed some light on the effects of the integration of

BECCUS facilities and systems within the overall energy system and its interaction with other energy system services. In addition, it will emphasize and analyze the important differences between BECCS and BECCU, not least from the perspective of potential business models and policy development. An understanding of the impacts of BECCUS on overall climate system in terms of potential for CO_2 mitigation is addressed and, finally, all different aspects covered will be analyzed jointly and provide policy recommendations. Task 40 will collaborate in four work packages.

Contact: Christiane Hennig, christiane.hennig[at]dbfz.de and Christian Bang, cb[at]eaea.dk

A new intertask project on **"Synergies of green hydrogen and bio-based value chains deployment"** was launched with a kick-off meeting on June 2, 2022. The meeting gathered more than 25 experts from 10 IEA Bioenergy Tasks. Task 40 leads the first work package to define the framework (also with the support of an expert workshop in late 2022). This will include defining criteria, indicators and boundaries, discussing assessment frameworks for case studies and summarising them in a scoping report (2023). There will also be a collection of examples of synergy value chains with a short description. Task 40 will also contribute to three other work packages (e.g. case studies).
More detailed information will be published in the next newsletter.

Contact: Christiane Hennig, christiane.hennig[at]dbfz.de

What's going on in 2022

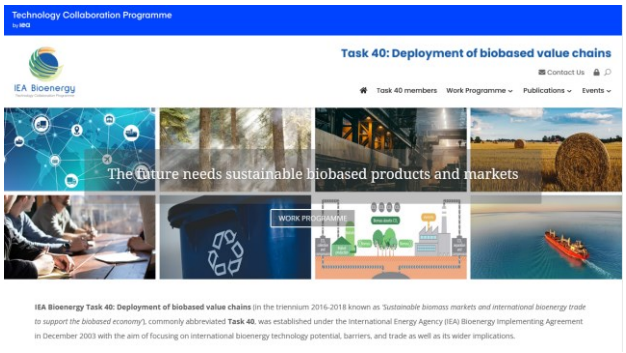
OUTLOOK

We are very much looking forward to our first physical meeting after three years of virtual meetings! Since 2019, we held 19 Task meetings, and met in many others (management team, core groups of Task/intertask projects and the Executive Committee) and workshops and conferences. In September 2022, we will most likely be hosted by our Danish Task member in Copenhagen. In addition to our Task 40 meeting, we plan a joint workshop with Task 32 (biomass combustion) and there will be opportunities for site visits (HOFOR).

NEWS: NEW HOMEPAGE DESIGN

Within IEA Bioenergy, the common design requirements are continuously updated and modified. In addition to uniform document templates, the websites of the individual tasks are also being adapted one by one. The Task 40 website now also got a **new look and presents itself in a new design** for the start of the new triennium. Take a look at our new pages:

https://task40.ieabioenergy.com/



Publications 2021-2022

Regional Transitions in existing bioenergy markets

Reports

Coming soon
Hoefnagels, R., Hartley, D., Li, C., Schipfer, F., Wild, M., Hennig, C., Burli, P., Schmid, C., Pfeiffer, A. (2022), Regional transitions in existing bioenergy markets. IEA Bioenergy.

Schmid, C., Hennig, C., (2022) Regional Transitions of Biomass Utilisation - A Case Study for Germany.

Hartley, D. S., Li, C., (2022) Adoption of bioenergy by existing biomass feedstock suppliers (agriculture, forestry).

Journal publications

Burli, P. et al. (2021) Farmer characteristics and decision-making: A model for bioenergy crop adoption. Energy 234: 121235
https://doi.org/10.1016/j.energy.2021.121235

Schipfer, Fabian; Pfeiffer, Alexandra & Hoefnagels, Ric (2022) Strategies for the Mobilization and Deployment of Local Low-Value, Heterogeneous Biomass Resources for a Circular Bioeconomy. Energies 15 (2): 433
https://doi.org/10.3390/en15020433

Presentations

Ric Hoefnagels (2021), Biomass feedstock supply chains and future markets. IEA Bioenergy

Conference 2021 (online), Setting up regional biohubs to enhance biomass mobilization. Tuesday 30 November 2021.

Fabian Schipfer (2021), Biomass supply mobilisation strategies. IEA Bioenergy Conference 2021 (online), Setting up regional biohubs to enhance biomass mobilization. Tuesday 30 November 2021.

Circular Bioeconomy Synergies

Further information/documentation can be found soon at the main page of Task 40 website.

RG (Renewable Gas) Intertask Project

Liebetrau, Jan et al. (2021) Synthesis Report of WP1: Biomethane – factors for a successful sector development. Synthesis Report of Work package 2 of the IEA Bioenergy intertask project Renewable Gases: Deployment, markets and sustainable trade. IEA Bioenergy. June 2021

Bozzolo, Fabio et al. (2022) Status and perspectives of non-biogenic renewable gases. Synthesis Report of Work package 2 of the IEA Bioenergy intertask project Renewable Gases: Deployment, markets and sustainable trade. IEA Bioenergy. March 2022

Fritsche, Uwe & Gress, Hans Werner (2022) Sustainable potentials for renewable gas trade. Synthesis Report of WP3 of the IEA Bioenergy intertask project Renewable Gas: Deployment, markets and sustainable trade. IEA Bioenergy. March 2022

Fritsche, Uwe et al. (2022) Summary Report of the IEA Bioenergy intertask project Renewable Gas: Deployment, markets and sustainable trade. IEA Bioenergy. March 2022

Bioenergy for High Temperature Heat in Industry- intertask Project

Olsson, Olle & Schipfer, Fabian (2021) Decarbonizing industrial process heat: the role of biomass. IEA Bioenergy Inter-task project on industrial process heat. IEA Bioenergy. December 2021

Deployment of BECCUS value chains- intertask Project

Cavalett, Otávio; Cherubini, Francesco & Olsson, Olle (2021) Deployment of bio-CCS in the cement sector: an overview of technology options and policy tools. Contribution of IEA Bioenergy Task 40/45 to the inter-task project Deployment of bio-CCUS value chains. IEA Bioenergy. December 2021

Olsson, Olle; Abdalla, Nabil; Bürck, Silvana & Horst Fehrenbach (2022) Carbon accounting across BECCUS supply chains. System study and contribution of IEA Bioenergy Task 40/45 to the inter-task project Deployment of bio-CCUS value chains. IEA Bioenergy. February 2022

Presentations

Christiane Hennig (2021), Bio-CCS and bioenergy flexibility – Finding the balance. IEA Bioenergy Conference 2021 (online), Bioenergy's contribution to low-carbon energy systems. Tuesday 7 December 2021

Christiane Hennig (2022), BECCS - Delivering negative emissions in power and industrial sectors. EUBCE European Biomass Conference & Exhibition 2022 (online). Wednesday 11 May 2022.

Coming soon
Hennig, Christiane; Olsson, Olle & Thrän, Daniela (2022) Bio-CCUS and bioenergy flexibility – finding the balance.

Case Study on "Bioethanol" Contribution to the IEA Bioenergy ITP Deployment of bio-CCUS value chains.

Special Project 11: Renewable Gas - Hydrogen in the grid

Fritsche, Uwe (2022) Renewable Gas – Hydrogen in the Grid. Synthesis report. IEA Bioenergy Task 41 Special Project. IEA Bioenergy. January 2022

Other

Baumgarten, Wibke et al. (2021) Country reports: Implementation of bioenergy in Germany – 2021 update. IEA Bioenergy Task 40. October 2021

For more info, upcoming events or contact please visit our homepage:
https://task40.ieabioenergy.com/