IEA Bioenergy
Technology Collaboration Programme

CCS/CCU/negative emissions and bio-based value chains/concepts

Management of Biogenic CO_2: BECCUS, Inter-task Project

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Carbon sinks in Europe: stakeholders taking action to bring out the next solutions for carbon neutrality

Brussels, 5 September 2023

IEA Bioenergy

Technology Collaboration Programme (TCP), functioning within a framework created by the **International Energy Agency** (IEA)

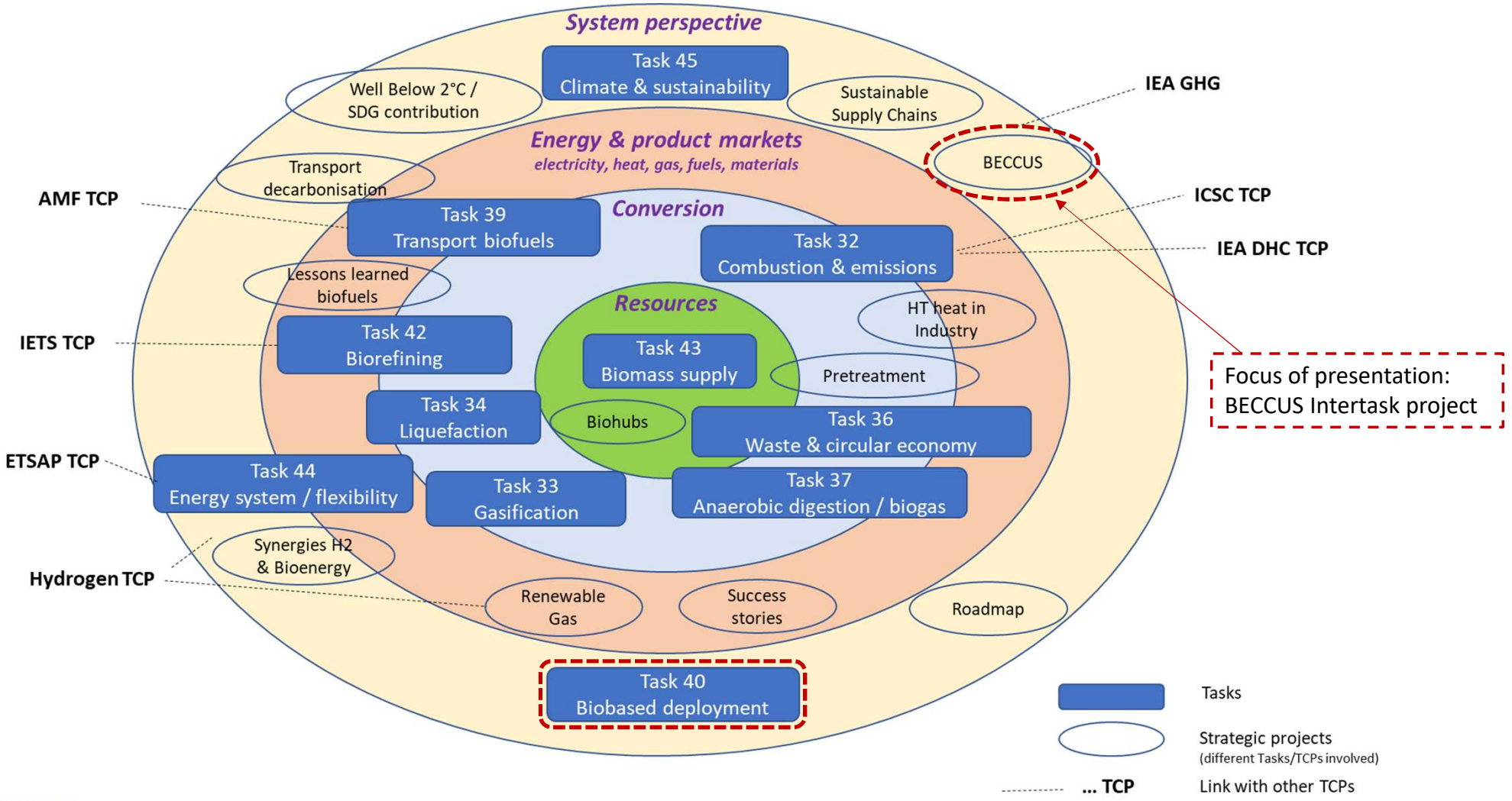
Goal:

- International **collaboration** and **info exchange** on bioenergy research, technology development, demonstration, and policy analysis
- Facilitate the commercialization and market deployment of sustainable bioenergy systems = **climate positive, environmentally sound**, **socially acceptable** and **cost-competitive** (incl. external costs)

Work programme carried out through **Tasks, Inter-Task** and **Special Projects**, covering the full value chain from feedstock to final energy product

Currently **24 countries** worldwide plus the European Commission are contracting partners, **11 Tasks in operation**

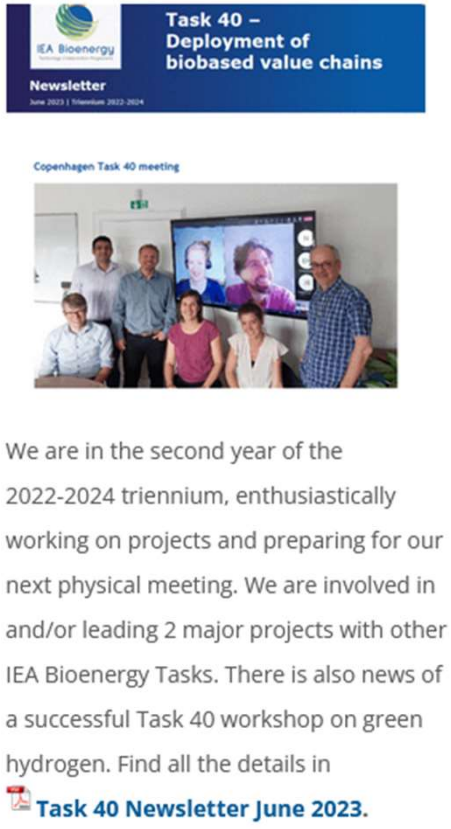
Activities in IEA Bioenergy



Task 40 | Deployment of biobased value chains

The future needs sustainable biobased products and markets

- Established in 2003
- Role and mission:
  - **clarifying the conditions** of deploying biobased value chains considering the longer-term climate and sustainability requirements, and the role of bioenergy and **biobased high value co-products in carbon management** as part of a future carbon economy.
- Task 40 provides orientation in the field of biomass deployment:
  - How could the transition from currently dominating biomass uses (power plants, heat) towards future uses of biogenic carbon look like?
- Further infos and publications: https://task40.ieabioenergy.com/
- Task 40 leads inter-task project on BECCS and BECCU



Management of Biogenic CO_2: BECCUS Inter-task Project

Project essentials

- 2 project phases
- Timeframe
  - Previous Project “Phase 1” 2019 to 2021
  - Phase 2 started in 2022 until end of 2024
- Overarching goal:
  - Analysing 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
  - Systemic analysis of how to facilitate deployment of BECCUS applications
- Key questions addressed:
  - Which technologies/concepts are (potentially) available? >> case studies
  - What are the requirements/implications for the deployment of BECCUS? >> system studies
- 7 out of 11 Tasks participating

BECCUS Project Phase 1.0 & BECCUS Project Phase 2.0

completed

BECCUS 1.0

5 case studies

- Biomass-based CHP
- Biomass-based electricity generation
- Bioethanol
- Waste-to-energy
- Cement, steel

3 system studies

- Scoping report
- Carbon accounting across BECCUS supply chains
- Bioenergy flexibility and carbon removal – finding the balance

ongoing

BECCUS 2.0

3 case study WPs

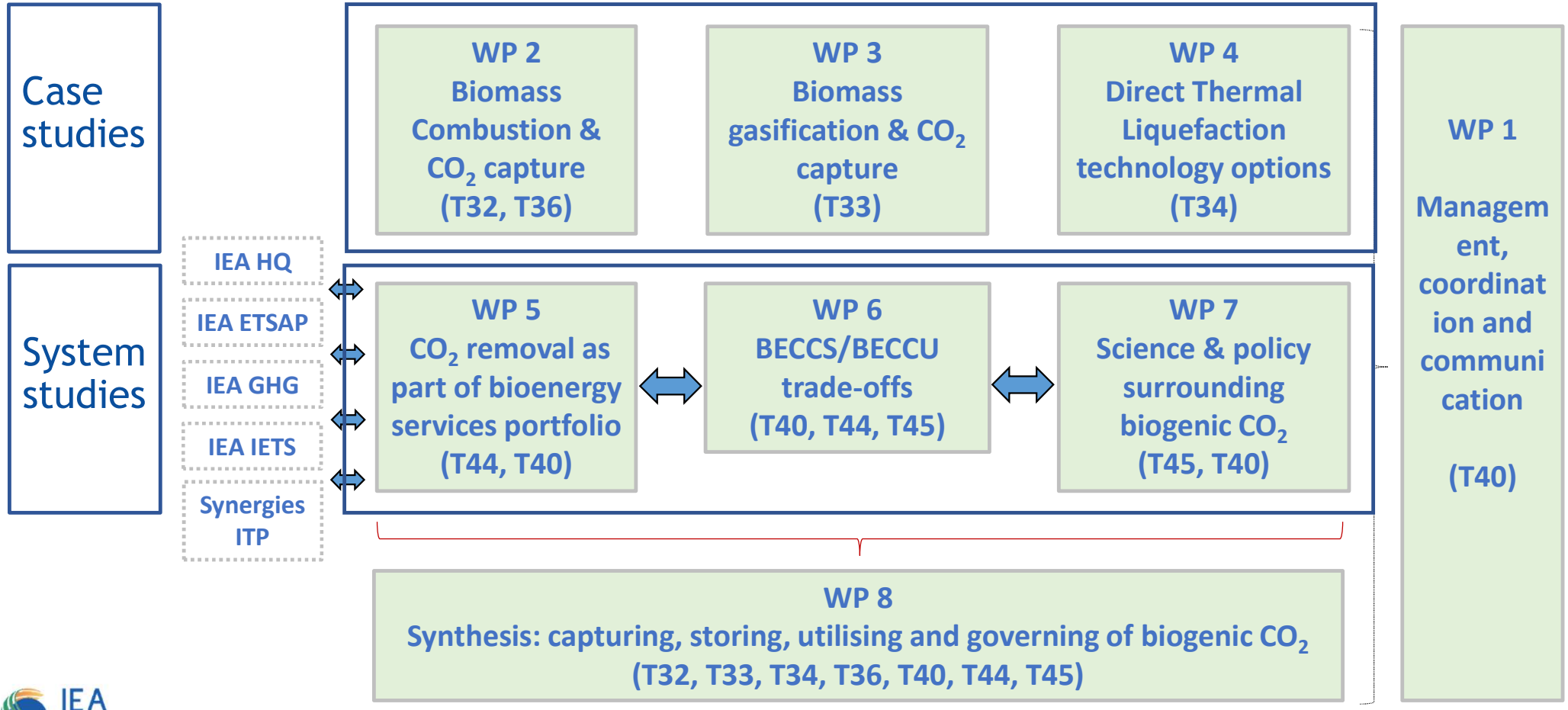
- Biomass combustion and CO_2 capture (WP2)
- Biomass gasification and CO_2 capture (WP3)
- Direct Thermal Liquefaction technology options (WP4)

3 system study WPs

- CO_2 removal as part of the overall bioenergy services portfolio (WP5)
- BECCS/BECCU trade-offs (WP6)
- Science & policy surrounding biogenic CO_2 (WP7)

BECCUS 1.0 & BECCUS 2.0 combined will allow for a complete picture of technology options in the bioenergy field and hard-to-abate industrial sectors, and a broader **systemic view**.

Main activities | project work packages



Brief summary of work to be undertaken

- Cross-sector and cross-country learning about implementation of BECCUS using different energy conversion processes (WP2-WP4).
- 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 (WP5).
- In addition, although we tend to refer to “BECCUS” as a unified concept, we also emphasise and analyse the important differences between BECCS and BECCU, not least from the perspective of potential business models and policy development (WP6).
- An understanding of the impacts of BECCUS on overall climate system in terms of potential for CO_2 mitigation is addressed (WP7).
- Provide policy recommendations (WP8).

Findings so far (I)

Case Study perspective:

- Technology for bioenergy with carbon capture is proven and ready for deployment
- Development needed into finding models of on-the-ground deployment that make most sense from a techno-economic perspective (e.g. scale)
- Business models show that in many cases the carbon is currently utilized rather than stored
- BECCS/U projects in certain regions in Europe >> strongest support and activities in Europe we see in Scandinavia
- Compared to other CDR technologies BECCS applications can be available in the near term and they provides also energy next to CDR, BUT BECCS availability is limited

>> we need a blend of CDR options

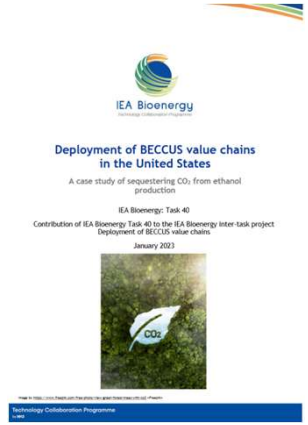
Findings so far (II)

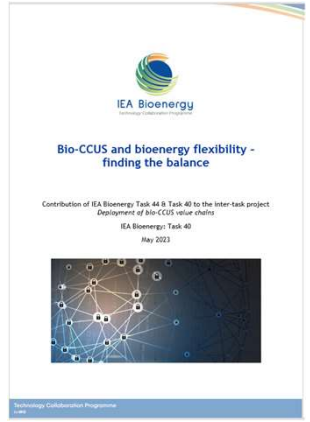
System/policy perspective:

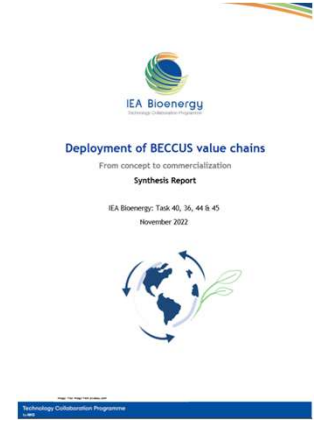
- Infrastructure and developing storage sides are the main challenges
- Reflecting on other roles/services bioenergy provides to a low-carbon energy system is crucial (e.g. Flexible Bioenergy)
- Reflecting on the role of CCU and CCS
- Regulatory framework and measures needed
- Governance in some European countries so far: financial support for investment, planning reverse auctions
- Governance on EU-level still needs to be developed
  - Should negative emissions be rewarded through integration in existing carbon pricing schemes (e.g. free allocation of EUAs)?
  - Or through dedicated policy measures (e.g. reversed auctions)?

Available publications

- Scoping Report
- Case studies/sectoral deep-dives:
  - Waste-to-energy (Task 36)
  - Biomass-based CHP (Task 40)
  - Biomass-based electricity generation (Task 45)
  - Cement (Task 45/40)
  - Bioethanol (Task 40)
- Cross-cutting/system studies:
  - Scoping report (Task 40)
  - Bioenergy flexibility and carbon removal (Task 44/40)
  - Carbon accounting across BECCUS supply chains (Task 45/40)
- Synthesis Report Phase 1 (Task 40 + all Tasks)







Time for questions?

Thanks for your attention

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