

Summaries of presentations

Kevin Chown, Kew Technology

- Introduction to KEW's Advanced Thermal Conversion (ATC) Technology
- KEW's journey
- CCUS Application to ATC
- How modularised ATC critically creates a pathway to a zero-carbon future and ultimately a negative-carbon future

Prof Peter Hammond, CCm Technologies

Using short case studies from the the water treatment, food processing and agricultural industries, Peter will demonstrate how CO₂ can deliver, resource, process and product enhancements which are sustainable in economic and environmental terms.

The talk will set out examples of:

- Enhanced resource recovery and emissions reductions from waste materials triggered by CO₂ capture.
- Improved materials processing characteristics resulting from CO₂ utilisation
- Enhanced product performance arising from sequestered CO₂

Dr Alison Mohr, Nottingham University

International and national emissions scenarios that limit future global warming and meet the aspirations of the Paris agreement rely heavily on the deployment of bioenergy with carbon capture and storage (BECCS) at a significant scale. However, BECCS deployment will happen at the local and regional level where governance decisions will need to consider the social and environmental dimensions and impacts as well as social acceptability of the technology. The potential for BECCS to deliver net-zero emissions therefore presents new and complex multi-level governance challenges, not least in how negative emissions can be accounted and assessed making explicit the underpinning value judgements, in how we prioritise competing resource use, and in how we defer responsibility for storage and local impact trade-offs to future generations.

Science and Technology Studies (STS) is concerned with the co-production of social and technological systems and the corresponding social and political arrangements that inhabit, organise, and govern them. Looking at BECCS from this perspective reveals how definitions of net-zero futures are highly contested with different views about effects and outcomes that point to the need for governance that considers the definition and scope of a socio-technical system and systemic change. Drawing on STS research and concepts applied to CCS and bioenergy social science, this presentation will identify pertinent lessons for the governance of BECCS.

Prof Michael North, York University

This presentation will start by introducing the UN sustainable development goals and the concept of linear versus circular economies. These ideas will then be applied to the combustion of fossil fuels and the three proposed methodologies for dealing with waste CO₂. It will be shown that only carbon capture and utilisation can be financially and environmentally sustainable and also provides a circular economy approach to dealing with waste CO₂. The ability to convert waste CO₂ into both chemicals and fuels will be highlighted and by analogy with the operation of existing petrochemical refineries, it will be shown that only by producing both chemicals and fuels can carbon capture and utilisation be both financially and environmentally sustainable. This leads to the concept of a CO₂ refinery. The second half of the presentation will provide an overview of our own work on the synthesis of cyclic carbonates from waste CO₂, showing how we have developed the technology from laboratory scale homogeneous catalysts to immobilised catalysts suitable for use in flow reactors with real waste CO₂. The progress of the technology through TRL levels from initial laboratory studies to an industrial mini plant and the verge of commercialisation will be highlighted.