

## CCUS for net-zero seminars, hosted by UKCCSRC

Outlined in the table below is the scheduled seminars for the full programme 22<sup>nd</sup> June – 19<sup>th</sup> August 2021

| Date         | Topic   | Speaker  | Main topic areas covered  |
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| 22 June 2021 | CCUS for net-zero overview                              | Dr Hannah Chalmers, University of Edinburgh                    | <ul style="list-style-type: none"> <li>• A brief overview of CCUS</li> <li>• Introducing a number of key topics that will be covered in more detail in later seminar</li> <li>• Key reasons for considering CCUS</li> <li>• A brief overview of the key technical features of CO<sub>2</sub> capture, CO<sub>2</sub> transport and CO<sub>2</sub> storage</li> </ul>  |
| 24 June 2021 | Climate change science and the role of CCS              | Professor Myles Allen, University of Oxford                    |   |
| 29 June 2021 | Capture overview: post-combustion (amines)              | Professor Jon Gibbins, University of Sheffield & UKCCSRC       | <ul style="list-style-type: none"> <li>• Basic principles of amine post-combustion capture (PCC)</li> <li>• Experience to date - Boundary Dam and Petra Nova</li> <li>• Key priorities for amine PCC in the light of problems on past projects</li> <li>• Examples of proposed new amine post-combustion capture applications, UK and elsewhere</li> <li>• How future UK power plants might operate under the Dispatchable Power Agreement</li> </ul>   |
| 1 July 2021  | Capture overview: pre-combustion (hydrogen) and oxyfuel | Professor Jon Gibbins, University of Sheffield & UKCCSRC       | <ul style="list-style-type: none"> <li>• Principles of hydrogen manufacture with CCS</li> <li>• Application example: Steam Methane Reformer and Partial-Oxidation routes from natural gas to hydrogen with CCS</li> <li>• Application example: Electric power production using hydrogen - pre-combustion capture</li> <li>• Application example: Gasification for hydrogen production - coal experience and biomass aspirations</li> <li>• Principles of oxyfuel combustion with CCS and topical examples, including the Allam Cycle</li> </ul> |
| 6 July 2021  | Permanent storage of CO <sub>2</sub>                    | Professor Stuart Haszeldine, University of Edinburgh & UKCCSRC | <ul style="list-style-type: none"> <li>• Why CO<sub>2</sub> is one major climate problem, fossil, atmosphere and ocean, nature, cycles</li> <li>• Natural occurrences of geologically stored CO<sub>2</sub> - and the timescales of storage</li> </ul>  |

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|                            |   |  | <ul style="list-style-type: none"> <li>• Geological resources and reserves of storage around the UK - serving CCS BECCS DACCS</li> <li>• Examples of uncertainty and risk during storage licensing</li> <li>• Monitoring and verifying CO<sub>2</sub> storage compliance</li> <li>• Other types of CO<sub>2</sub> storage - installation, maintenance, monitoring, permanence, cost</li> <li>• Why progress to geological CO<sub>2</sub> storage is so slow</li> </ul>  |
| 8 July 2021                | Public acceptance   | Dr David Reiner, University of Cambridge & UKCCSRC                                       | <ul style="list-style-type: none"> <li>• Understanding the drivers of public attitudes</li> <li>• UK attitudes toward CCUS in international context</li> <li>• A history of UK attitudes towards CCUS as part of a portfolio of decarbonisation options</li> <li>• A case study of views towards CCUS in Peterhead and Scotland</li> <li>• A changing role for the public in CCUS deployment?</li> </ul>  |
| 13 July 2021               | CO <sub>2</sub> transport   | Professor Haroun Mahgerefteh, University College London                                  | <ul style="list-style-type: none"> <li>• The importance of a reliable safe and least cost way of transporting large amounts of Carbon Dioxide (CO<sub>2</sub>) as part of the Carbon Capture and Storage (CCS) chain</li> <li>• How is UK placed for offshore transportation of CO<sub>2</sub> for permanent subsea geological storage</li> <li>• What is special about the properties of CO<sub>2</sub></li> <li>• Different modes for transport of the captured CO<sub>2</sub>; pros and cons</li> <li>• Shared pipeline networks in CCS industrial clusters</li> </ul> |
| 15 July 2021               | CCUS for energy-intensive industries                                    | Professor Paul Fennell, Imperial College London & UKCCSRC                                | <ul style="list-style-type: none"> <li>• Cement – what works and what doesn't work</li> <li>• Iron and Steel – opportunities into the future</li> <li>• The importance of systems boundaries</li> <li>• Economics of CCS – and why different systems are required for different processes</li> </ul>  |
| 20 <sup>th</sup> July 2021 | BECCS and DACCS   | Prof Niall Mac Dowell, Imperial College London & UKCCSRC                                 | <ul style="list-style-type: none"> <li>• Why we need GGRs, and why they're not an alternative to mitigation.</li> <li>• Why permanent removal is key.</li> <li>• The portfolio of GGR pathways.</li> <li>• The importance of MRV for GGR.</li> <li>• Technology deepdive of BECCS and DACCS; current state of the art and next steps.</li> </ul>  |
| 22 <sup>nd</sup> July 2021 | CO <sub>2</sub> utilisation: carbonation and sustainable aviation fuels | Prof Paula Carey, Carbon8, Prof Mohamed Pourkashanian, University of Sheffield & UKCCSRC | <ul style="list-style-type: none"> <li>• Principles of carbonation</li> <li>• Examples of applications</li> <li>• Additional benefits</li> <li>• Principles of CO<sub>2</sub> utilisation for fuels</li> <li>• Example of applications for SAF</li> <li>• Achieving net zero GHG emissions</li> </ul>   |

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| 27 <sup>th</sup> July 2021   | CCS in China   | Dr Xi Liang, University of Edinburgh  | <ul style="list-style-type: none"> <li>• Role of CCUS in China's Climate Policy Agenda</li> <li>• Current Status of CCUS Development in China</li> <li>• Guangdong Offshore CCUS Project Opportunities</li> <li>• Industry CCUS Development Opportunities: Steel and Cement</li> <li>• Finance Large Scale Full Chain CCUS Projects in China</li> </ul>   |
| 29 <sup>th</sup> July 2021   | CCS in the Netherlands                               | Jan Hopman, Director CATO   | <ul style="list-style-type: none"> <li>• Overview of CCUS development in the Netherlands</li> <li>• Lessons from Netherlands projects that didn't happen</li> <li>• How the Netherlands are tackling CCS this time</li> <li>• Role of government in CCS development</li> <li>• Netherlands as a CCS hub for Europe</li> </ul>   |
| 3 <sup>rd</sup> August 2021  | CCS in USA   | Rudra Kapila, Senior Policy Advisor for Carbon Management, Third Way, Washington DC |   |
| 5 <sup>th</sup> August 2021  | Possible future CO2 capture technologies             | Prof Paul Fennell, Imperial College London & UKCCSRC                                | <ul style="list-style-type: none"> <li>• Future CCS technologies</li> <li>• The importance of innovation</li> <li>• The importance of economics within the innovation space</li> </ul>  |
| 10 <sup>th</sup> August 2021 | Environmental issues and permitting for CCS projects | John Henderson, Environment Agency  | <ul style="list-style-type: none"> <li>• Environmental permitting - what it is and how it works</li> <li>• BAT for CCS - key factors in protecting the environment</li> <li>• Assessing the environmental impact of CCS</li> <li>• Permit Application and what is in the permit</li> <li>• Permit Compliance</li> </ul>   |
| 12 <sup>th</sup> August 2021 | CCS in Norway  | Dr Mona Mølnevik, SINTEF  | <ul style="list-style-type: none"> <li>• The Norwegian CCS Research Centre and its role in developing full-scale CCS in Norway</li> <li>• Why a centre of excellence is needed and how it works</li> <li>• The Longship Project - a step towards scaling up CCS</li> <li>• Thoughts concerning capacity and limited resources</li> <li>• Knowledge building and industrial development- hand in hand</li> </ul> |
| 17 <sup>th</sup> August 2021 | CCS in the UK energy system                          | Prof Goran Strbac, Imperial College London & UKCCSRC                                | <ul style="list-style-type: none"> <li>• Whole system perspective for the UK</li> <li>• Role of CCUS and hydrogen</li> <li>• Meeting real-time demand</li> <li>• Delivering net-zero and negative emissions</li> </ul>  |

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| 19 <sup>th</sup><br>August<br>2021 | Financing and risk (insurable and non-insurable) aspects of CCUS projects | Allan Baker,<br>Societe Generale | <ul style="list-style-type: none"><li>• What is needed for a bankable CCS project?</li><li>• Lessons from previous UK CCS initiatives</li><li>• International experience and contrasts</li><li>• Financing for different CO<sub>2</sub> sources and different parts of the CCS chain</li></ul> |
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