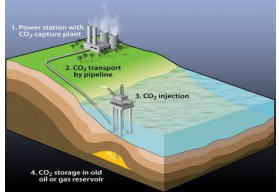



Carbon Capture from power Plant and atmosphere

Science and Innovation Award £4M EP/F034520/1

CCS: **reduced CO2 emissions from fossil mega-sources**

Biochar: **negative CO2 emissions from biomass mini-sources**

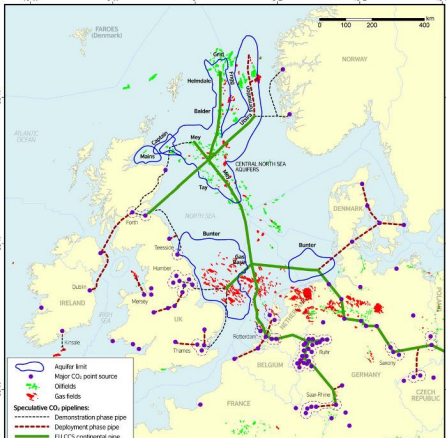
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Established expertise on storage




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North Sea rim: CCS grid



UK and Scotland can offer offshore storage capacity to EU 27

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Capture methods

- Cryogenic distillation – mature
- **Liquid absorption (amines) – rollout and testing**
- **Adsorption (CO₂, O₂, H₂ – pre or post combustion)**
 - Pressure swing adsorption (PSA) processes
 - Novel packings (monoliths)
 - Novel optimized materials
- **Membranes (CO₂, O₂, H₂ – pre or post combustion)**
 - Novel optimized materials
 - Mixed matrix materials
- **Looping** post combustion gas or coal: carrier, fluid dynamics

Basic science ==> materials ==> test performance ==> industrial scale

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New methods of industrial scale CO2 capture

1 new staff University of Edinburgh:
Dr Hyungwoong Ahn



3 PDRA - in progress
Joins 5 staff, 2 PDRA, 5 PhD

2 new staff Heriot-Watt University
- recruit in progress
Joins 3 staff, 5 PhD

Amines, Engineered microporous solids, chemical looping

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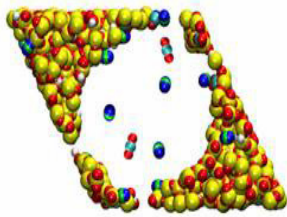
Amine optimisation (Graeme White)

Gas-Liquid Contacting Column Optimise internal packing to ensure good gas-liquid contact to gain maximum mass transfer efficiency

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Pressure swing (Stefano Brandani)



Pressure swing adsorption using Metal-organic frameworks as novel adsorbents

molecular simulation to the design and development of nanoporous materials

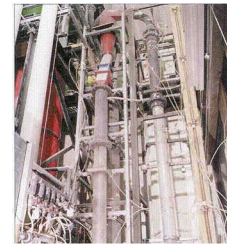
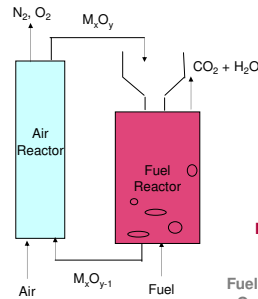
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7

Chemical looping (Raffaella Ocone)

- Combining power generation with CO₂ separation
- CCL low cost, high efficiency



Most common set-up:

Air Reactor → CFB
Fuel Reactor → Bubbling Bed
Oxygen carrier MCO₃, MOx

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8

Biochar

Proposition:

Anthropogenic emissions are committed to > 2C rise

Extracting CO₂ from atmosphere is desirable

Storing carbon in soil can maintain / increase fertility

Slow pyrolysis (200-800 C) of biomass,
Producing 'charcoal' intended for application to soil
Impact ambitions globally : 1 Gt C /yr



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9

Dimensions

Three new lecturer staff, UK and international links

Dr Simon Shackley (ex-Tyndall) - Techno-social, also CCS

Dr Saran Sohi (ex-Rothamsted) - Soil science

Dr Ondrej Masek (ex-Cranfield) - pyrolysis engineering

3 x PDRA Peter Brownsort, Miranda Prendergast-Miller Andy Cross

6 - 12 PhD - 2 in place



UK Biochar Research Centre @ Edinburgh

www.geos.ed.ac.uk/scs/biochar

UK Biochar Research Centre

Reducing and removing CO₂ while improving soils: a significant and sustainable response

Login | You are here: Scottish Centre for Carbon Storage >> The UK Biochar Research Centre

Section Contents

The UK Biochar Research Centre

The Mission of UKBRC is to undertake leading edge multi- and interdisciplinary carbon storage and sustainable energy technology, and to provide an understand and socio-economic impacts of biochar.

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10

Example activity

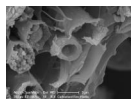


UK slow pyrolysis unit

Field trials : UK + 7% yield

Since January 2009, research sponsorship £ 400k from: DEFRA, Shell, ProNatura, C Gold

Dedicated UK laboratory: under construction



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Co-firing BECS

UK mandates 3-5% biomass in central power plant

Drax is planning 10% by 2011

Co-fired plants tested to 10% , progressing to 30%



If CCS (90%) fitted to co-fired plant, ==> neutral, potentially -ve

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12

