Newton Fund - Sustainable Gas Futures Workshop (SGF) 25th-27th February 2015

Carbon Capture & Storage (CCS) including Bioenergy CCS (BECCS)

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CCS & BECCS

- Global emissions of CO_2
- What are CCS & BECCS?
- Operational CCS & BECCS projects
- Barriers to development of the industry
- CCS in the UK
- CCS & CO_2-EOR/EGR
- Technical challenges – future research?
- Summary

Global emissions of CO_2

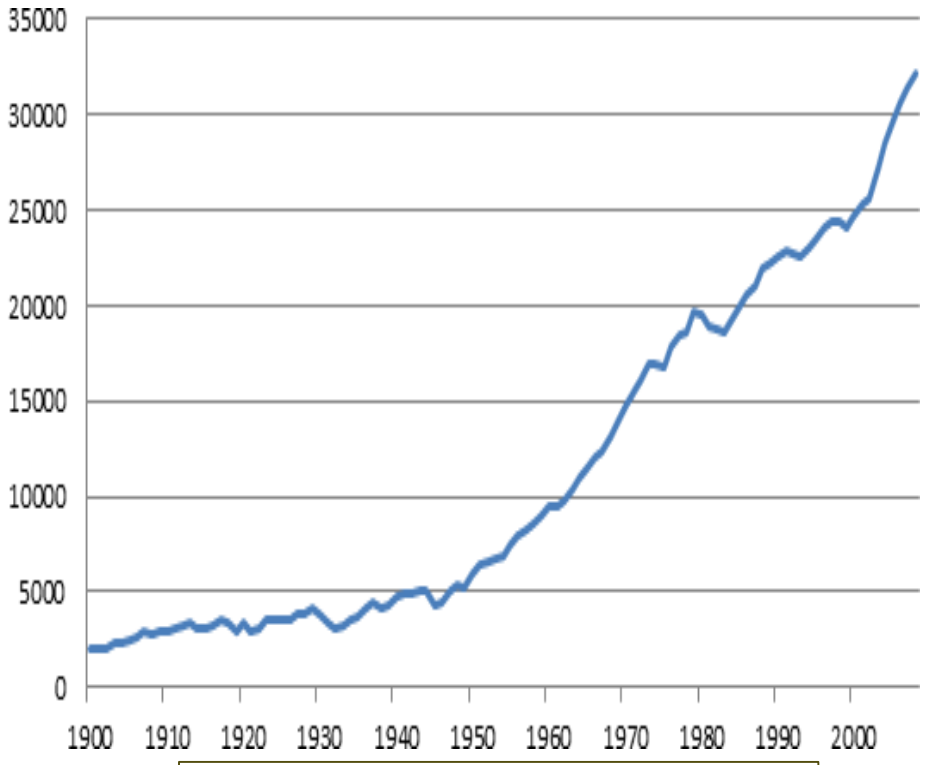
Annual 2012, 10^6 tonnes

1.	China	8,287
2.	USA	5,433
3.	EU	3,710
4.	India	2,009
10.	Russia	1,741
15.	UK	494
7	Brazil	420

Per capita tonnes
USA 18; UK 7.9; China 6.2; Brazil 2.2
World 4.9

World 33,615x10^6 tonnes

Storage 5x10^6 tonnes



Data from USEPA & Wikipedia

What are CCS & BECCS?

- Carbon capture & storage
  - Capture of CO_2 at source (power generation, cement, ammonia production etc)
  - Compression & transportation to burial site
  - Injection into depleted petroleum field or seep saline aquifer at >800m burial depth as dense phase fluid
  - Monitoring during injection and shut in phases
- Bioenergy CCS
  - As above but with bio capture of CO_2 from the atmosphere

Operational CCS & BECCS projects - aspirational

Global CCS Institute

Operational CCS & BECCS projects - operational

Stage: Operate | Region: -- Region -- | Industry: -- Industry -- | Capture type: -- Capture type -- | Transport type: -- Transport type -- | Storage type: -- Storage type --

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Operational CCS & BECCS projects – non-EOR

Illinois Industrial Carbon Capture and Storage Project

Sleipner CO_2 Storage Project

Global CCS Institute

Barriers to development of the industry

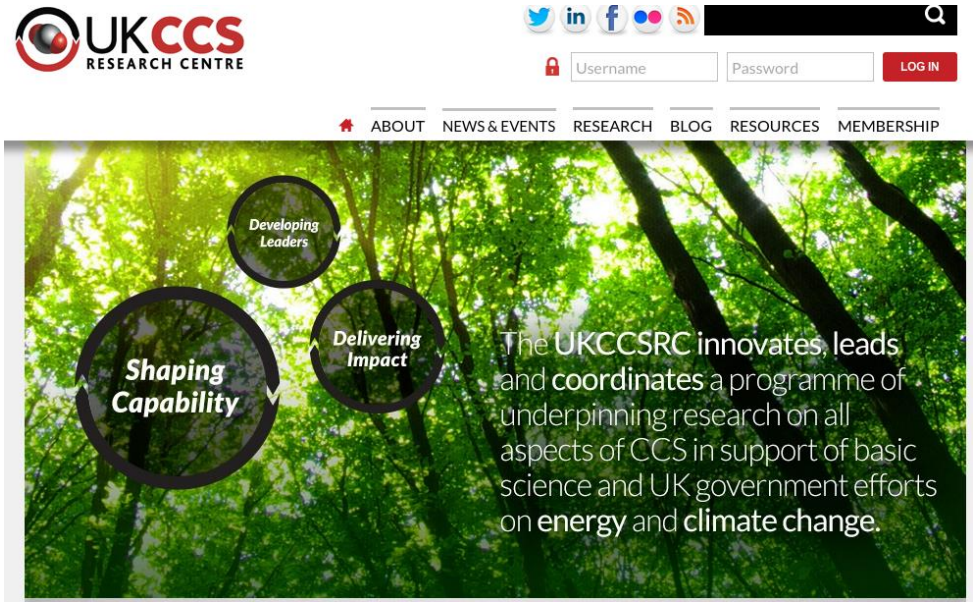
- CCS adds cost to a project
  - First generation estimated at 30% energy penalty
- Long term environmental impact not factored into costs/value
- Individual projects driven by national laws/commitments to emissions reductions – global buy-in lacking
- CO_2-EOR (& EGR) generates value..
  - Adds capability and capacity…the way ahead?

CCS in the UK

- First CO_2 injection – 18 days in 1980 into depleted Egmanton Field (onshore UK)
- First dedicated CO_2 injection well drilled by NGC – July 2013 (offshore UK)

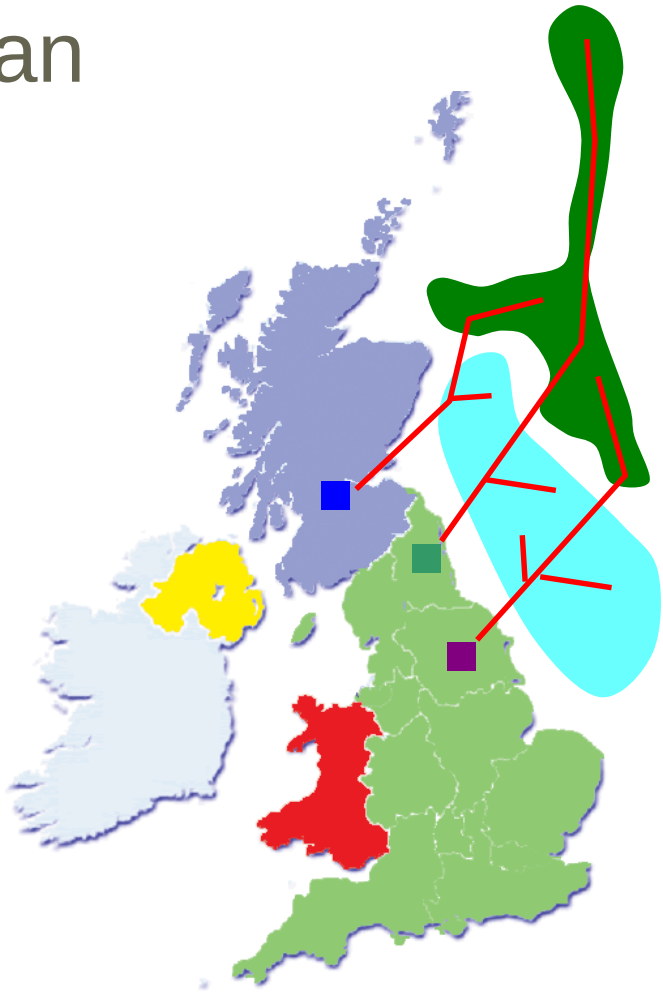
- Peterhead Project
- White Rose

https://ukccsrc.ac.uk



CCS & CO_2-EOR/EGR

- 1 tonne of injected CO_2 can deliver 2-5bbl oil
- UK potential 2-8 billion bb oil
  - East cost UK – 60 million tonnes of CO_2 available
- UK enhanced gas potenti being assessed



Technical challenges – future research?

- Capture
  - cost reduction on post combustion
  - new plants oxyfuel & pre-compustion
- Storage
  - confirmation of dynamic capacity
  - Monitoring – passive continuous
- Society
  - social acceptability

Summary

- CCS – only industrial scale emissions reduction process available if we are to continue to fossil fuels
- BECCS – potential carbon negative adjunct to CCS
- Needs buy in from all major emitters
  - 75% of emissions comes from China, USA, EU, India, Russia, Japan, Iran, South Korea, Canada, Saudi Arabia, South Africa, Mexico, Indonesia, Brazil, Australia…