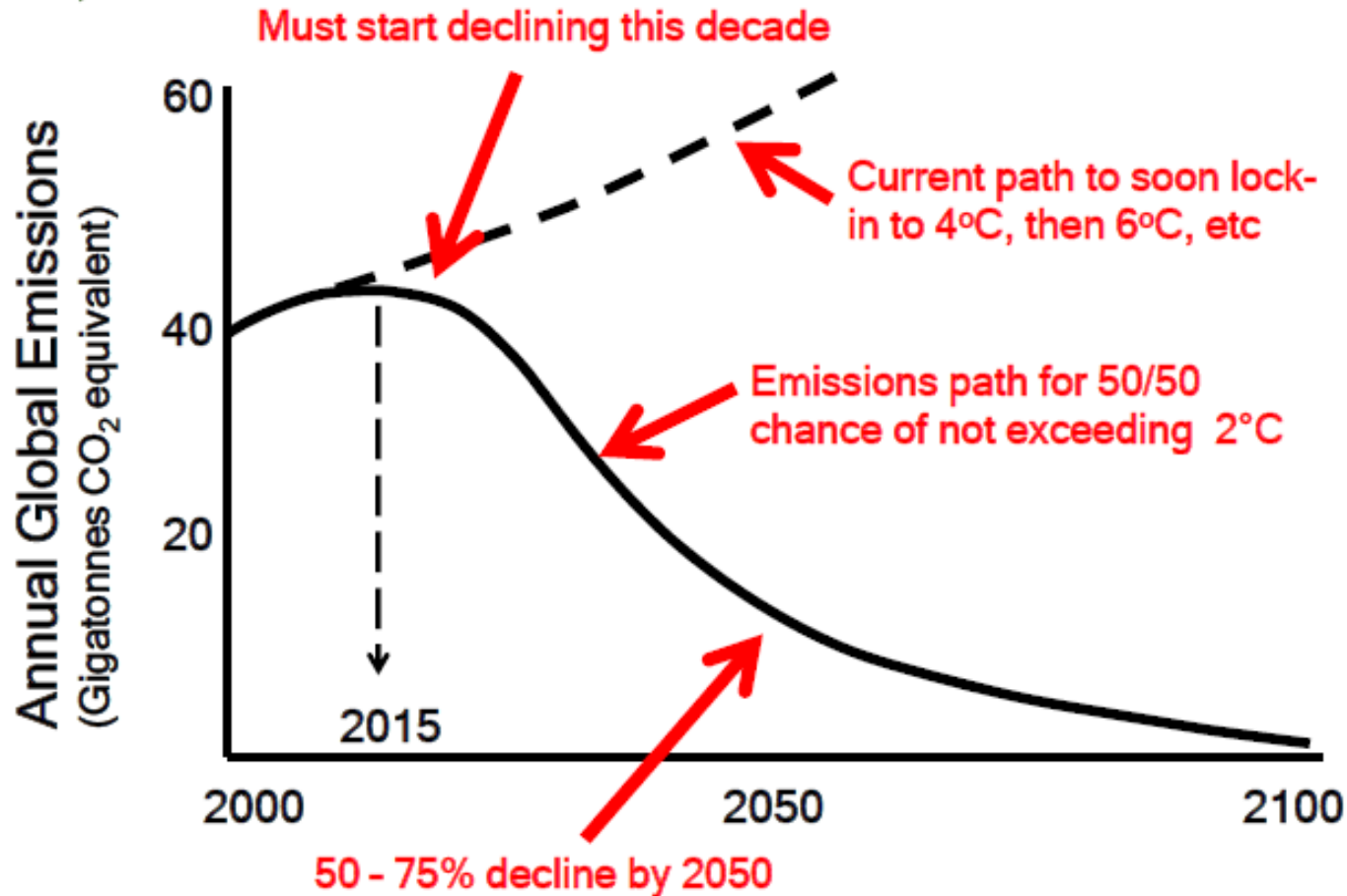


Alternative CCS Pathways

EJ. Anthony
June 26-27th, 2014



Diverting from a hotter, unstable world



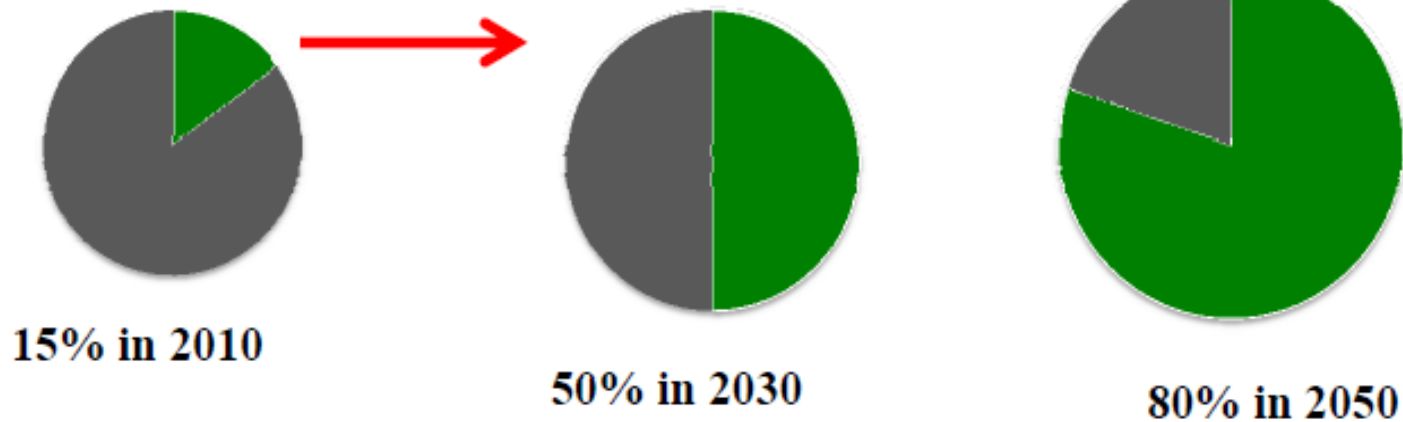
John Nyboer, CMC Conference Banff, May 25th, 2014
Simon Fraser University



Global energy system - 40 year, 2°C path

Only possible if virtually all
long-lived energy
investment is CO₂-free
from today

50% reduction from
growing system requires
80% CO₂-free globally



CO₂-free energy share = renewables + nuclear
+ fossil fuels with carbon capture & storage

Solutions to GHG Issues

- More (much more) renewable energy!
 - Renewables (e.g. solar and wind) will make up a 1/4th global power mix by 2018. The IEA said that in 2016 renewable energy will overtake natural gas as a power source, will be twice that of nuclear, and second only to coal as a power source
- Mitigation Approaches
 - With the caveat that it is likely to be much more expensive than prevention – Stern Report, 2006
 - The US government spent more taxpayer money on the consequences of 2012 extreme weather than on education or transportation
- Climate Modification
 - Untested, but likely essential!
- Carbon Capture and Storage
 - Being demonstrated

Project Name	Leader	Location	Feedstock	Size MW	Capture Process	CO2 Fate	Status
Kemper County	Southern	Mississippi	Coal	582	Pre	EOR	Under Construction
HECA	SCS	California	Petcoke	405	Pre	EOR	Planning
FutureGen	FutureGen Alliance	Illinois	Coal	200	Oxy	Saline	Planning
TCEP	Summit Power	Texas	Coal	400	Pre	EOR	Planning
WA Parish	NRG Energy	Texas	Coal	250	Post	EOR	Planning

Canada

Project Name	Leader	Location	Feedstock	Size MW	Capture Process	CO2 Fate	Status
Boundary Dam	SaskPower	Saskatchewan	Coal	110	Post	EOR	Under Construction
Bow City	BCPL	Alberta	Coal	1000	Post	EOR	Planning

Originator	Technology	Success
John Espy (the storm king) USA 1849	Burning large tracts of forest to make rain	None
General Daniel Ruggles and Robert Dryenforth, USA 1891	Concussion Theory –make rain by creating large explosions in the atmosphere	None
Various (Recent used in China in 2007)	Seed clouds to make rain	Moderate
John von Neumann, USA 1950's	Develop computer models of climate	None, but unintended consequences
USSR 1950's	Stalin's great plan to transform nature, e.g. dam the Bering Straits to melt arctic ice!	None, but some environmental disasters
Various	Geo-engineering (seeding oceans with Fe, reflective mirrors in space, air capture), ocean liming	Too soon to say

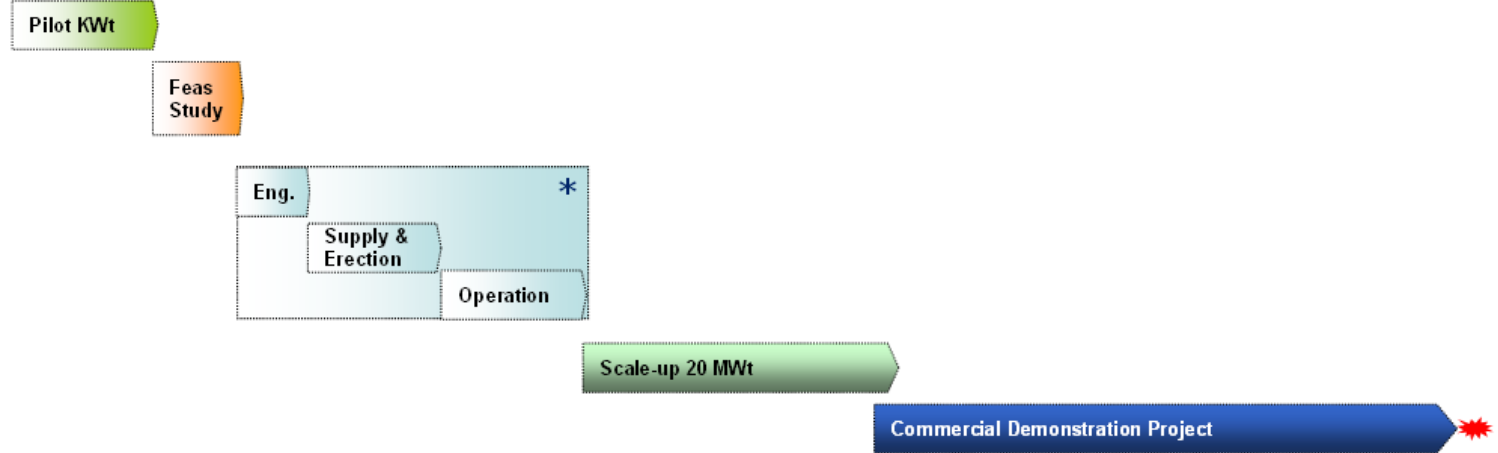
CCS as conceived today is not climate control and cannot prevent climate change!

However, exceptions exist e.g.
BECSS

CaOling Roadmap

TECNICAL DEVELOPMENT AND DEMONSTRATION STAGES

2008	2009	2010	2011	2012	2013	2014-2020
Pilot Plant La Pereda 1 MWt				Commercial Demonstration Project		
Pilot KWt S-1	Feasi bility stud S-2	Demo Plant 1MWt S-3		Scale- up 20 MWt S-4		Commercial Demonstration Project Existing Power Plant S-5



*** Industrial Application**

Venue and Travel

The Edinburgh Conference Centre, Heriot-Watt University, Edinburgh
The Edinburgh Conference Centre is located in the beautiful grounds of the Heriot-Watt University campus, 6 miles from the city centre. It is ten minutes from Edinburgh International Airport and is just off the city centre bypass which connects with Scotland's motorway network, making it easily accessible from all over Scotland and beyond. It is also served by three bus routes from the city centre. The ECC shares its entrance with the main reception of Heriot-Watt University.

Detailed travel information may be found on the event website.

Accommodation

Details of accommodation, which will include university halls of residence, will be available on the website once registration has opened.

Registration Fees

One of the principal aims of this conference is to encourage wide participation and, to enable this, the cost to participants is kept to a reasonable level. The conference fees will be [approx.]:

- £365 Royal Society of Chemistry member
- £185 Royal Society of Chemistry student member
- £550 Non-RSC member
- £305 Non-RSC student members

The fee will include lunches, refreshments, the poster buffet dinner and the Conference Dinner. All participants are asked to cover their own accommodation and travel costs.

Conference Executive Committee Officers

- Dr David J A McCaffrey (Conference Chairman), McEnergy Consultancy
- Mr Michael Harrington (Conference Committee Secretary), EDF Energy plc
- Miss Ike Sikuade (Conference Treasurer), HSBC Bank plc
- Prof James A Anderson (Conference Programme Co-ordinator), University of Aberdeen

Conference Executive Committee

- Dr Giorgio Caramanna, Herriot-Watt University (local organiser)
- Prof Mercedes Maroto-Valer, Herriot-Watt University (local organiser)
- Dr Edward J Anthony, Cranfield University
- Mr John Greene, Consultant
- Dr Stuart A Norman, E.ON Technologies
- Dr Richard Oldroyd, Elkington and Fife LLP
- Mr Stephen Preece, EDF Energy plc
- Mr Brian Shelley, Retired
- Dr Trystan M Watson, Swansea University
- Dr Di Wei, Nokia Research Centre

Conference Advisory Board

- Dr Miles Drake, Weyerhaeuser (USA)
- Dr James R Gasson, Fraunhofer Institute (Germany)
- Dr Kinson C Kam, Haldor Topsoe A/S (Denmark)
- Prof Tong Lin, Deakin University (Australia)

Secretariat Contact

- Mrs Maggi Churchouse, Maggi Churchouse Events
- 3 East Barn, Market Weston Road, Theltham, Diss, IP22 1JJ, UK
- Telephone and fax: 01359 221004
- E-mail: maggi@maggichurchouseevents.co.uk

Website Address

www.chemistryinenergy.org



Conference Announcement and Call for Papers



1st Chemistry in Energy Conference (1st CEC)

Monday-Wednesday, 20th-22nd July 2015

Heriot-Watt University, Edinburgh, UK



RSC Energy Sector