

Chevening Fellowship



Low carbon innovation and new growth theory:

Observations from the coal face

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Outline



- + British context
- + Economics of innovation
- + Relevance to low carbon investments
- + Carbon capture and storage (CCS)

Chevening Fellowship



- + Chevening Masters and Fellowships
- “Finance and investment in a low carbon economy”*
- + University of Edinburgh Business School
- + From 2011 offered as a Masters course – see flyers



Chevening Fellowship



- + Placement on CCS at EcoFin
- + So this presentation has an energy focus



CCS is part of
THE CLEAN REVOLUTION

British CC policy



“In an environment where policy is increasingly technology specific.... British policy has moved away from the notion that technology choice is a matter for markets alone.” (Gross et al 2010)

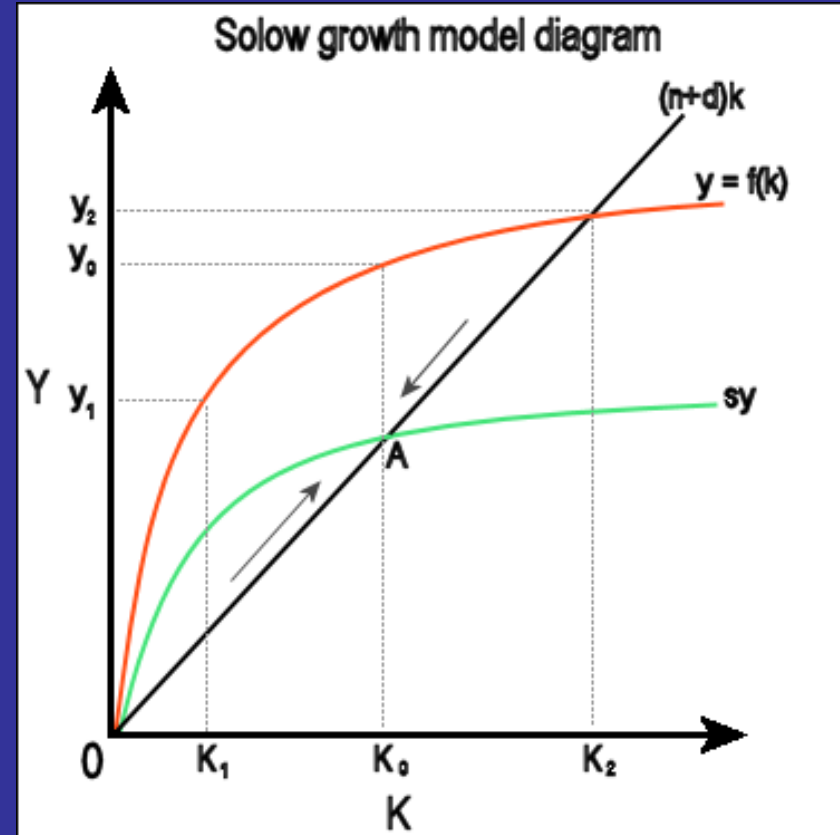
- + Interventionist policy = lower economic growth
- + Is there a real problem, misguided British CC policy is trying to address?



Economics of innovation



- + Competition drives innovation
- + Solow and others, innovation most important driver of economic growth (Smith & West, 2007)
- + Romer (1986) endogenised technology in growth models
 - new growth theory
 - emphasises importance of knowledge creation
 - Increasing returns
 - Many equilibria



Economics of innovation

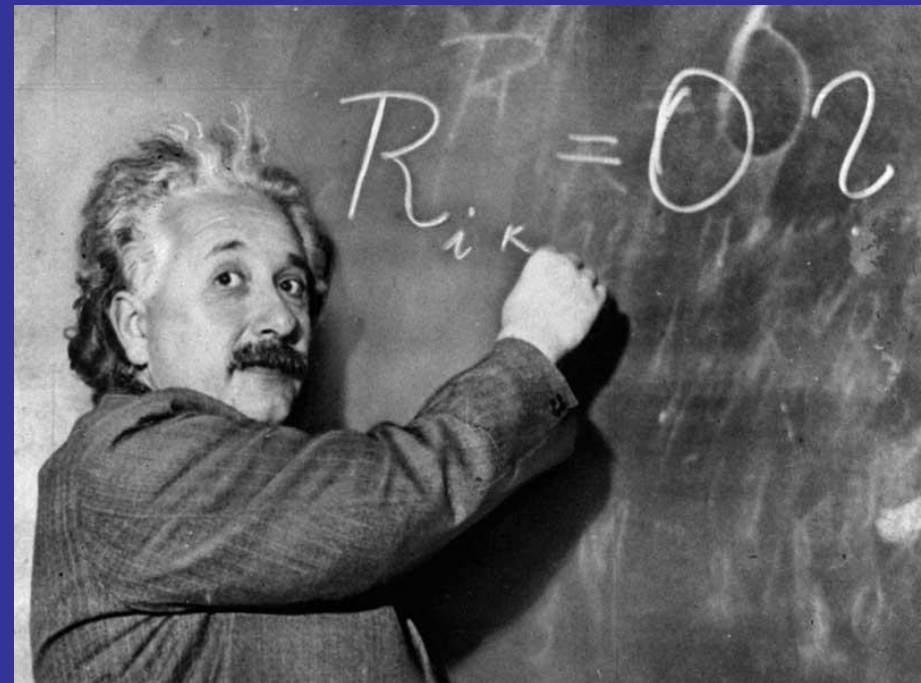


- + Innovation based on knowledge
 - knowledge is a public good

Policy recommendations:

- + Neoclassical: focus on R&D and education
- + Endogenous: broader view of role of government

... innovation policy should reduce, not increase, cost of innovation



Relevance to low C innovation



- + Increasing returns = first mover advantage
- + Danish wind manufacturers:
 - 90% of wind jobs came from rest of economy
 - GDP US\$270 million lower (CEPOS, 2009)



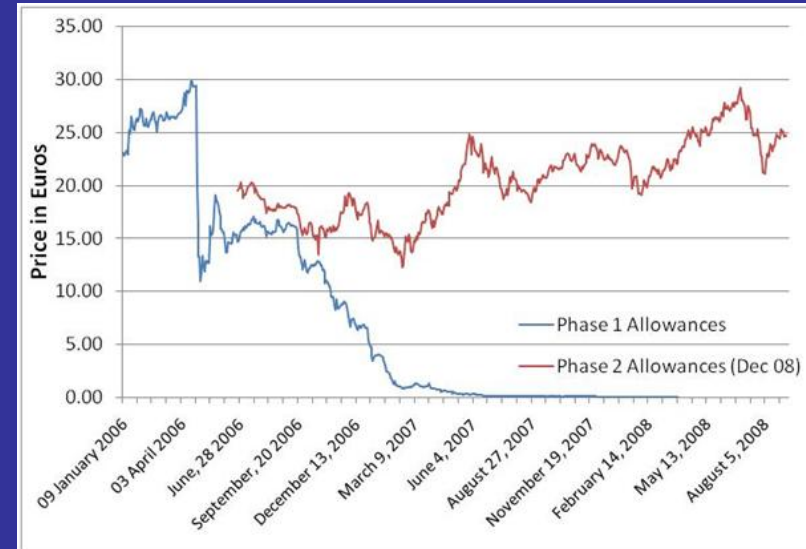
Relevance to low C innovation



Low C not special

- + Carbon price will drive innovation
- + Diverse sectors: transport, agriculture, energy etc
- + Global investment: \$1 trillion p.a. by 2030
- + Small part of economy

... McKinsey (2010)
sector specific innovation



Relevance to low C innovation



Energy sector:

- + Regulated pricing
- + Low R&D levels
- + Long lived, large, lumpy investments
- + Long lead times
- + Need reliability
- + Economy of scale
- + Vested interests
- + Political

.... no nuclear



CCS innovation

- + Only 2 full size CCS demonstrations...
 - in whole of EU (EcoFin)
 - how many for Australia
 - what scale?



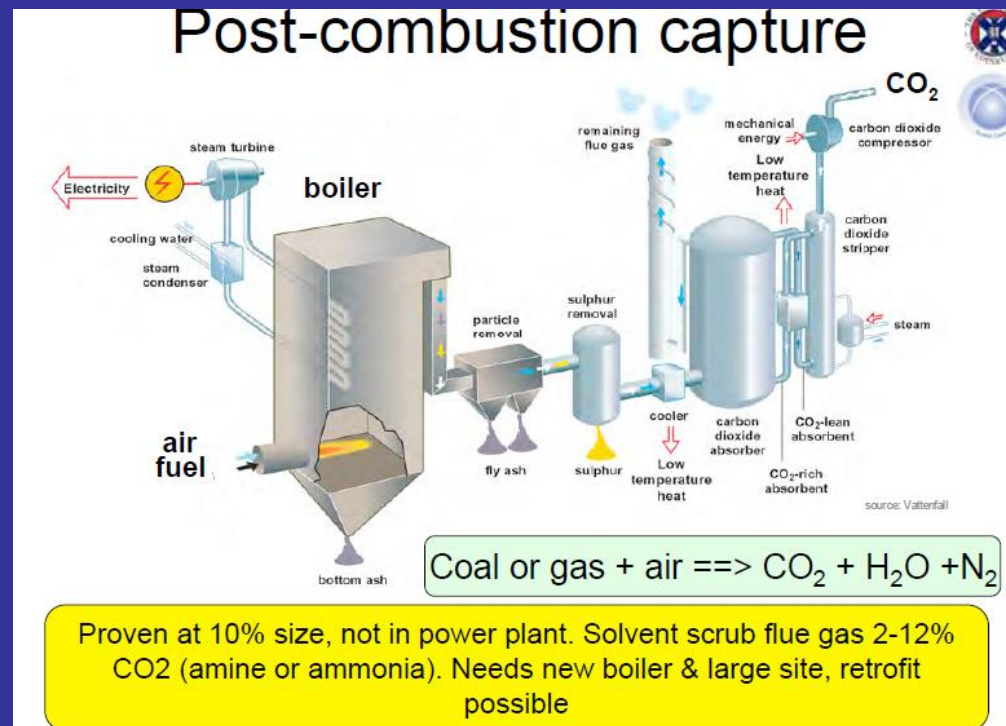
CCS innovation

- + Funding could address financial issues:
 - greater leverage with consortia
 - debt could finance if: performance indicator across whole chain, major sponsor, route to commercial viability



CCS innovation

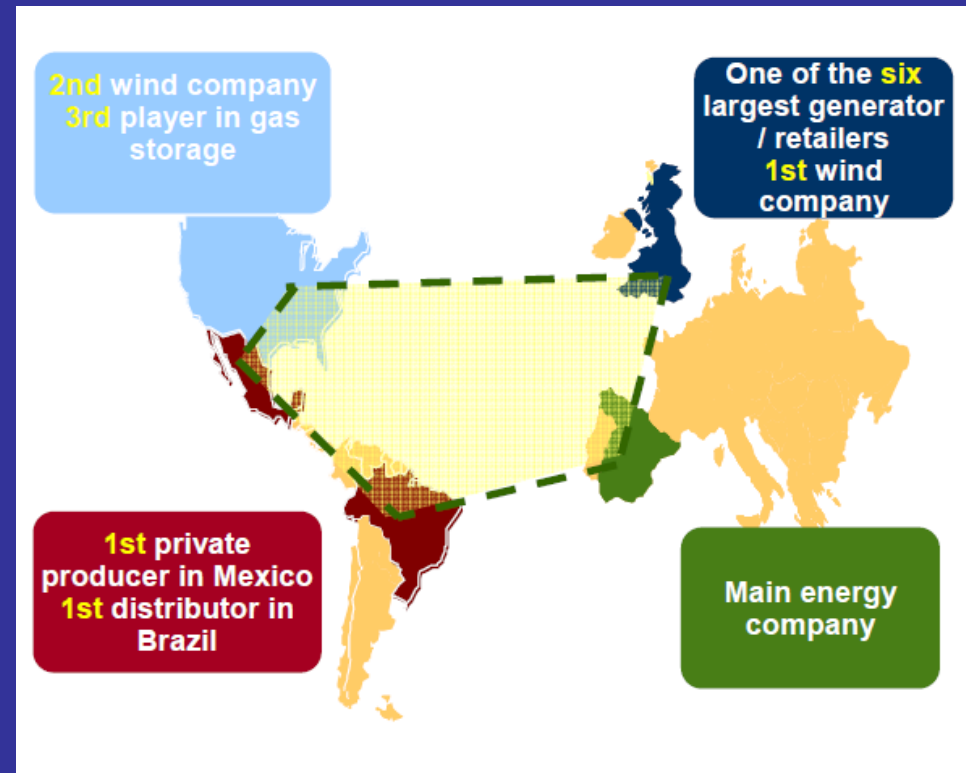
- + Focus on innovation:
 - CO2 pipes not innovative
 - industrial chemistry for post-capture amines is, energy saving 15-20% at Longannet
 - business model and risk requires innovation
 - creative delivery: CarbonTrust



CCS innovation



- + Australia's strengths
 - significant second mover advantages (EcoFin)
 - fast adopter
 - chemistry?
 - financial services?
 - fund forestry carbon accounting in Indonesia instead?



CCS innovation



- + Culture of innovation:
 - withstand vested interests
 - examine/ advocate good governance
 - prizes subject to evidence
- + Supportive regulatory environment
- + Manage risks: CCS might never work efficiently

Observations



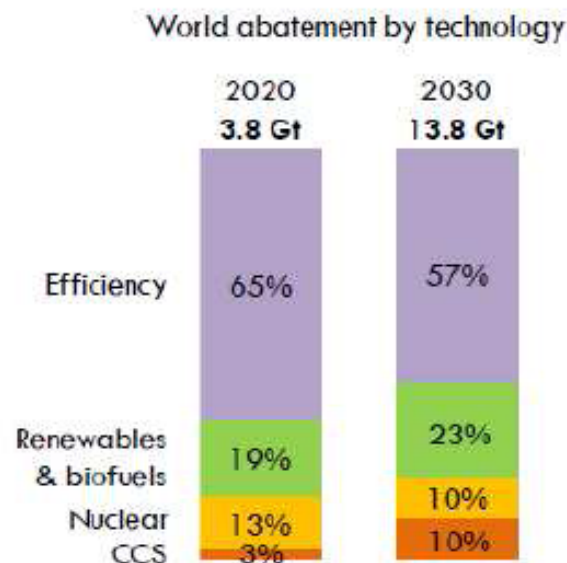
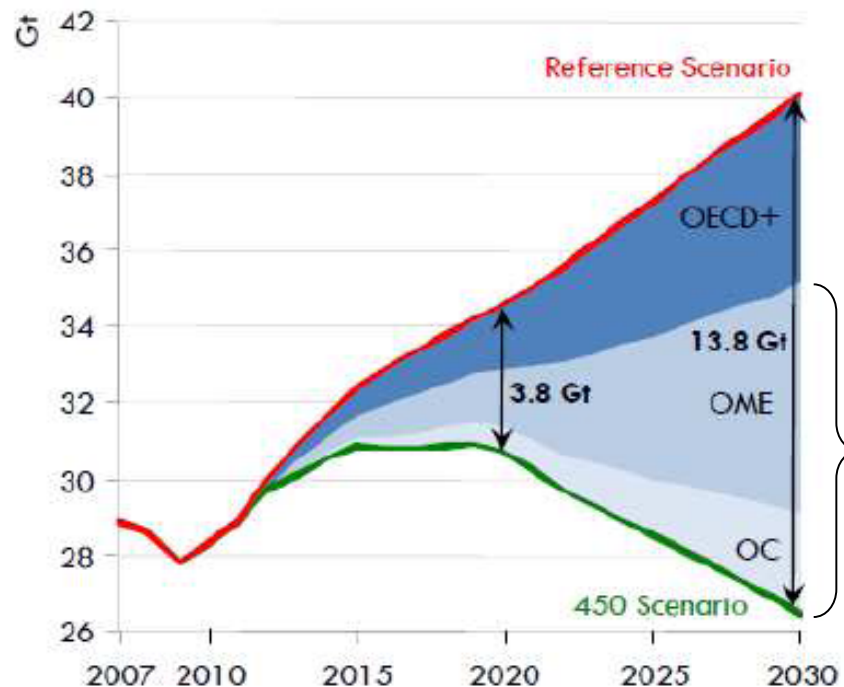
- + Focus on innovation
 - not on the appearance of innovation
 - innovation should reduce costs
- + Strategic approach
 - an honest appraisal of Australia's strengths
- + Tailor innovation policy to context
- + Keep things in perspective
- + Develop frameworks and evidence for innovation
 - novel approaches to distributing funds
- + Good policy takes time:
 - still fixing 1995 cap in MDB



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How much capital? – energy scenarios

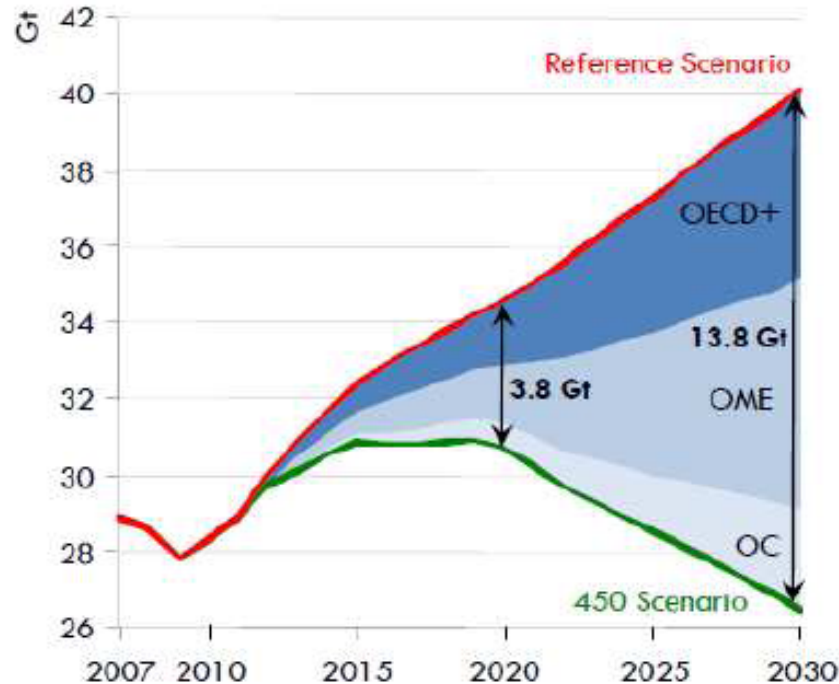


Additional \$10.5 trillion investment is required in total to 2030 (mainly EE)

Source: IEA/OECD (2009) World Energy Outlook 2009.



How much capital? – energy scenarios



Additional \$10.5 trillion investment is required

Source: IEA/OECD (2009) World Energy Outlook 2009.

Reference case

- + \$26t to 2030
- + \$1.4t (1.4% GDP average)

Additional carbon invest^t

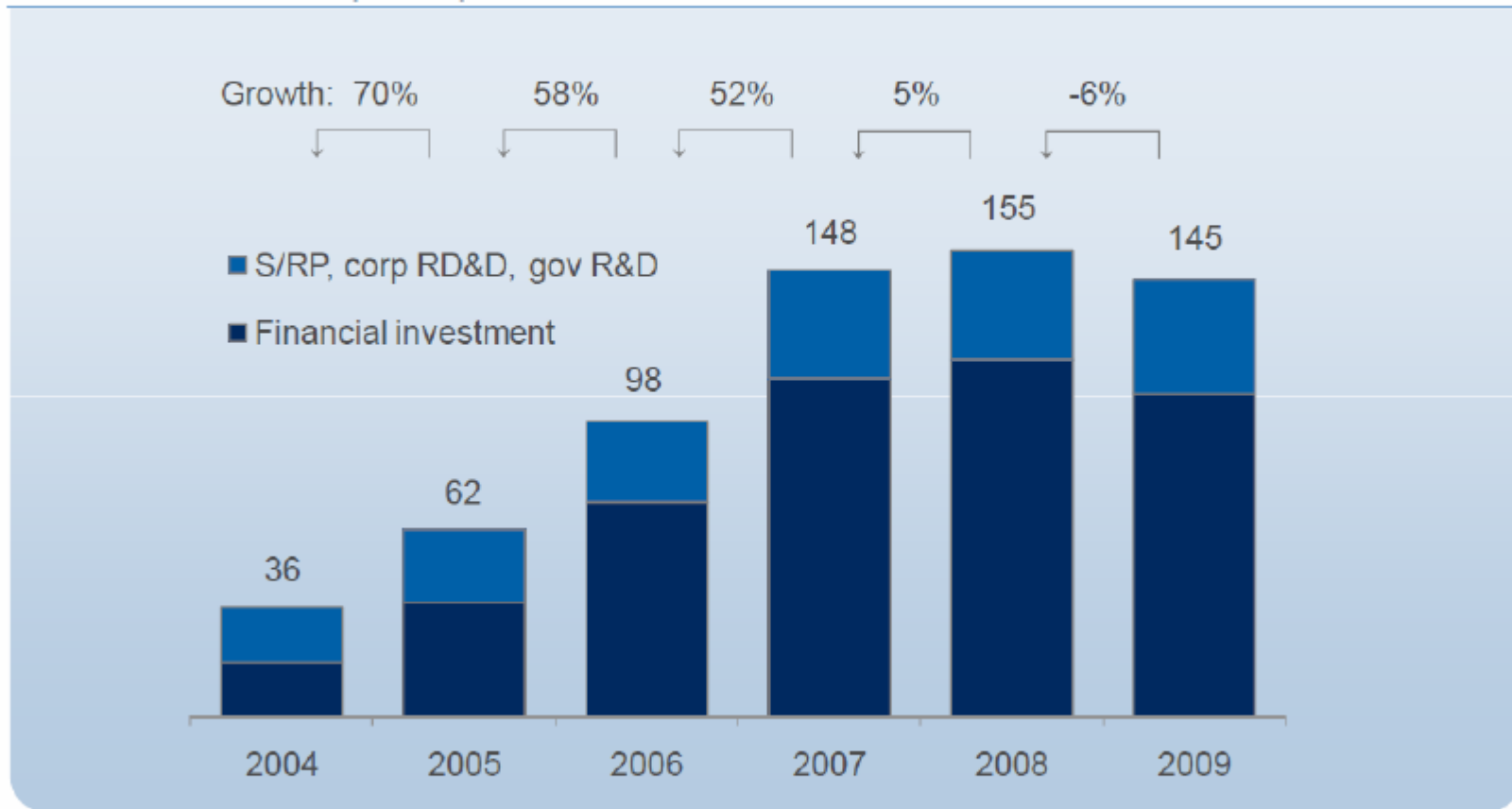
- + \$10.5t to 2030
- + \$430b (0.5% GDP in 2020)
- + \$1.1t (1.1% GDP in 2030)

Tech change drives economic growth (Arrow)

- + If have relative advantage in low C tech^y there are ec growth advantages



Recent growth has slowed



Note: Includes 4 quarter running average. Financial sector investment only (i.e. excluding residential scale projects). Not adjusted for re-invested equity. Total values include e

\$430b 'required' p.a. by 2020