UNIVERSITY OF CAMBRIDGE | Electricity Policy Research Group

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Carbon Pricing and the Restructuring of Electricity Sectors

David Newbery

Carbon Pricing, Power Markets And The Competitiveness Of Nuclear Power

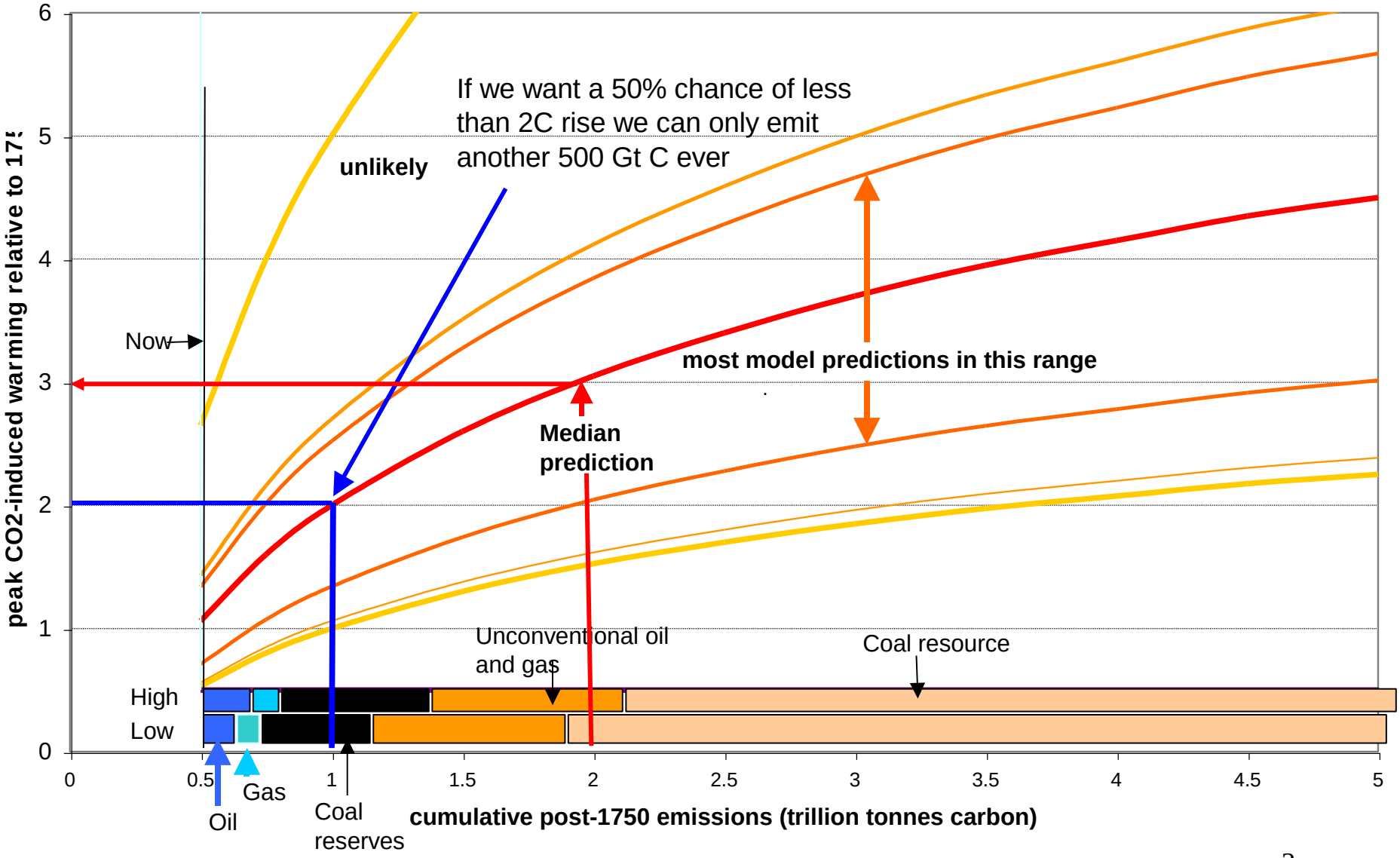
IEA/NEA Paris 11 January 2011

http://www.eprg.group.cam.ac. uk

Outline

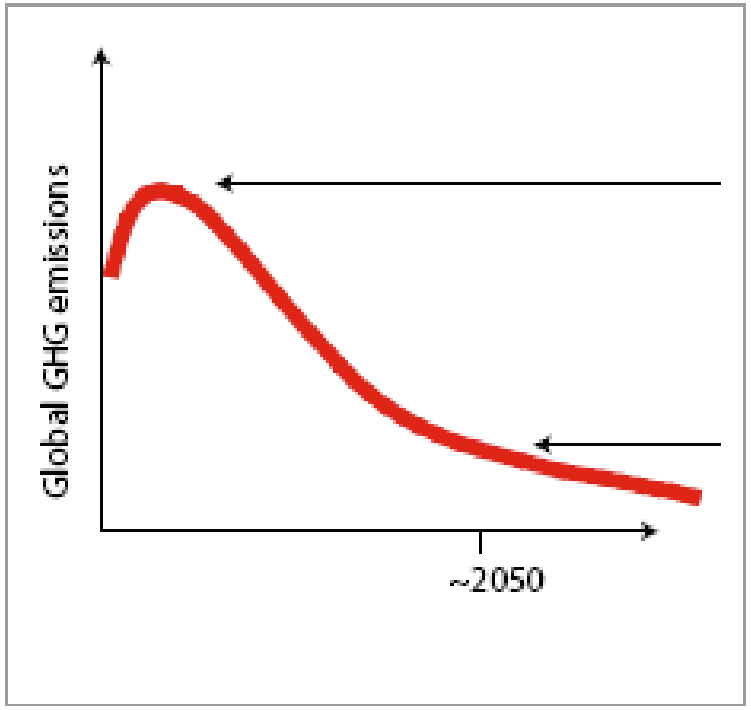
- The need for carbon pricing
- EU Instruments: ETS and 20-20-20 Directive
  - in conflict, need reform
- Stabilising the carbon price
  - taxes, banks or floors
- Restructuring electricity - the UK EMR
  - CO_2 floor, CfD, capacity payments, EPS, ...

Peak CO_2-warming vs cumulative emissions 1750–2500



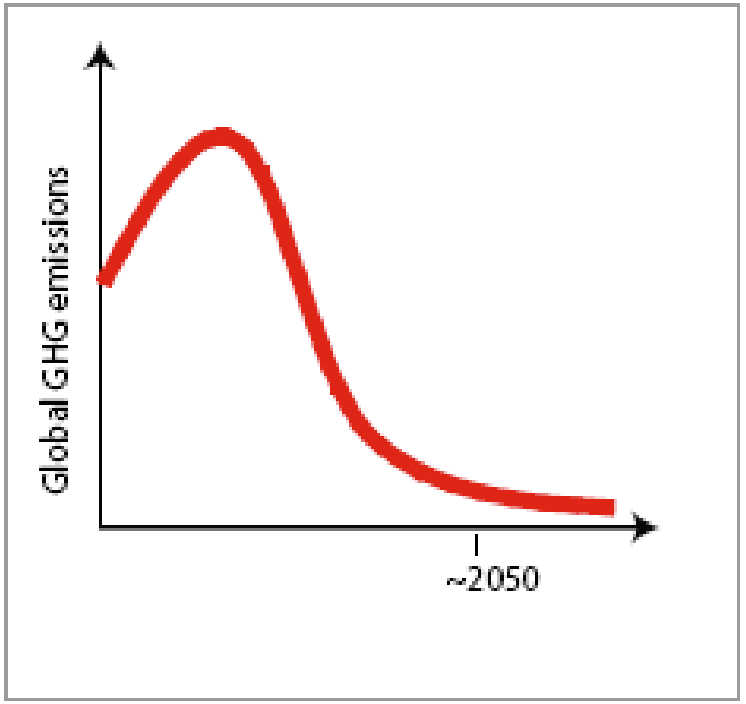
After MR Allen *et al. Nature* **458**, 1163-1166 (2009) doi:10.1038/nature08019

Total cumulative emissions determines global warming



Lower peak

Gradual reduction after peak



Higher / later peak

Faster reduction after peak

- Delaying peak requires a faster subsequent decline
- peak should be before 2020

Source: ENEP Emissions Gap Report 2010

Policies for mitigating climate change

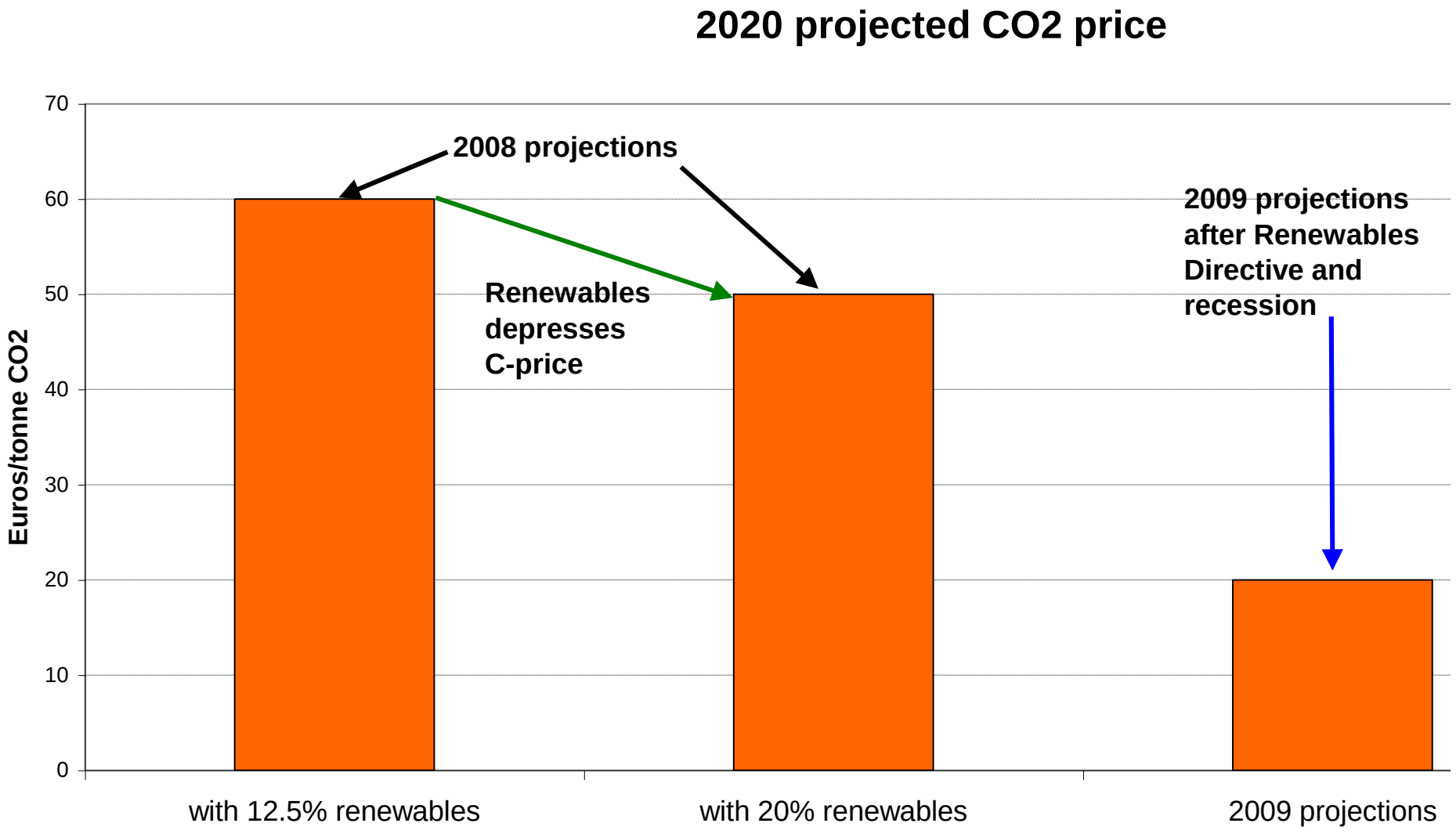
- GHG emissions are a global stock public bad
  - uncertain distant damage with uneven impacts
    => very hard to agree coordinated policies
  - damage regardless of emissions location, persistent
    => damage moderately independent of date of emission
  - much irreversible over historical time scales
- Solution: uniform charge for GHG emissions,
  - charge rises at discount rate
  - reset in light of new information

UNIVERSITY OF CAMBRIDGE

EU climate change policy

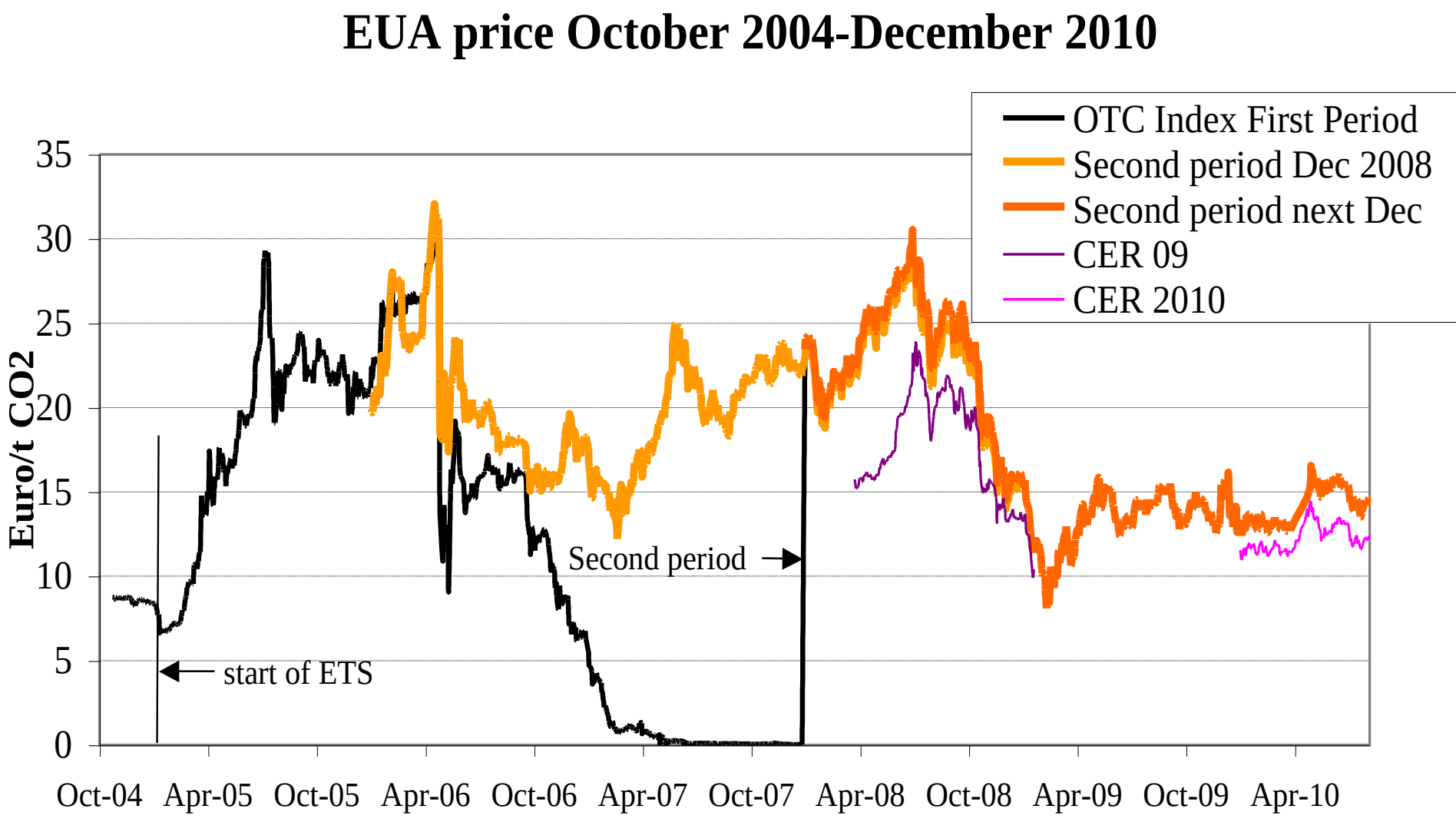
- ETS to price CO_2
  - fixes quantity not price => poor guide for low-C
- 20-20-20 Directive: demand pull for renewables
  - justified by learning spill-overs and burden sharing
- EU SET-Plan to double R&D spend
  - to support less mature low-C options

But ETS undermined by 20-20-20



Source: Committee on Climate Change, 2008 and 2009

CO_2 prices are volatile and now too low



Permits vs Taxes

Weitzman: Taxes superior to permits unless MB of abatement steeper than MC

CO_2 is a ***global persistent stock pollutant***

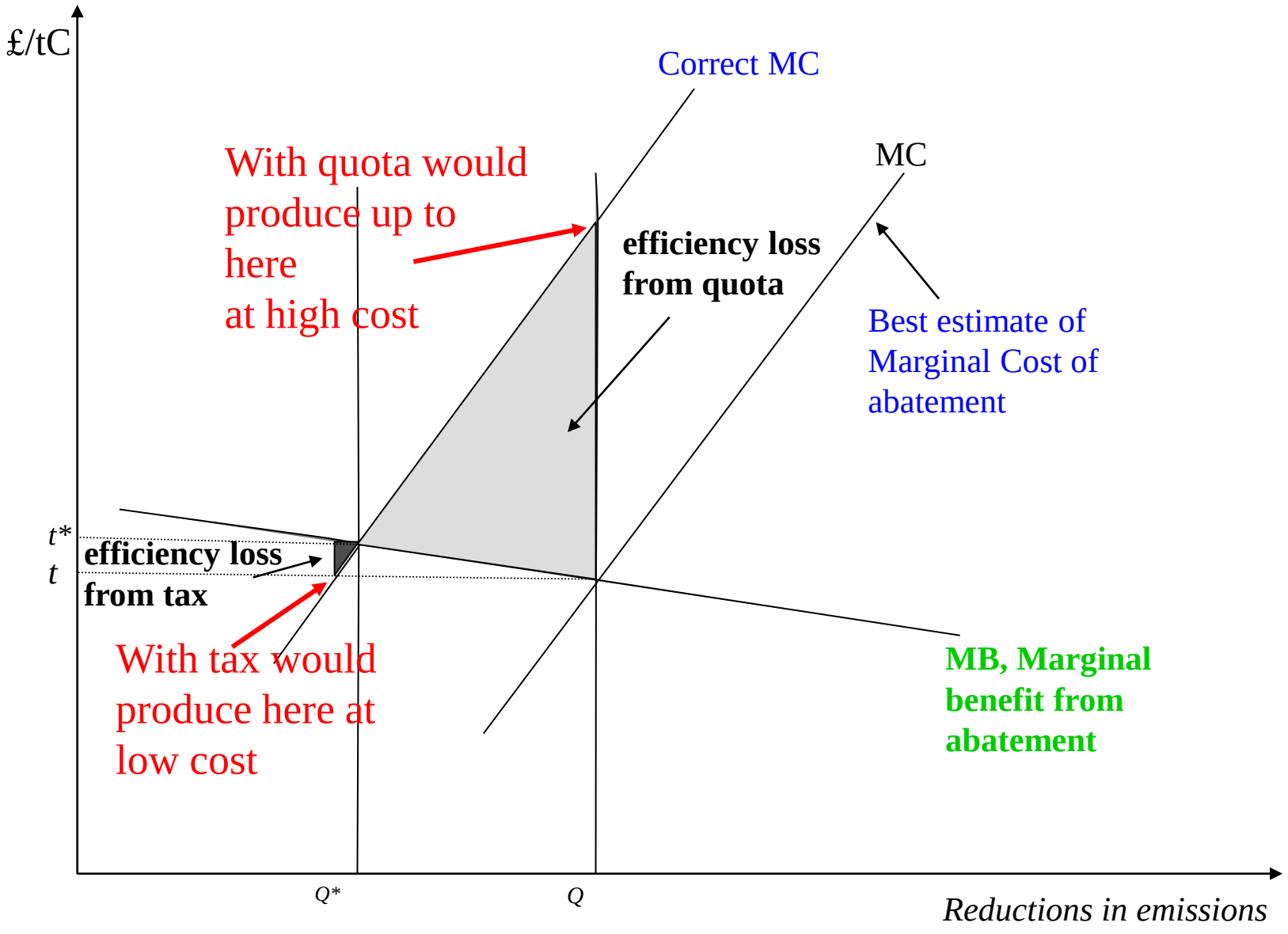
- CO_2 damage today effectively same as tomorrow

  => marginal benefit of abatement essentially flat
- marginal cost of abatement rises rapidly
- future abatement costs very uncertain

Carbon tax superior to tradable permits

but permits easier to introduce

Costs of errors setting prices or quantities



Failures of ETS

- Current ETS sets quota of total EU emissions
- Renewables Directive increases RES

  => increased RES does not reduce CO_2

  => reduces price of EUA

  => prejudices other low-C generation like nuclear
- Risks undermining support for RES

  Solved by fixing EUA price instead of quota

Reforming ETS

- Reform EU ETS to provide rising price floor
  - sufficient for nuclear *or on-shore wind if cheaper*
- Commitment to raise CO_2 price at 3% p.a. over life of plant may suffice
  - €25/EUA 2010 => €34 in 2020, €61 in 2040 ...
- Making it credible: write CfD on this path
  - offer CfD at €45/EUA for 20y from commissioning?

makes extra carbon savings additional

Stabilising CO_2 price

- Floor price - Member states receive x% of NAP each year, adjusted to support EUA price
- EU Carbon Bank
  - buys and sells EUAs to stabilise price
  - Member States resist transferring any EUAs?
- Replace by carbon tax?
  - Cheaper to implement and Cash positive
  - Covers whole economy, simplifies policy
  - underwritten by CfD on path for commitment
  - Need border tax adjustment for traded sectors?

UNIVERSITY OF CAMBRIDGE

Competitiveness impacts

- No difference between permits and taxes
  - both raise opportunity cost of emitting CO_2
  - both raise cost of electricity by same amount
  - if auctioned Govt. gets €€, if granted Co.s get €€
- easier to rebate C tax on exports
  - border taxes on imports, or exempt traded goods?

ETS lobby-prone, so might be rebated C-taxes

Need for market reform

- Low-C generation is capital intensive
  - except CCS has low variable cost
  - wind: v low variable cost, intermittent

=> risk of low prices much of year

  - peak and average prices set by gas +C price?

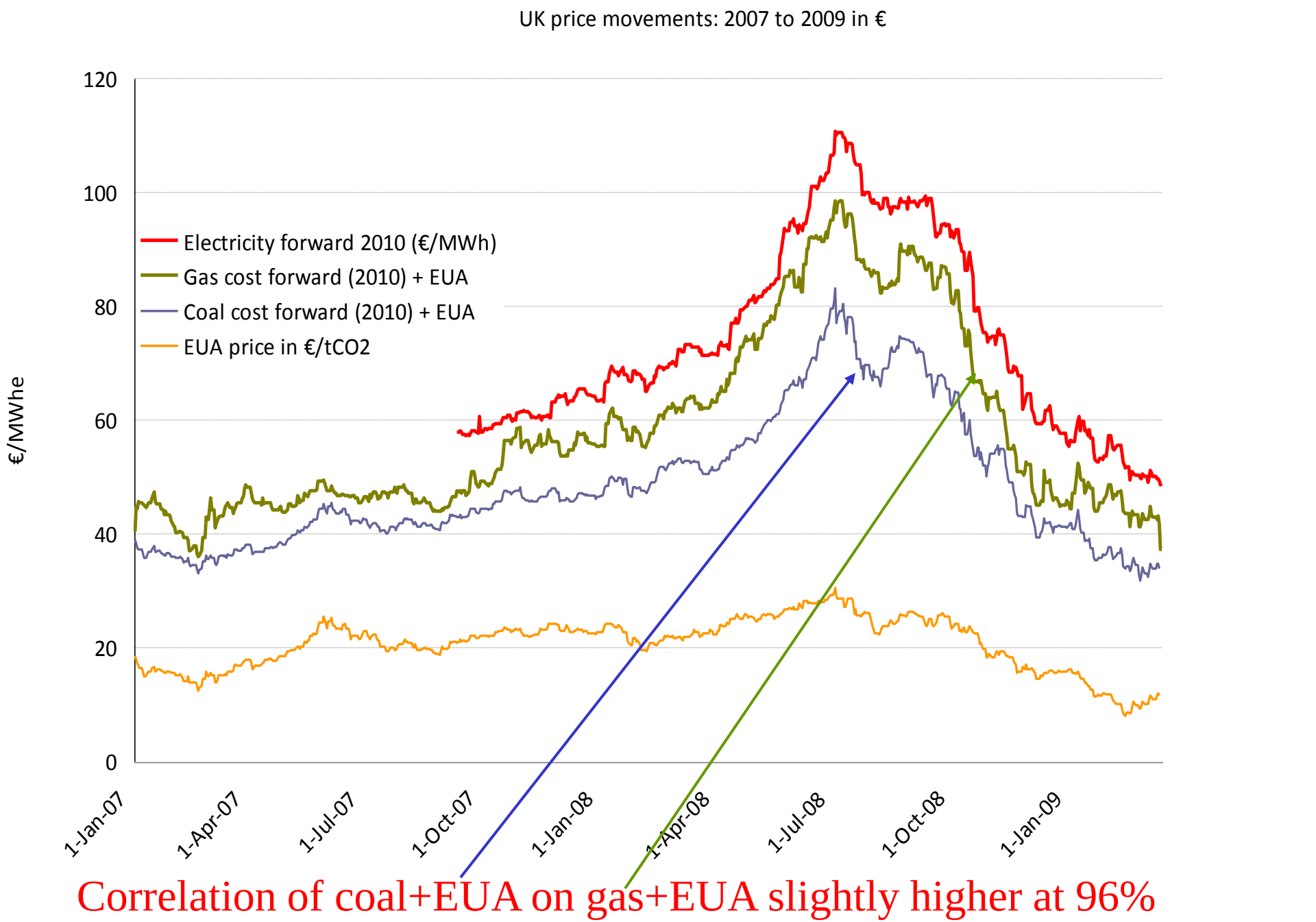
=> how to encourage investment in low-C gen?

  - economics depend on C-price over life: 40+ yrs
  - renewables supported by FITs or ROC

Nuclear power will need assurance on C price

UK Electricity Market Reform

- C-price floor to underwrite wholesale price
  - reduces temptation to renege on contracts
  - supports decentralised market led investment
- CfD for low-C to guarantee future revenues
  - negotiated or tender auctions, technology specific
- Capacity payments to ensure peaking capacity
  - and reduce risk to capital intensive plant/
- Emission performance standards
  - belt and braces to rule out unabated coal


UK price movements: 2007 to 2009 in €
120
100
80
60
40
20
0
€/MWhe
Electricity forward 2010 (€/MWh)
Gas cost forward (2010) + EUA
Coal cost forward (2010) + EUA
EUA price in €/tCO2
1-Jan-07
1-Apr-07
1-Jul-07
1-Oct-07
1-Jan-08
1-Apr-08
1-Jul-08
1-Oct-08
1-Jan-09
Correlation of coal+EUA on gas+EUA slightly higher at 96%

Why?

- Mutually reinforcing elements to reduce risk
  - fossil generation hedged, low-C risky => CfD
  - cost of risk high for low-C
- Carbon price floor to avoid subsidy claims
  - "no subsidies to nuclear power"
  - reduces risk of renegotiating contracts
  - but risks inefficient trade if not EU wide
- Capacity payments and EPS - for comfort?

UNIVERSITY OF CAMBRIDGE

Conclusions

- EU ETS CO_2 price is too low
  - needs ***credible*** rising stabilised floor price
- RES Directive undermines ETS
  - and risks bringing ETS into disrepute
  - fixing EUA price avoids this conflict
- Most electricity markets will not deliver low-C
  - without contracts and/or minimum credible C price
- UK EMR is (moderately) coherent

EU carbon price floor would help

UNIVERSITY OF CAMBRIDGE | Electricity Policy Research Group

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Carbon Pricing and the Restructuring of Electricity Sectors

David Newbery

Carbon Pricing, Power Markets And The Competitiveness Of Nuclear Power

IEA/NEA Paris 11 January 2011

http://www.eprg.group.cam.ac. uk