



UNIVERSITY OF  
CAMBRIDGE | **Electricity Policy  
Research Group**



# Energy in a low carbon economy: new roles for governments and markets

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8<sup>th</sup> BIEE Academic Conference

*Energy in a low carbon economy: new roles for  
governments and markets*

Oxford 22<sup>nd</sup> September 2010

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

# UK Energy policy

‘ensure our energy is **secure, affordable and efficient**’ and ‘bring about a transition to a **low-carbon** Britain’ (DECC web site, 2009)

- What is needed to deliver **low-C Britain**?
- What does that imply for energy policy
- What kind of market for low-C electricity?

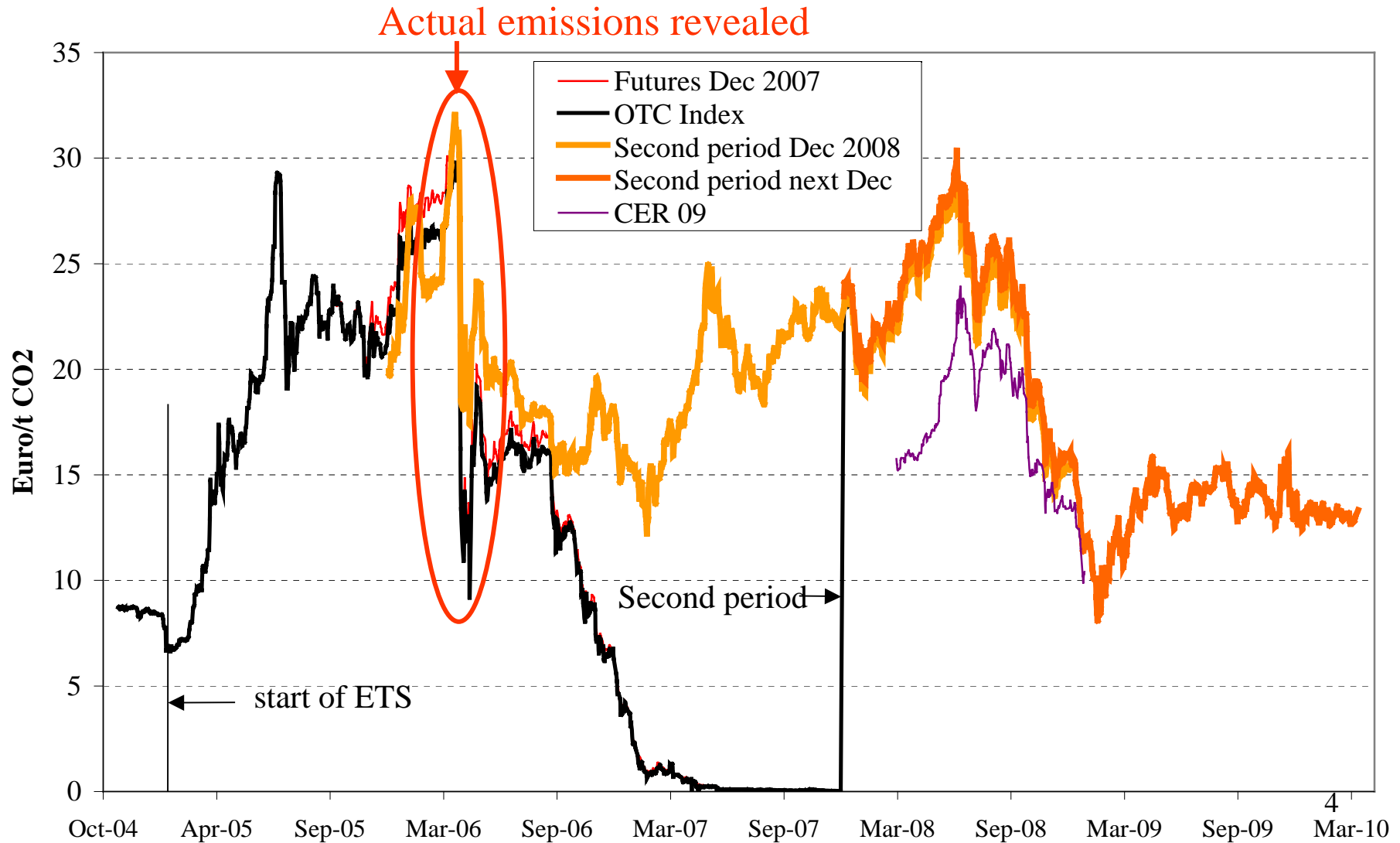
# EU climate change policy

- **ETS** to price CO<sub>2</sub>
  - 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

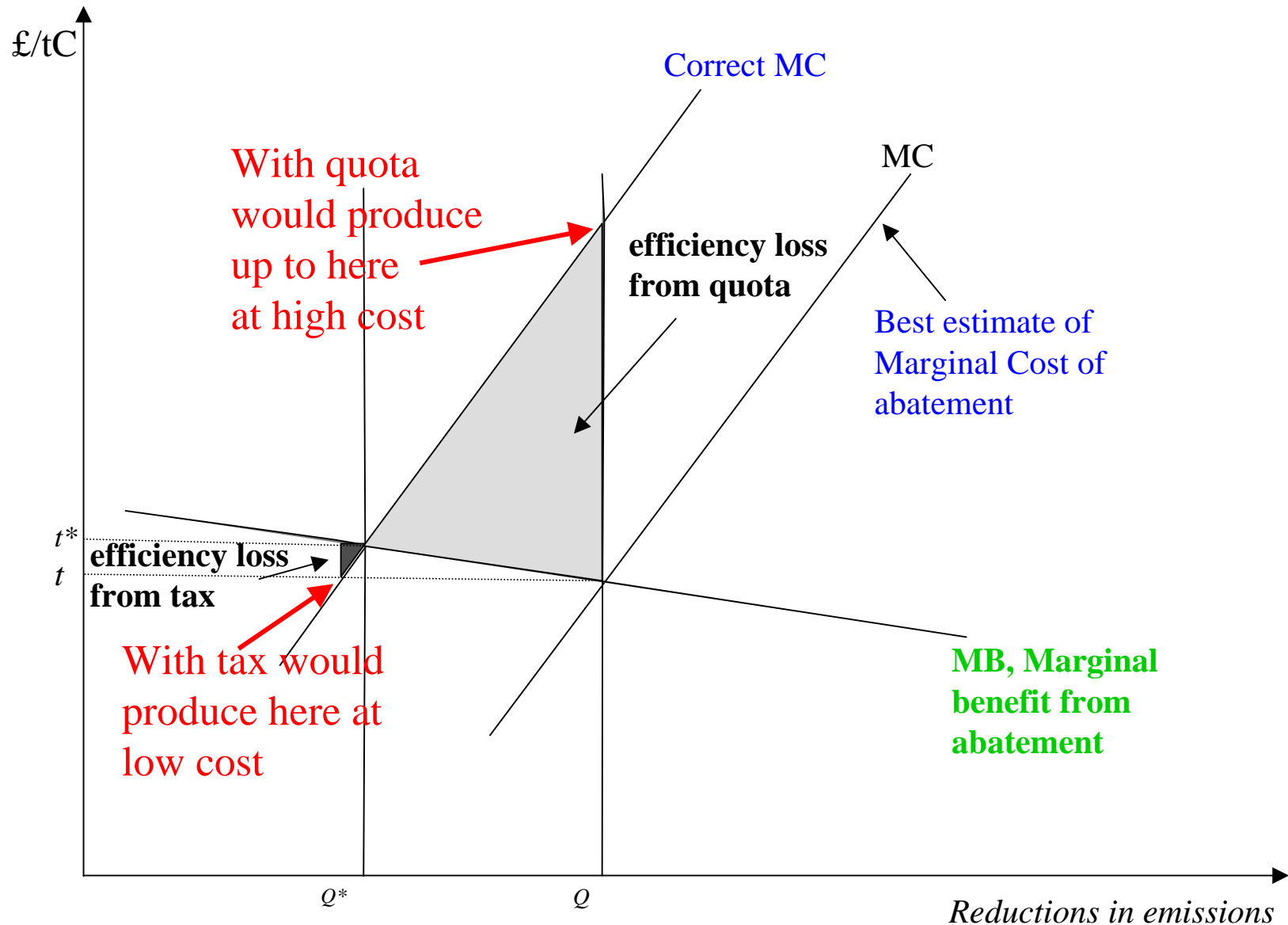
*Are these policies consistent?*

# CO<sub>2</sub> prices are volatile and now too low

## EUA price October 2004-April 2010



# Costs of errors setting prices or quantities

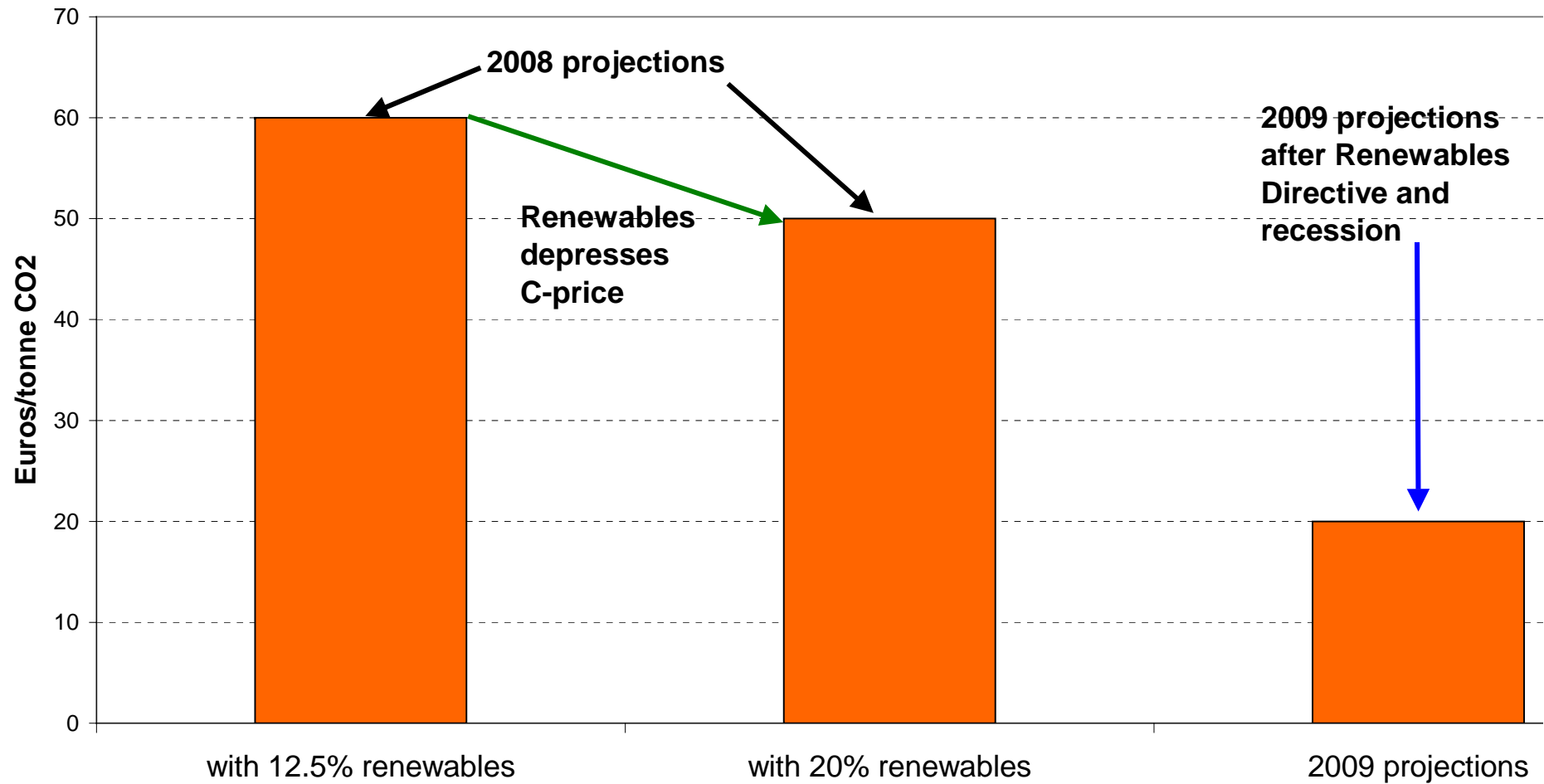


# Failures of ETS

- Current ETS sets quota of total EU emissions
  - **Weitzman argues for tax/charge not quota**
- Renewables Directive increases RES
  - => increased RES does not reduce CO<sub>2</sub>
  - => reduces price of EUA
  - => prejudices other low-C generation like nuclear
- Risks undermining support for RES

***Solved by fixing EUA price instead of quota***

## 2020 projected CO2 price



Source: Committee on Climate Change, 2008 and 2009



# Reforming ETS

- Reform EU ETS to provide **rising price floor**
  - sufficient for nuclear *or on-shore wind if cheaper*
  - => Carbon Bank trades EUAs to stabilise price
- Commitment to raise CO<sub>2</sub> 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
  - remove uncertainty for low-C generation investment

***makes extra carbon savings additional***





# UK's Plan B if no ETS reform

- Underwrite UK CO<sub>2</sub> price
  - for power sector? **Cash negative**
- Change CCL into Carbon Correction Levy
  - a tax carbon content of fuel **Cash positive**
  - rebated by EUA price for covered sector
  - starts at current CCL rate say £12/t CO<sub>2</sub> and escalate at 6% above RPI = > £22/t by 2020
  - underwritten by CfD on path for commitment

***Coalition supports C floor and full ETS auctioning***

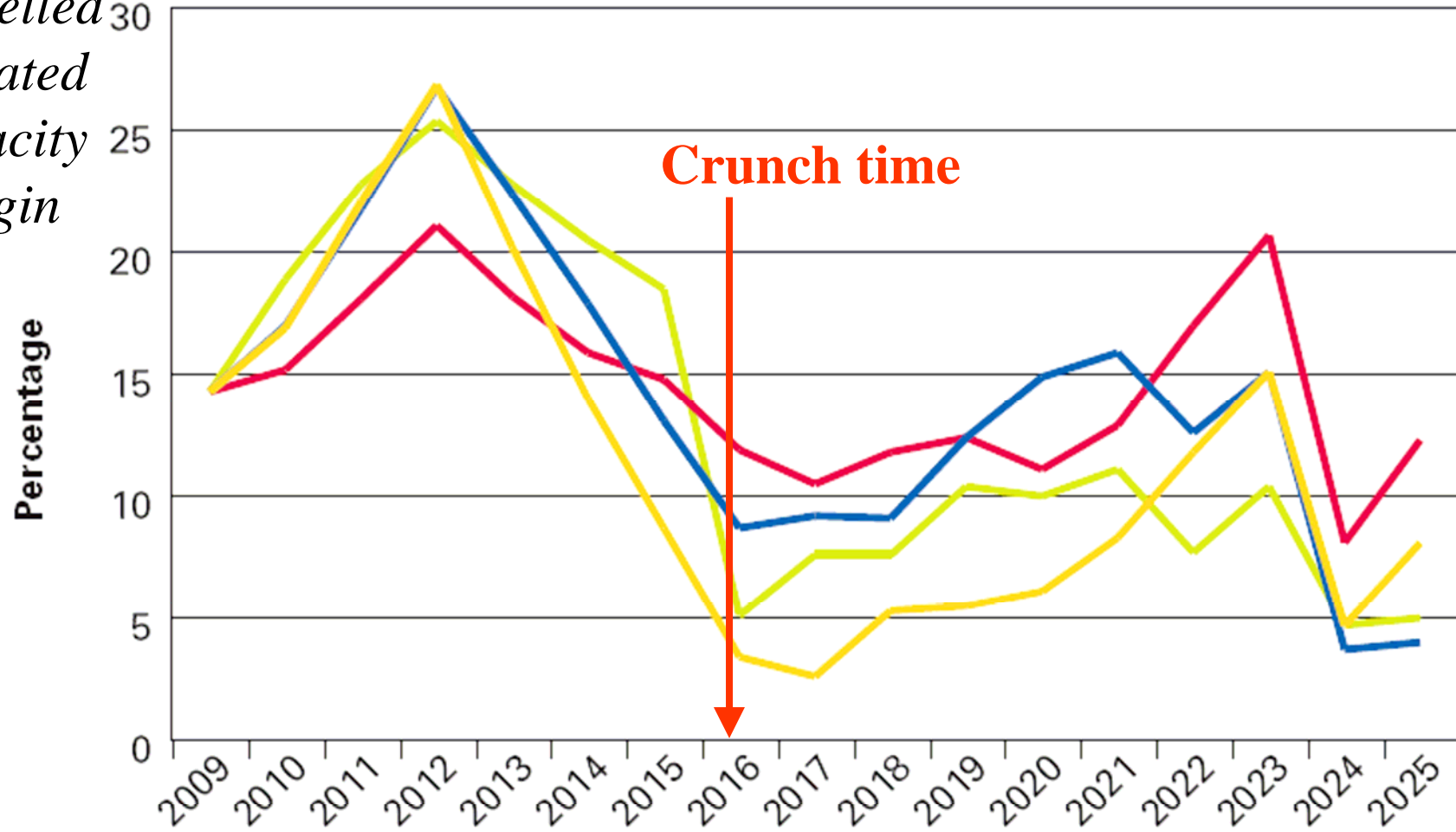
# Security

- Will the lights stay on?
  - => will there be timely investment?
- **Investment will be delayed if policy is uncertain**
  - => clarify energy policy as soon as possible
  - => reduce unnecessary risk
  - => replace ROCs by tendered FITs
  - => underpin and guarantee the carbon price

# Security

Under Ofgem's scenarios reserve margin falls in 2016

*modelled  
de-rated  
capacity  
margin*

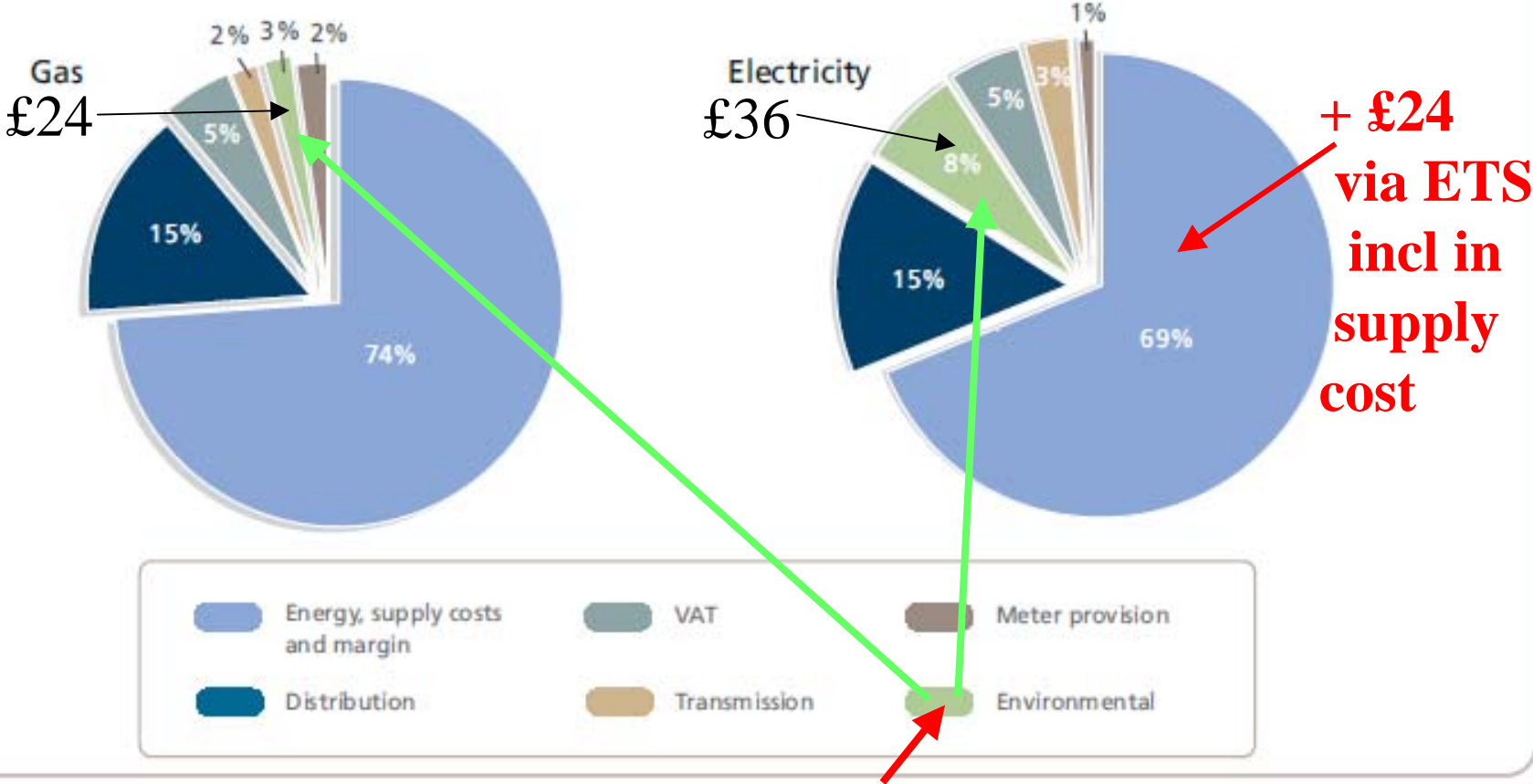


Ofgem *Project Discovery*

- Slow Growth
- Green Transition
- Dash for Energy
- Green Stimulus

# Domestic fuel bill breakdown 2009

Breakdown of gas and electricity bills. This reflects current gas and electricity prices in June 2009. The current average gas bill for a quarterly credit account is £800 and for electricity it is £445.

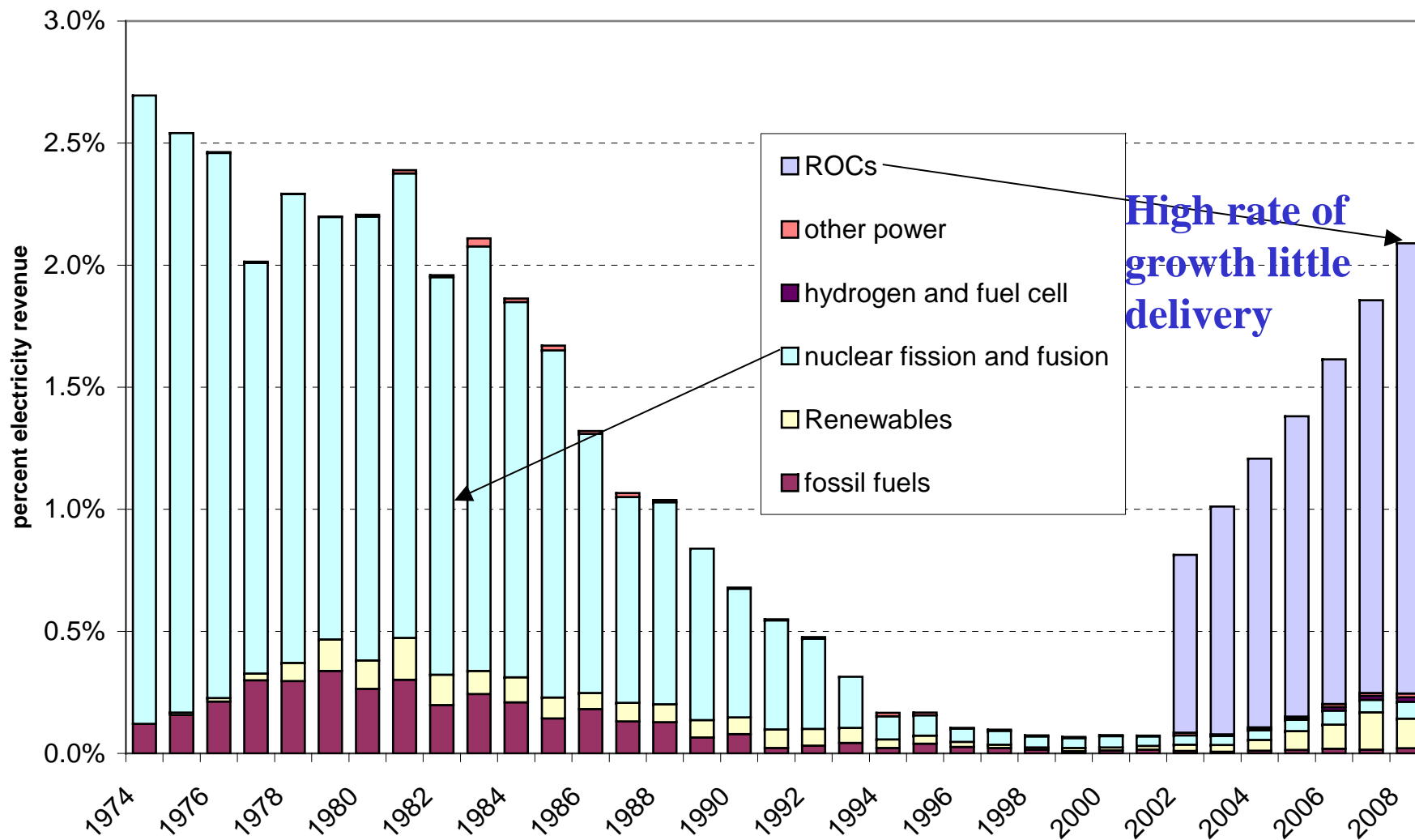


**Proportionately nearly 3 times higher on elec than gas**

# Affordability (climate change)

- Average domestic electricity bill **£400/yr**
  - Main programmes
    - EU Emissions trading scheme **£24**
    - Carbon Emissions Reduction Target\* **£15**
    - Community Energy Savings Programme\* **£1**
    - Renewables Obligation **£12**
    - Total (annual cost) = **£52**  
**=13% of total bill**
  - **Subsidy from reduced VAT (£53)**
- \* allocated pro-rata to expenditure on electricity and gas

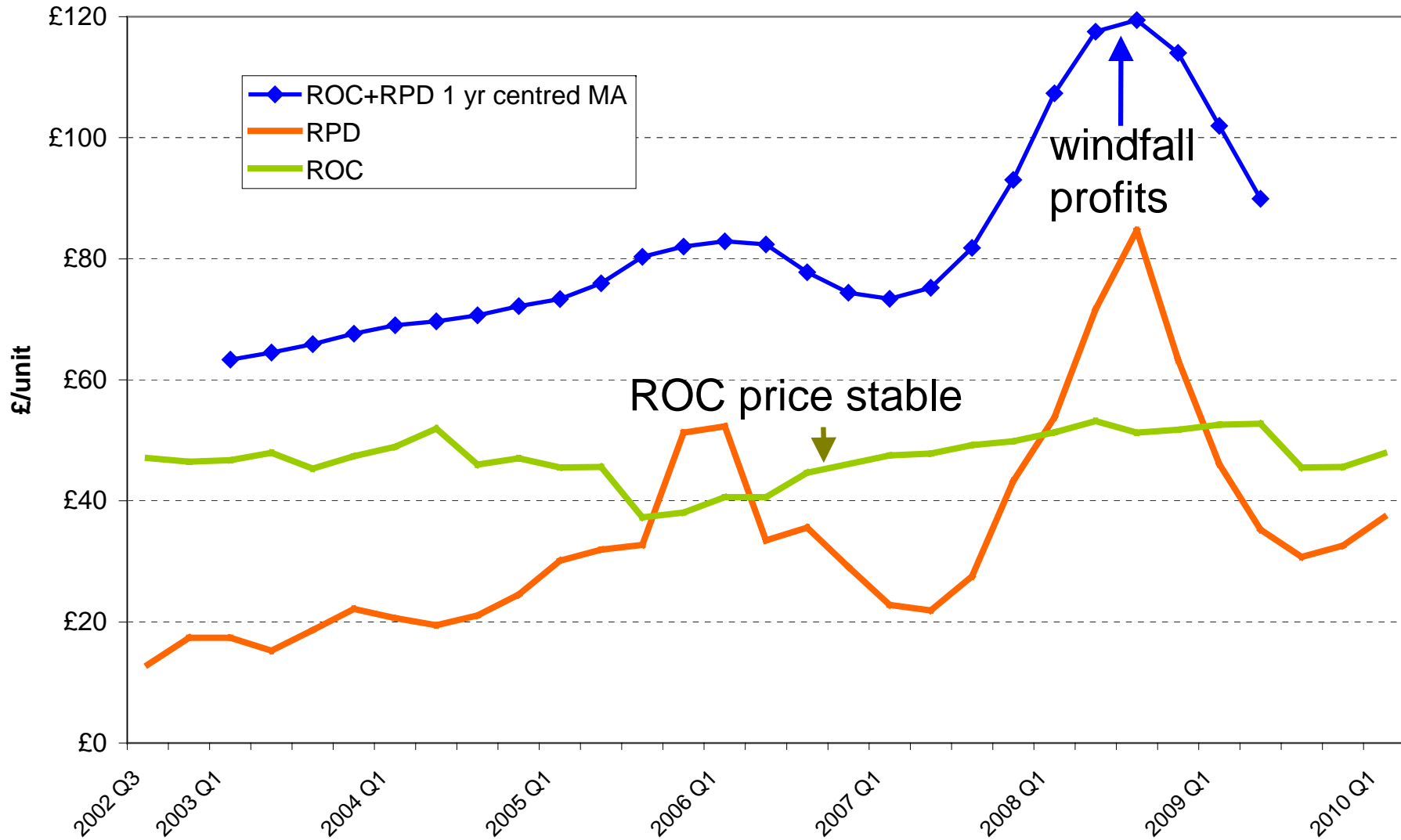
# UK Electricity R&D intensity



# UK Renewables policy

- ROCs are expensive
    - reward scarcity, deter entry, discourage localism
  - The problem is planning
    - coalition has abolished IPC (but that was not suited to on-shore wind anyway)
- => Separate system planning (SP) from TSO
- => SP finds optimal RES sites, secures consent
- => runs tender auctions for least cost FIT

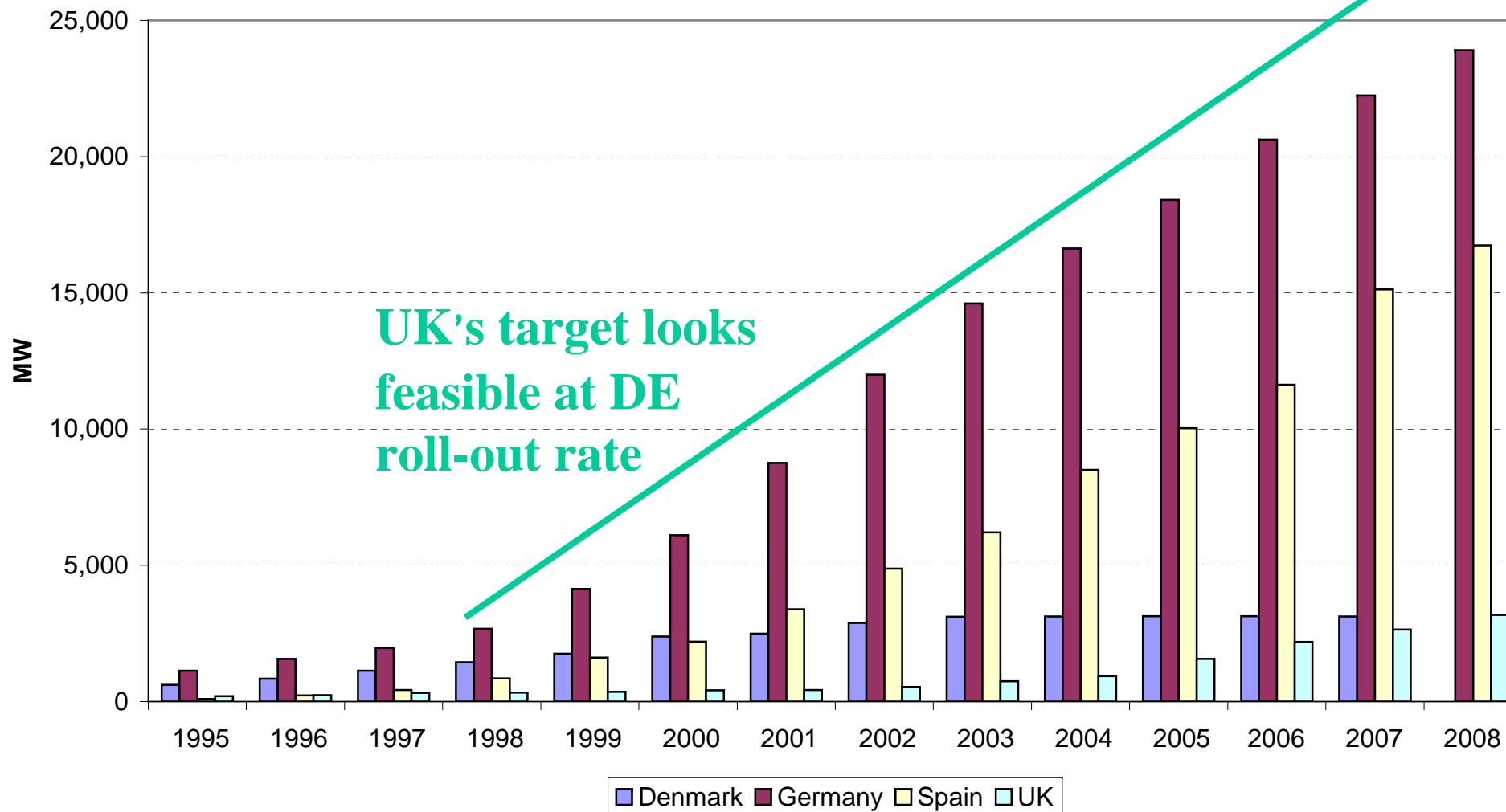
# UK ROC, EUA, and electricity prices





**CCC'09 UK 2020 target is 27,000 MW**

### Installed wind capacity



# Financing low-C electricity

- ROCs rapidly escalating in cost
  - comparable to past R&D, mostly on nuclear
  - despite very modest renewables
- low-C subsidies paid by electricity consumers

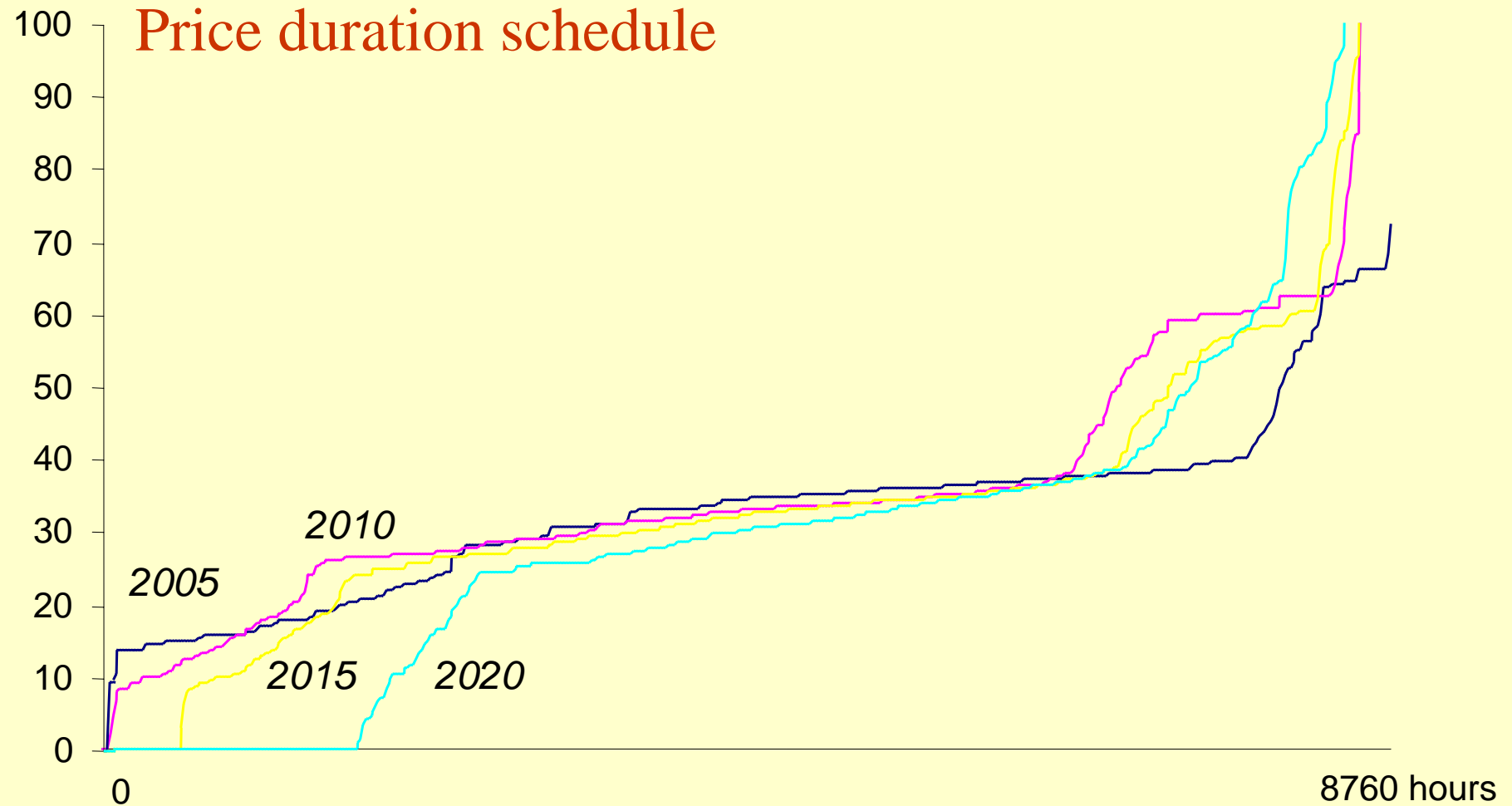
*This is an inefficient tax for a public good*

# Simulation – more volatility, challenges market design

Euro/MWh

*Illustrative*

## Price duration schedule



# Efficiency in low-C market

- Markets drive efficiency, innovation
    - but volatility and policy risk raises capital cost
  - Low-C has high capital cost, low MC
    - cheapest solution has long-term contracts
    - ⇒ **pay wind for availability to avoid negative prices**
- ⇒ removes increasing share from price setting
- CCS and peakers have higher MC
  - but may need capacity payments or contracts

***reform market design and transmission pricing***



# Spatial and temporal optimisation

⇒ nodal pricing + central dispatch

- Nodal price reflects congestion & marginal losses
  - lower prices in export-constrained region
  - efficient investment location, guides grid expansion
- **Central dispatch** for efficient scheduling, balancing
- PJM demonstrates that it can work
  - Repeated in NY, New England, California (planned)

***Recreate a pool for liquidity, entry and contracting***



# Conclusions

- CO<sub>2</sub> price is too low
  - new coalition supports floor price
- RES Directive undermines ETS
  - and risks bringing ETS into disrepute
  - => make RES additional, set CO<sub>2</sub> price
- UK energy taxes lack logic
  - but offer simple scope for cash positive gains
- market and transmission access need reform