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Contracting with Government for low carbon technologies: Designing the Visible Hand

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Long-term contracting in electricity markets

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Outline

- What market failures need addressing?
- State aid guidance on correcting market failure
- Why are long-term contracts needed?
  - What form should they take?
  - How do different models compare?
- How should they be financed?

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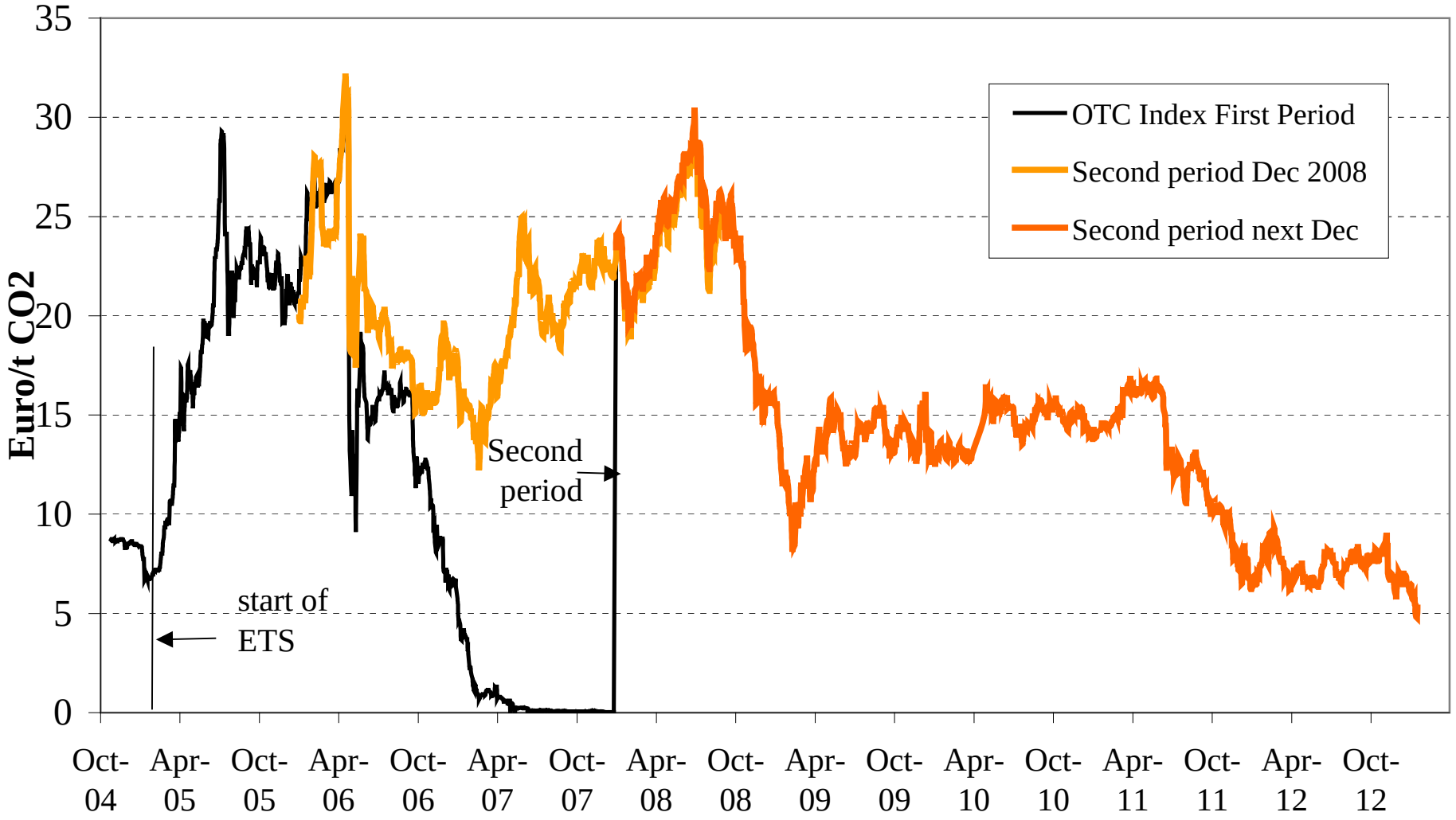
Correcting market failures

- ETS to price CO_2
  - to support mature low-C options
  - fixes quantity not price => poor guide for low-C
- 20-20-20 Renewables Directive:
  - demand pull for not-yet-commercial renewables
  - justified by learning spillovers and burden sharing
- EU Strategic Energy Technologies (SET) Plan to double 2007 R&D spend
  - R&D to support less mature low-C options

Carbon prices have crashed

EUA price October 2004-March 2013



Source: EEX

Failures of ETS

- Current ETS sets quota of total EU emissions
- 20-20-20 Renewables Directive increases RES

  => increased RES does not reduce CO_2

  => reduces carbon price

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

Solution: fix carbon price instead of quota

Plan B: each country has carbon price floor

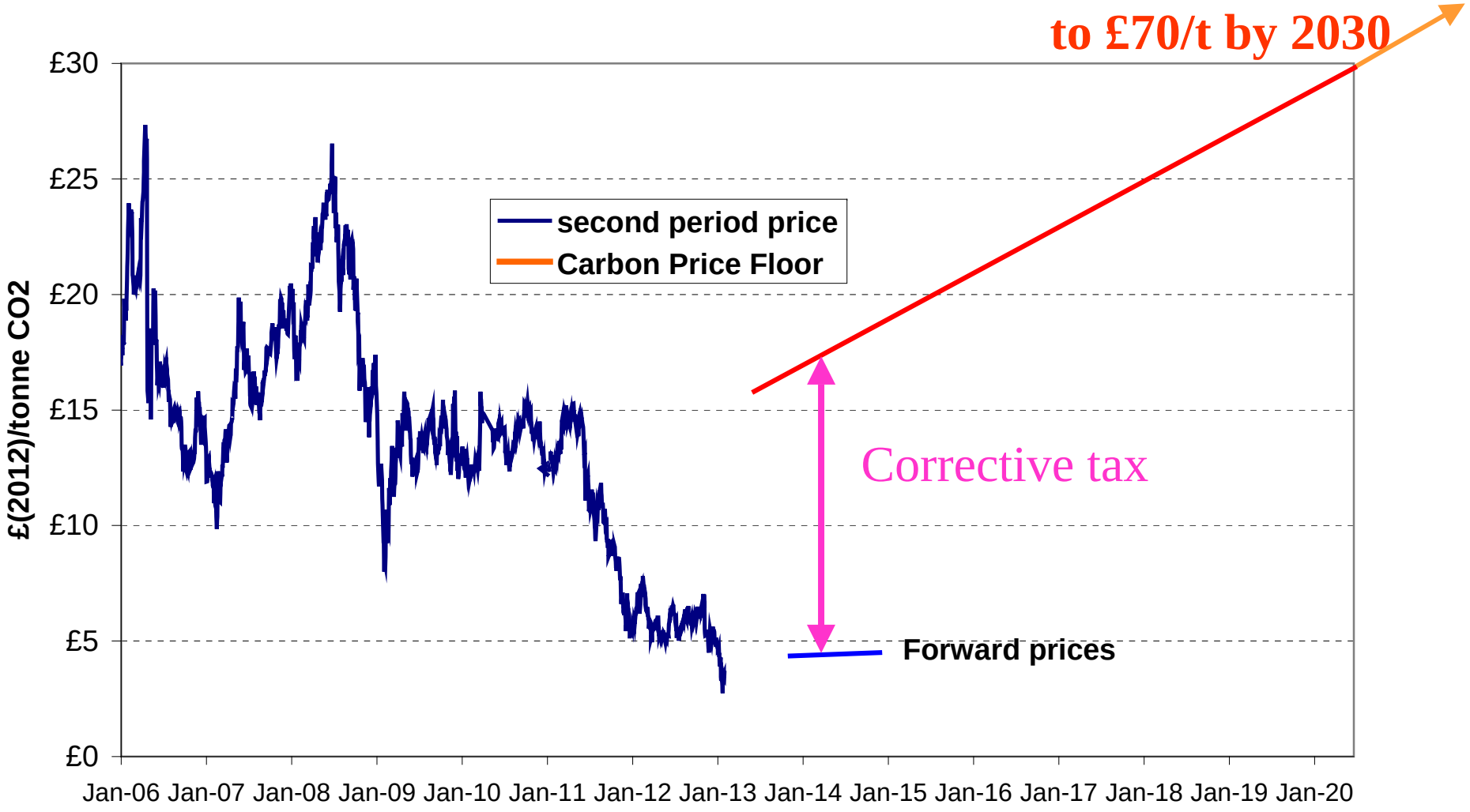
The case for a carbon tax

- Each country imposes a Carbon tax
  - tax bads not goods as part of fiscal adjustment
  - rebated by EUA price for covered sector
  - can start low: €20/t CO_2 and escalate at 5% p.a. above RPI = €34/t by 2020
- Tax can finance research and renewables

Message: setting a carbon tax is better than trading carbon permits

UK's Carbon Price Floor - in Budget of 3/11

EUA price second period and CPF £(2012)/tonne



Source: EEX and DECC Consultation

State aids

- DG COMP's State aid guidelines designed to prevent market distortions
  - to be updated for energy 2014
- intervention justified by irreparable market failures
- Test of intervention: "is the aid measure proportional, namely could the same change in behaviour be obtained with less aid?"
- So what market failures justify Government contracts?
- and what form should they take?

Low-C market failures

- Carbon price too low; hard to reform ETS

=> country-specific Carbon Price Floor

  - but that distorts trade
  - and is not credibly durable without contractual underwriting

- What about a Government subsidy?
  - not credibly durable without contractual underwriting
- RES not commercial even with adequate C price

=> devise additional support for RES

=> a premium FiT, a fixed price FiT or CfD?

=> which is most efficient/least cost?

Long-term contracts

- CO_2 price unpredictable, CPF not credible
- Electricity prices risky to non-fossil gen

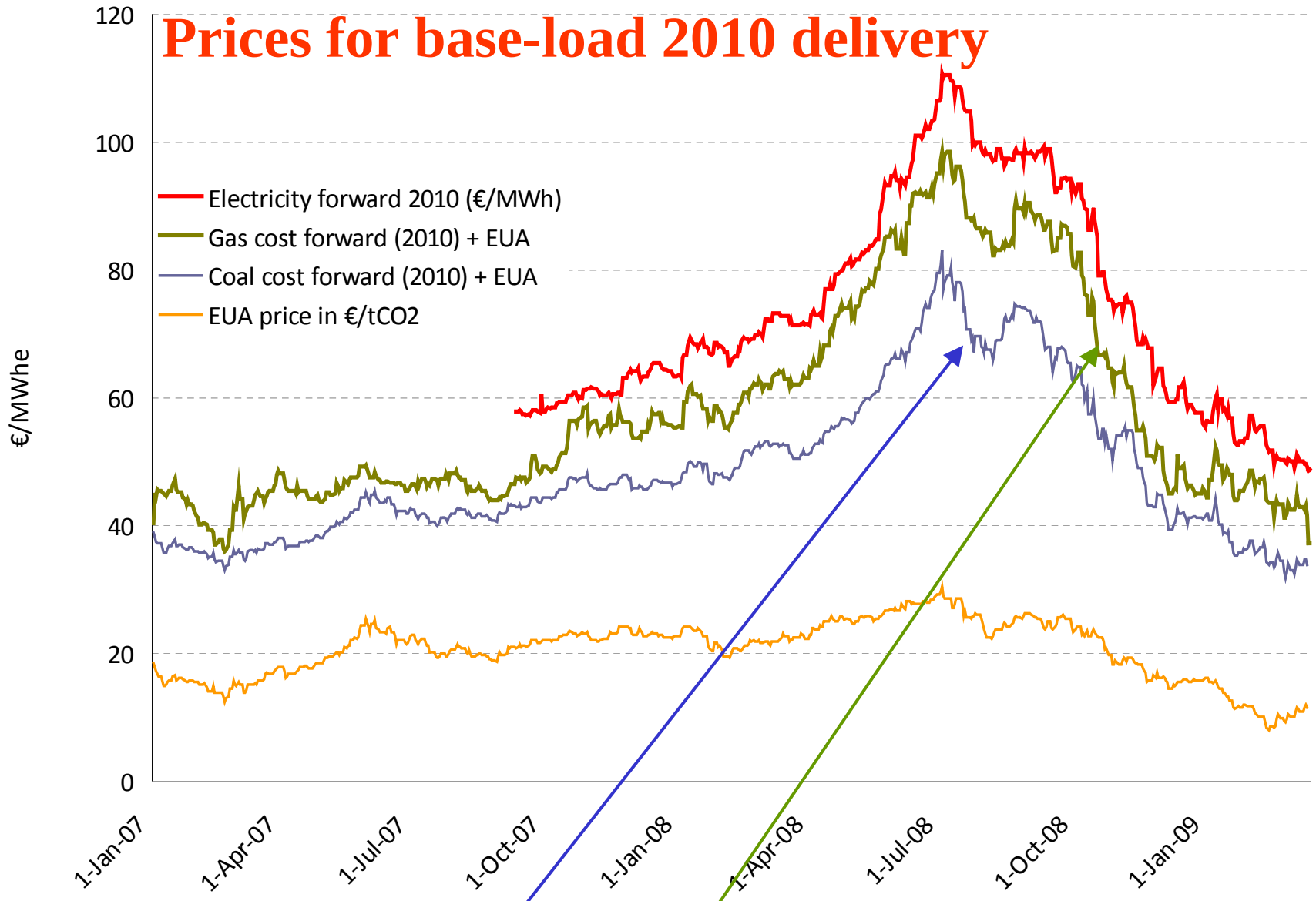
=> long-term contract enforceable in courts

- but technologies differ and so should contracts
  - => simple FIT for on-shore wind
  - => tender auctions for wind?
  - => CfD for nuclear, subsidy to capital for demo CCS?

Need satisfactory counter-party = Government

Need to adapt contract to technology

UK price movements: 2007 to 2009 in €



Correlation of coal+EUA on gas+EUA high

Source: Bloomberg

Contract design

- Efficiency => least total system cost

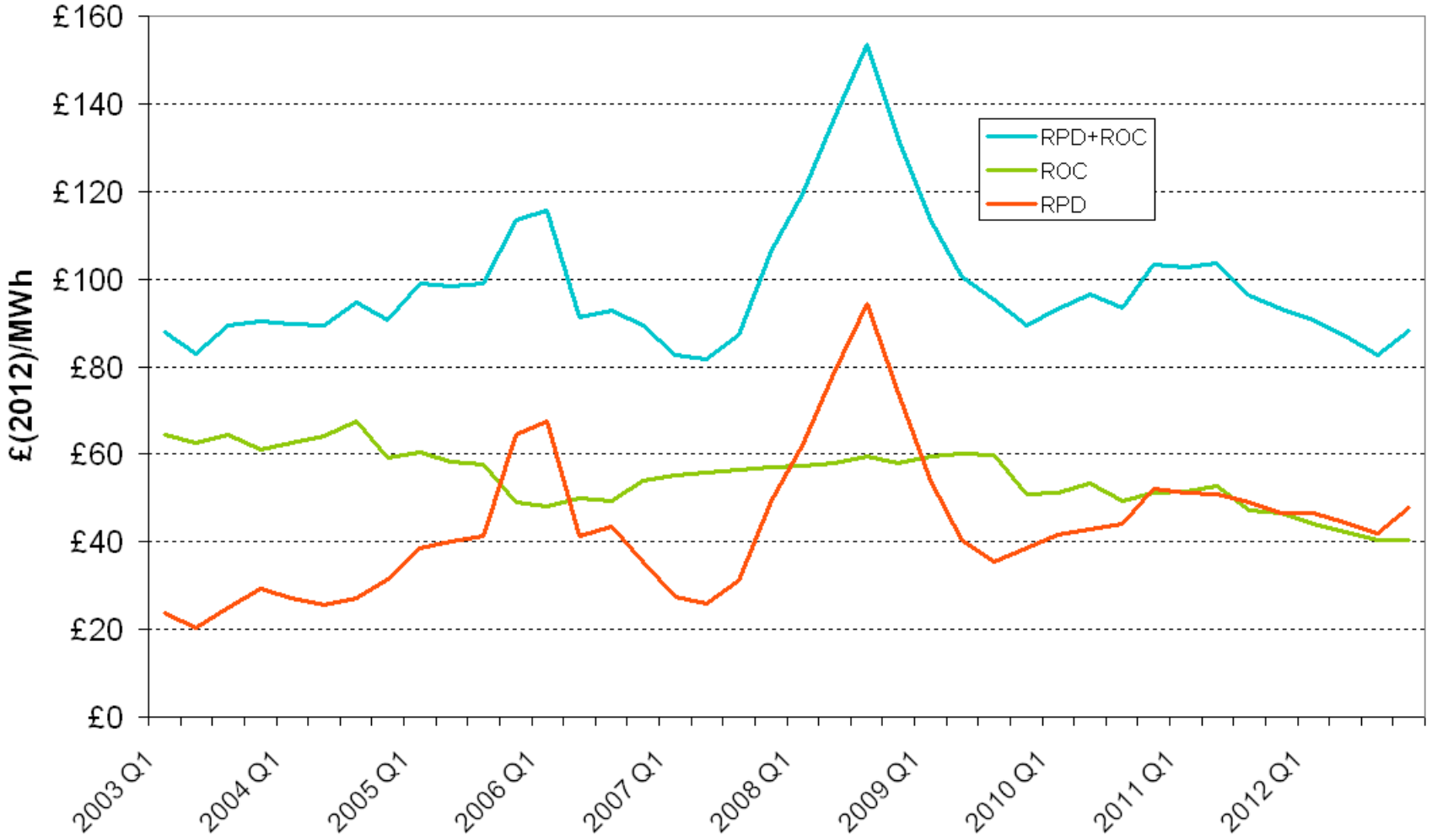
=> including costs for transmission, balancing, inertia, etc

- least cost to consumers => avoid excessive rent
  - wind resource varies with location

Solution A - PFiT: efficiently price all costs, pay fixed premium per MWh, otherwise leave to market (UK)

- Problems: hard to locationally price extra T for wind
  - after location choice, wind & PV are largely uncontrollable
  - forecasting more efficient if aggregated
  - balancing markets often imperfect, costly for small firms
  - market risk raises cost of capital, discourages entry

Support to Wind under the ROC Scheme (real prices)



Sources: APX, Ofgem

CfD (UK model)

- Government announces strike prices and annual subsidy limit
  - uniform by technology (except Island wind), set 2014-17
  - runs in parallel with ROCs (pFiTs) to 2017

  => has to be made as attractive as ROCs

  => comparable rate of return (rather high for on-shore wind)

  => undermines logic of lowering cost by lowering risk

  => relies on locational grid signals (still under discussion)
- may lead to tender auctions if levy control breached

=> could then lead to better market-led outcome

Feed-in tariffs

- Pay fixed price per MWh for *n* years (DE)
  - measure output for three years to estimate market revenue
  - *n* set to cover excess cost relative to market revenue
    - low in windy places extracts (share of) excess rent
  - requires good locational signals for transmission costs
  - SO responsible for dispatch, weather forecasting etc
- Auction for FiT to connect to specified grid points
  - TSO assess all extra costs (transmission balancing etc)
  - developers assess local RES resource, choose best site, specify price level, contract length, constrained off payment
  - SO select least cost to system; developer pays local connex

Immature low-carbon

- CCS and wave/tidal stream at pre-deployment stage
  - arguably off-shore wind as well
- need demo plants to assess cost ***and*** more R&D
- What is the best form of support?
- Competition - as for CCS, with support for major risk

=> capital subsidy with large cost share

- arguably also appropriate for first nuclear plant
- Competition for R&D projects
  - need criteria to select and terminate

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How should they be funded?

- Reducing carbon, creating learning and knowledge are all ***PUBLIC GOODS***

=> finance out of public funds, not levies on electricity

- current policies exempt some industries in some countries from such levies
  - legally discriminatory, violates State aids, DG COMP cross

=> Solution = ALL industry should be exempt from distortionary taxes => fall on final consumers (VAT)

Make Energy policy consistent with good public finance

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Conclusions

- Long-term contracts needed as no credible futures markets for corrective carbon tax
- Near-market renewables needs extra support
  - long-term contracts hedge political risk
  - contact design needs improvement
  - auctioned contracts better if adequate competition
- Immature technologies need targeted competitively bid support
- Subsidies should come from general taxation

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Acronyms

CCS	Carbon capture and storage
CfD	Contract for Difference - pays (charges) difference between strike price and reference market price
CPF	carbon price floor
ETS	Emissions Trading System
EUA	EU Allowance for 1 tonne CO_2
FiT	Feed-in tariff
pFiT	Premium FiT
RES	Renewable Electricity Supply
ROC	Renewable Obligation Certificate
SC	Scotland
SO	System Operator
T	Transmission
TSO	Transmission System Operator
TEM	Target Electricity Market