

**Imperial College  
London**

# Subsidies in the UK Electricity Sector until 2020

David Newbery

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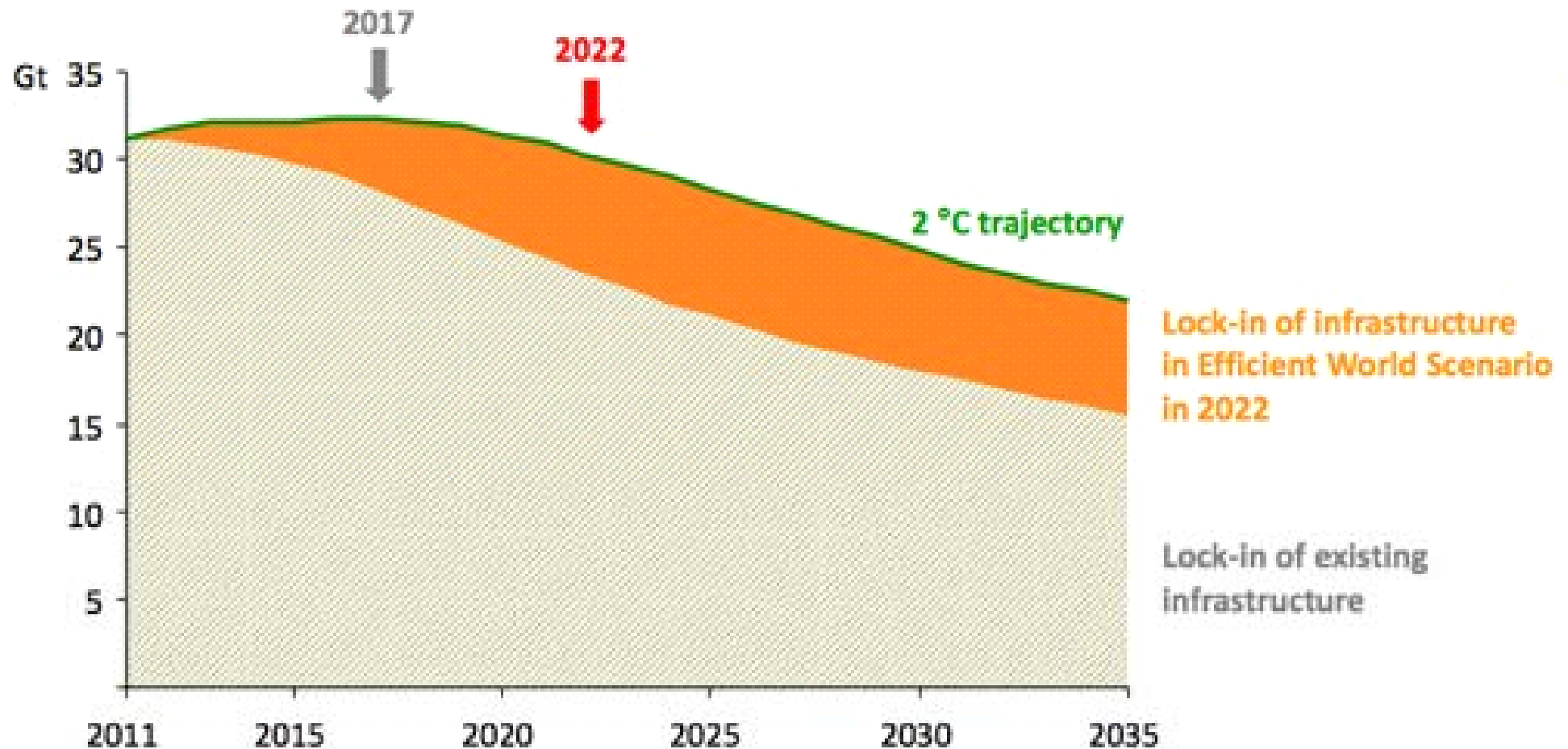
Cambridge, 7<sup>th</sup> February 2014

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

- **Energy Act** 18 December 2013 to address:
  - Security of supply and carbon/RES targets
  - problems with EU ETS
  - market failures
- To deliver **secure low-C in UK affordably**
  - => **capacity payments**
  - => **Carbon Price Floor**
  - **de-risk investment** => **Contracts** to lower cost of capital
- Problems with contract design
- Problems with finance



# We are already locked in to high carbon emissions from past fuel choices



Source: IEA <http://www.carbonbrief.org/blog/2012/11/favourite-graphs-from-iea>

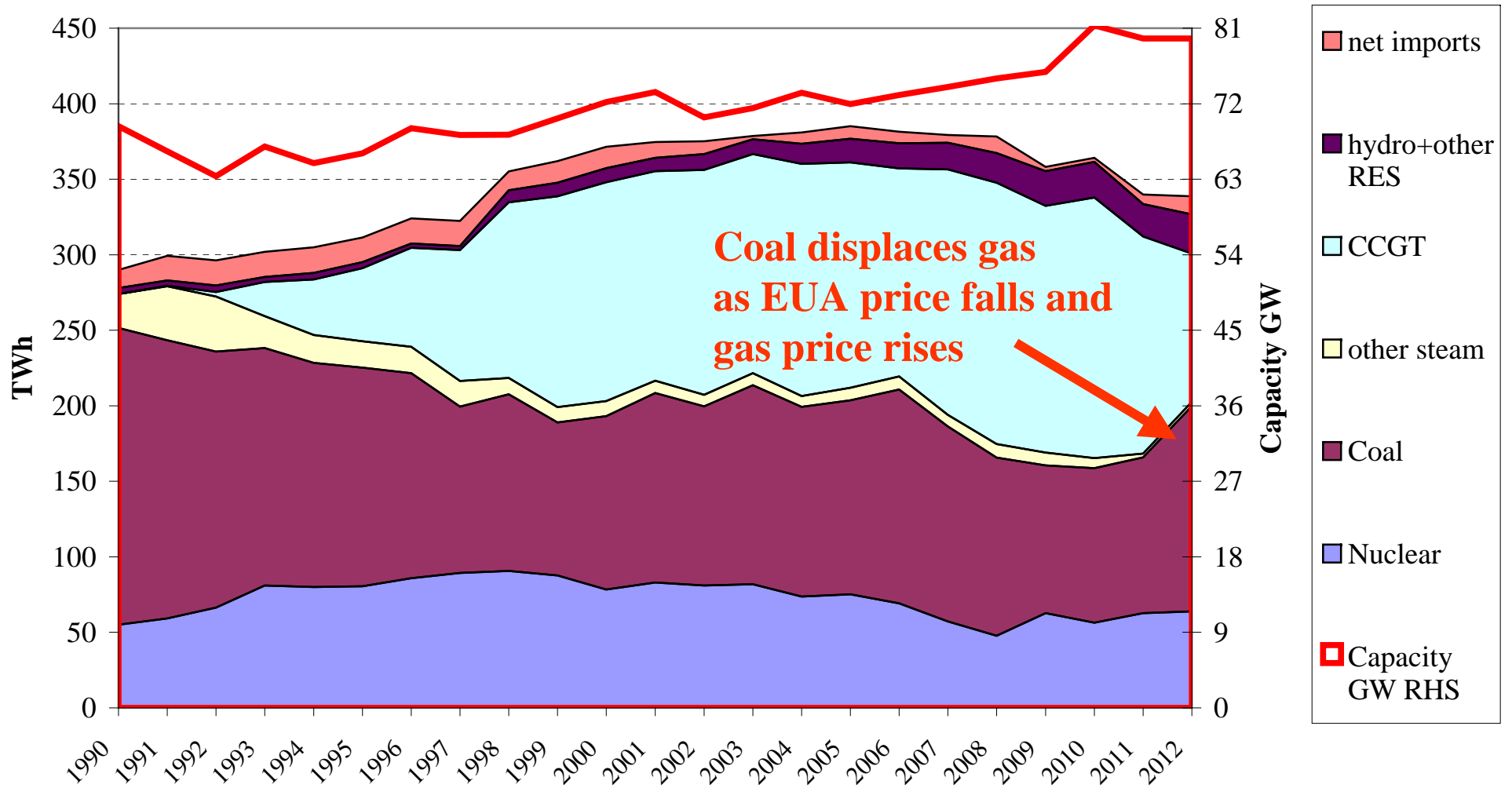
# UK climate change policy

- 2027 **legal** target: 50% C reduction from 1990
- Zero-C generation faces more risk than fossil
  - electricity price set by gas or coal
- Renewables support is expensive
- return depends on electricity price
  - set by gas and carbon price
  - and scarcity of ROCs - rewards failure

*need to de-risk zero C investment*



## Electricity supplied by, and capacity of, UK generators, 1990-2012



Source: DECC DUKES

# Little recovery after backloading and tightening post 2020

## EUA price October 2004-January 2014



Source: EEX

# Failures of ETS

- Current ETS sets quota of total EU emissions
- 20-20-20 Renewables Directive increases RES
- Global Financial Crash reduces demand
  - => increased RES does not reduce CO<sub>2</sub>
  - => reduces carbon price
  - => prejudices other low-C generation like nuclear
- Risks undermining support for RES

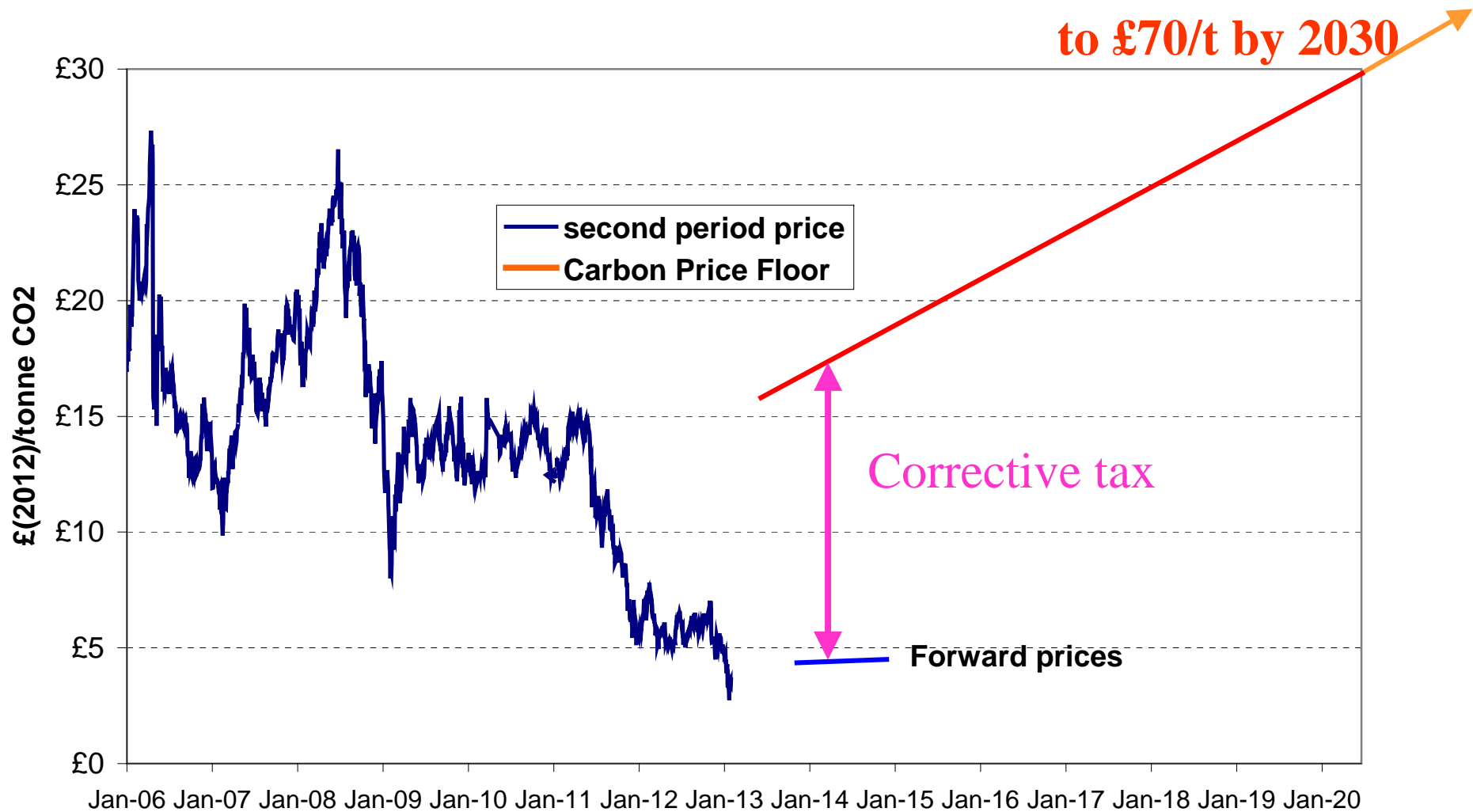
***Solution: fix carbon price instead of quota***

***Persuade EU to create carbon price floor***



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

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



D Newbery 2013

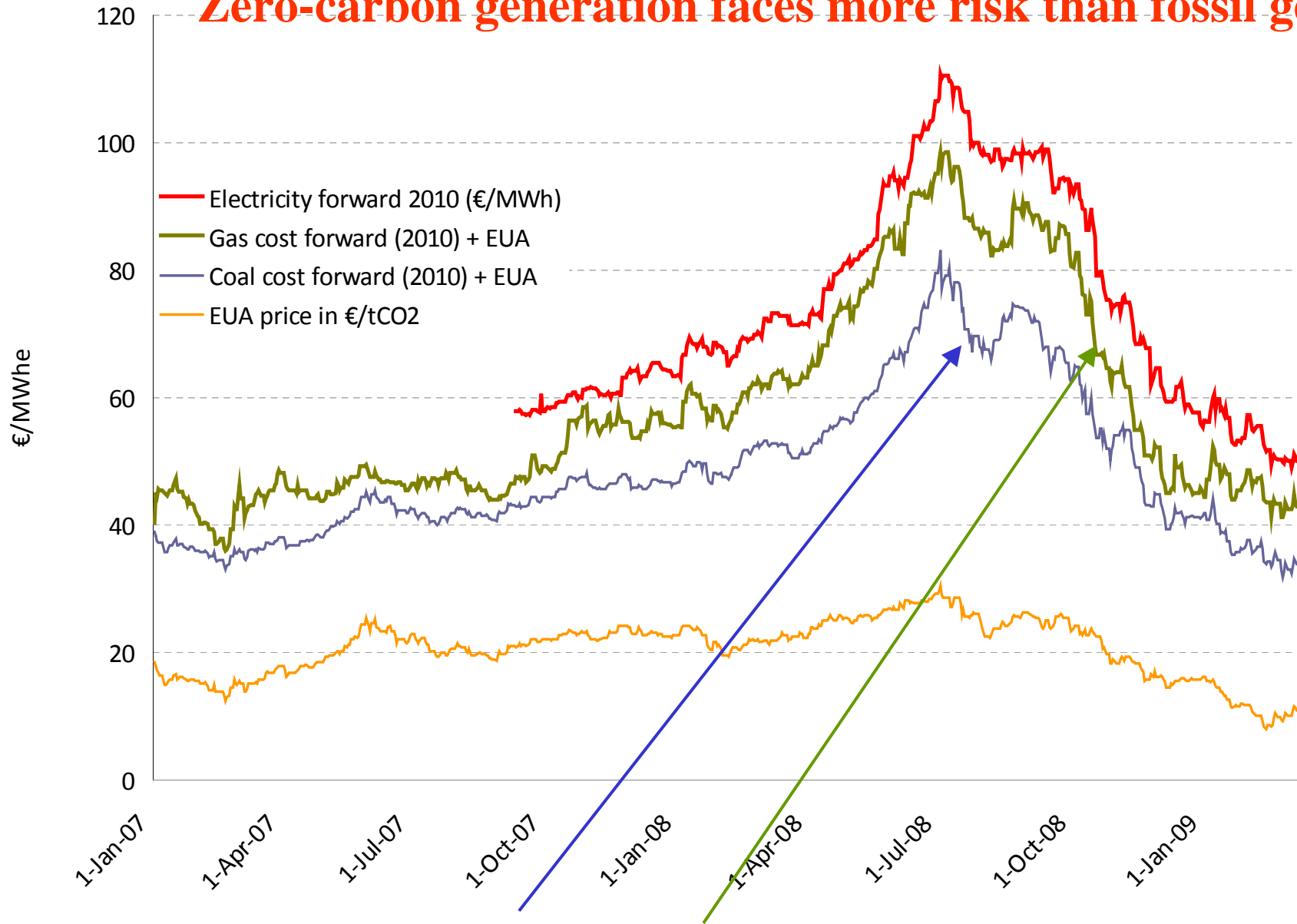
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Source: EEX and DECC Consultation



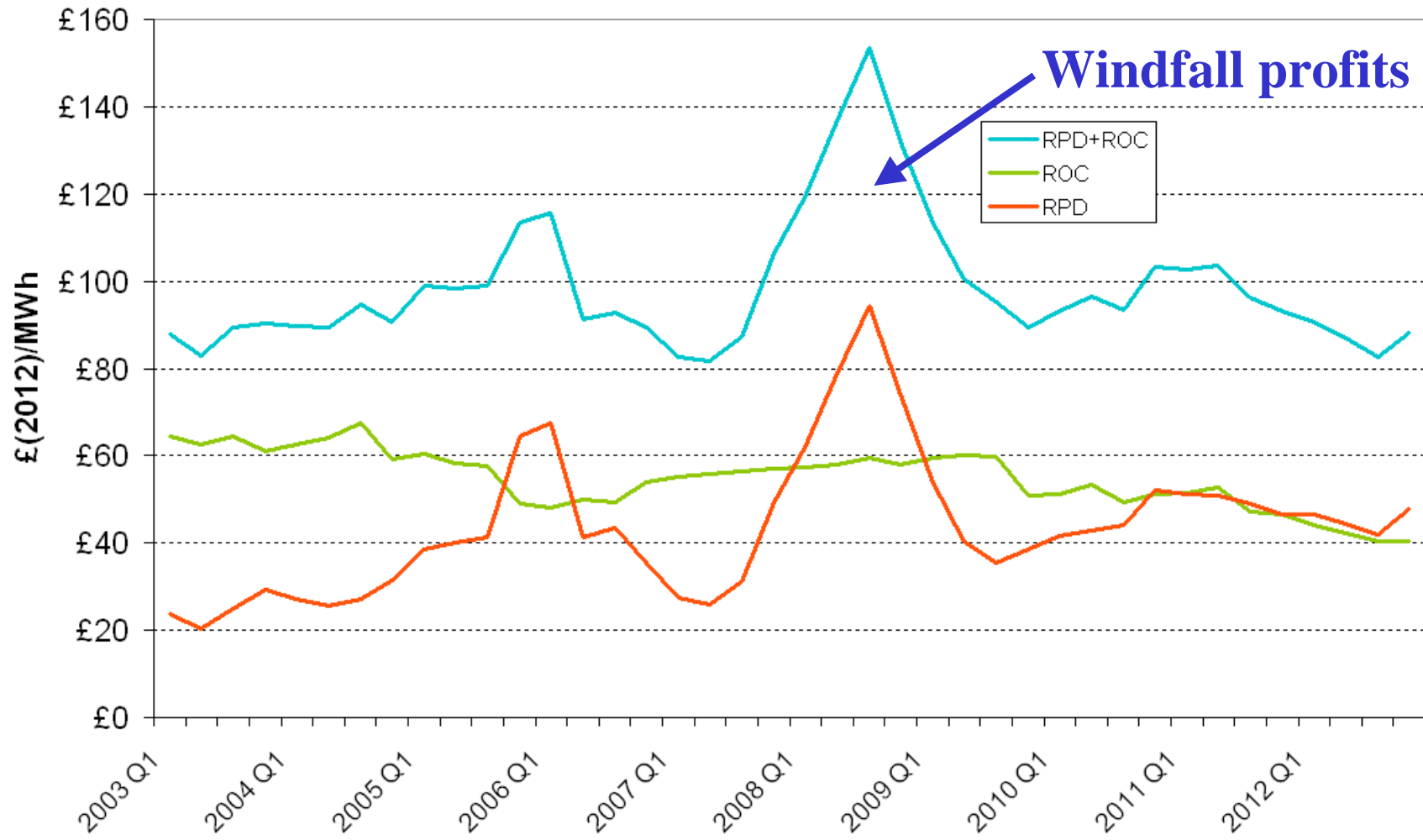
UK price movements: 2007 to 2009 in €

# Zero-carbon generation faces more risk than fossil generation



Source: Bloomberg

## Support to Wind under the ROC Scheme (real prices)



Source: Ofgem and APX

- CO<sub>2</sub> price unpredictable, CPF not credible
  - Need to attract new sources of finance
    - balance sheet of incumbents inadequate
  - Electricity prices risky to new entrants in non-fossil gen
    - but attractive to incumbents with retail customers
      - hedges some of wholesale volatility
- => long-term **contract-for-difference** (CfD)  
enforceable in courts

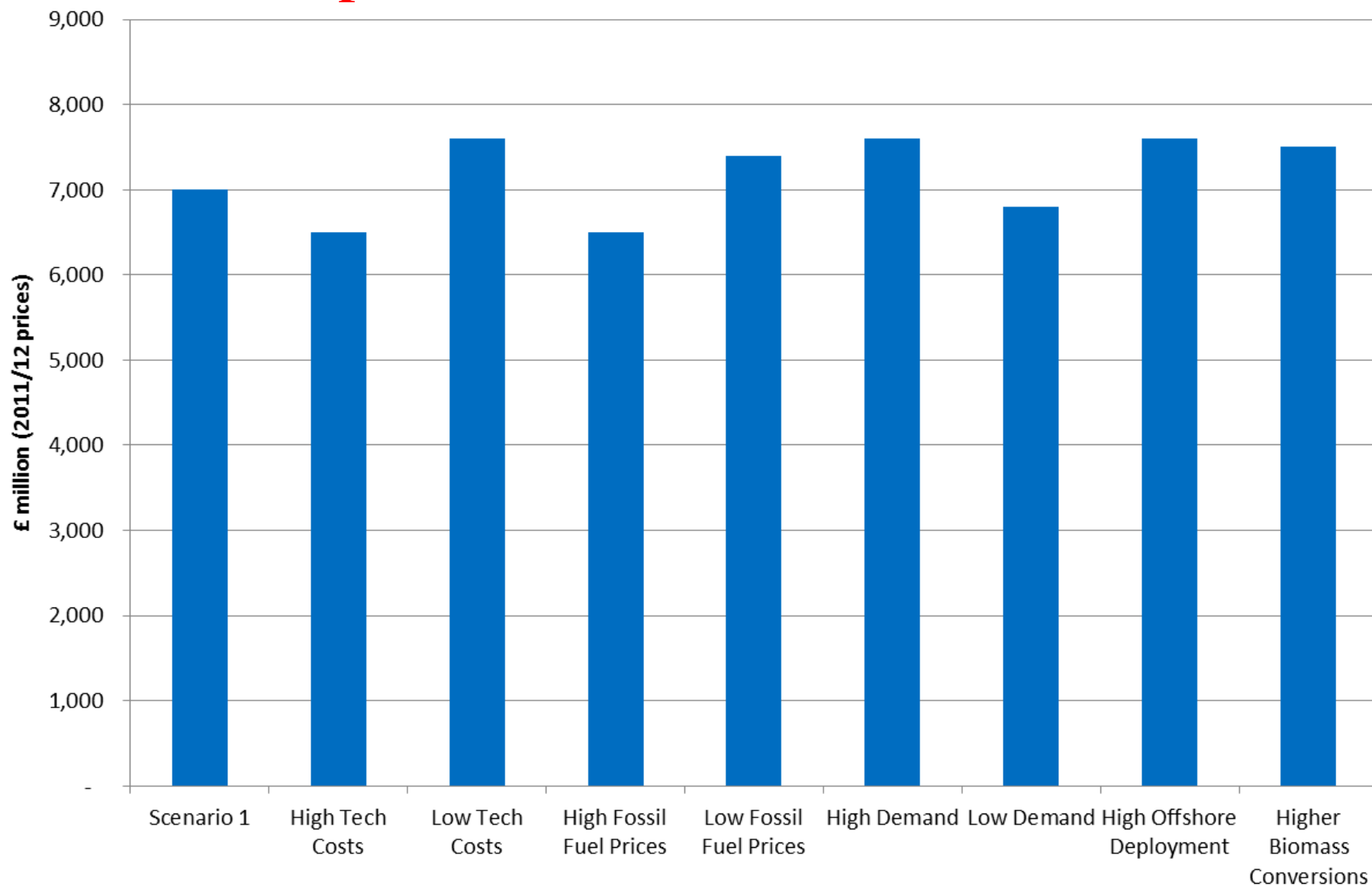


## CfD in *Energy Act 2013*

- Government announces strike prices and annual subsidy limit (Levy Control Framework)
  - 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**



## LCF Spend for all Scenarios in 2020/21



Source: NG EMR Report

- CfDs may be overgenerous (especially for **nuclear**)
- 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?”
- Are CfDs least cost? Are there better solutions?

***German feed-in tariffs look cheaper***

***Best GB solution - move to auctioning asap***



## Better solution: 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
    - lower 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



- 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





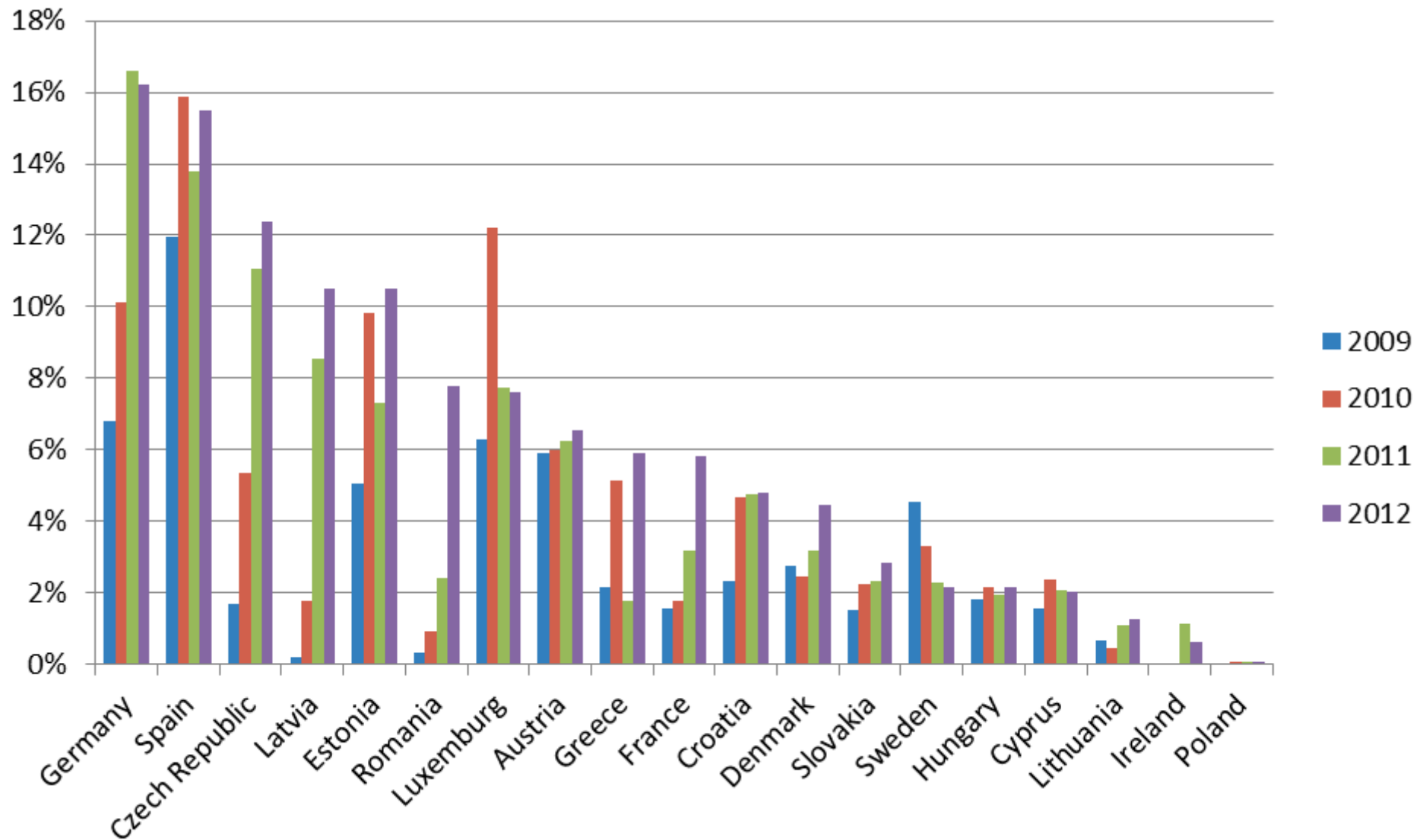
## How should subsidies be funded?

- 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***

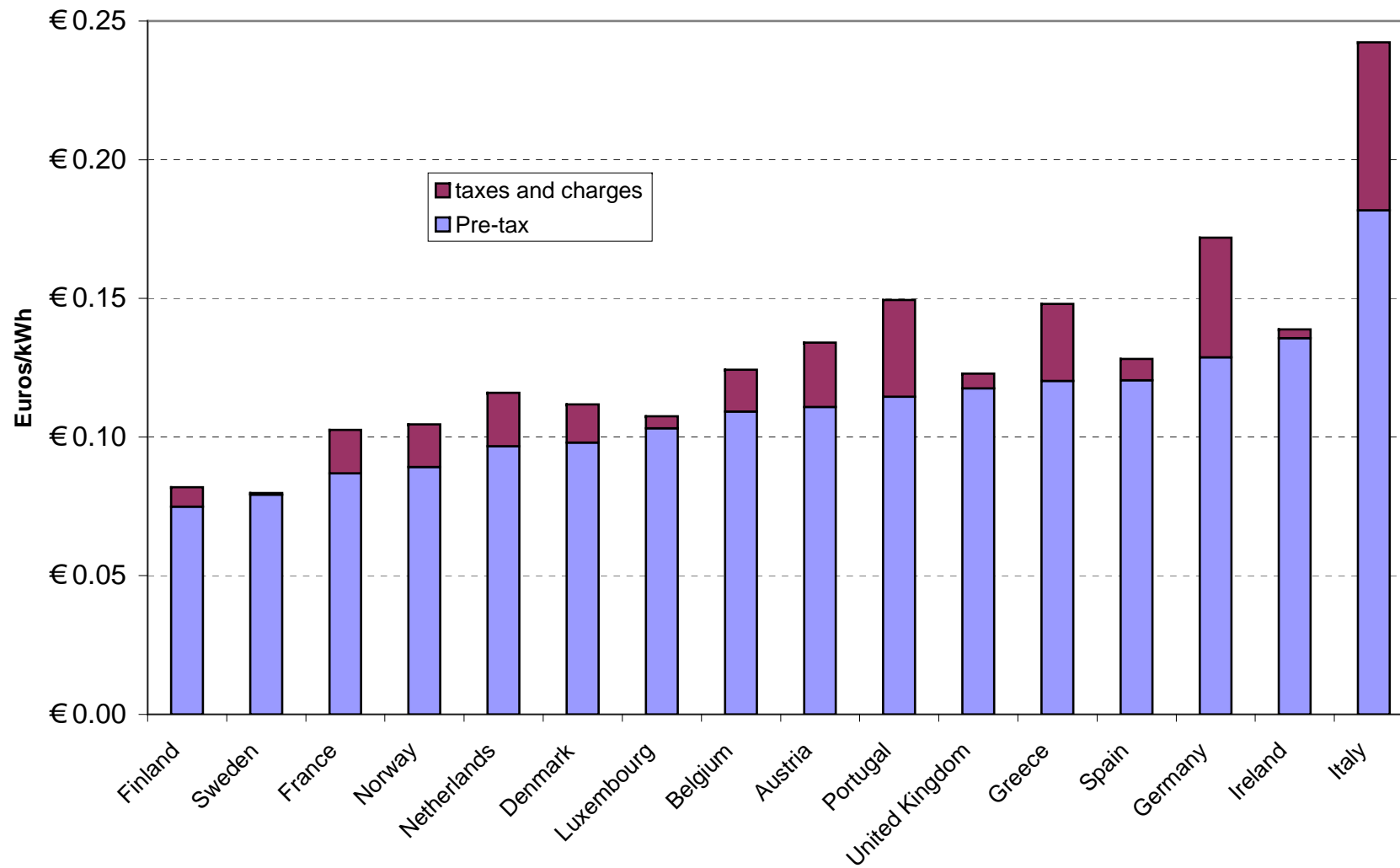


## Evolution of the share of RES-E levies in the electricity price for households in selected EU countries (2009-2012)



SWD(2014) 20 Fig 26

## Medium industrial electricity prices 2012



Source: Eurostat, 500-2000 MWh

# Criticisms of Market Reform

- “Contracts mark return to **Single Buyer Model**”
  - but all IPPs in 1990s had long-term PPAs
- “**Bureaucrats**, not markets choose investment”
  - but current RES support Govt designed after intense lobbying by incumbents
  - => tenders, auctions to create competition
  - => contracts should incentivise efficient operation
- “Wholesale price will be **distorted** by contracts”
  - fossil at margin until 2020+, problem is wind and low variable cost plant => capacity payments?
  - Problem from RES, not contracts



- **Low-C** generation needs 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
  - contract 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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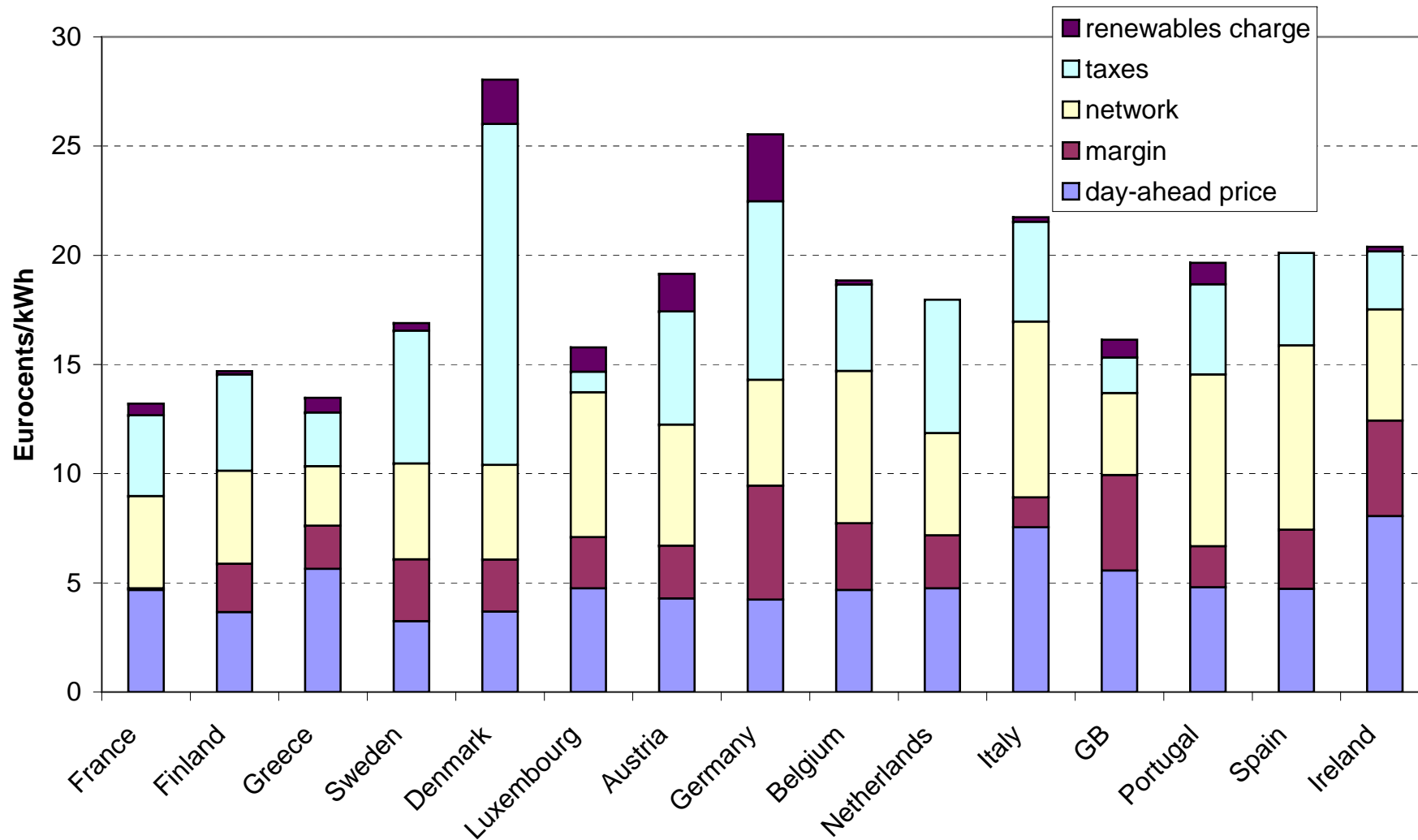
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CCS	Carbon capture and storage
CfD	Contract for Difference - pays (charges) difference between strike price and reference market price
CPF	carbon price floor
ETS	Emissions Trading System
EUA	EU Allowance for 1 tonne CO <sub>2</sub>
FiT	Feed-in tariff
pFiT	Premium FiT
IPP	Independent Power Producer
PPA	Power Purchase Agreement
RES	Renewable Electricity Supply
ROC	Renewable Obligation Certificate
SO	System Operator
TSO	Transmission System Operator



## Build-up of final retail domestic price 2012



Sources: DECC 2013 at <https://www.gov.uk/government/uploads/system/uploads/.../qep551.xls> with breakdown from ACER market monitor 2013 applied to tax inclusive price