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What future(s) for liberalized electricity markets?

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Energy Industry at a Crossroads

Toulouse 5th June 2014

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

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Outline

- Why did we liberalize electricity?
  - Contrast reasons and starting points
  - Was it worth it? When does it work well?
- What are the problems with this model?
  - High discount rates => short-termism
  - collapse of R&D
  - Hard to invest in viable low-carbon generation

Do energy politics undermine this model?

What other models are on offer?

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Traditional ESI structure

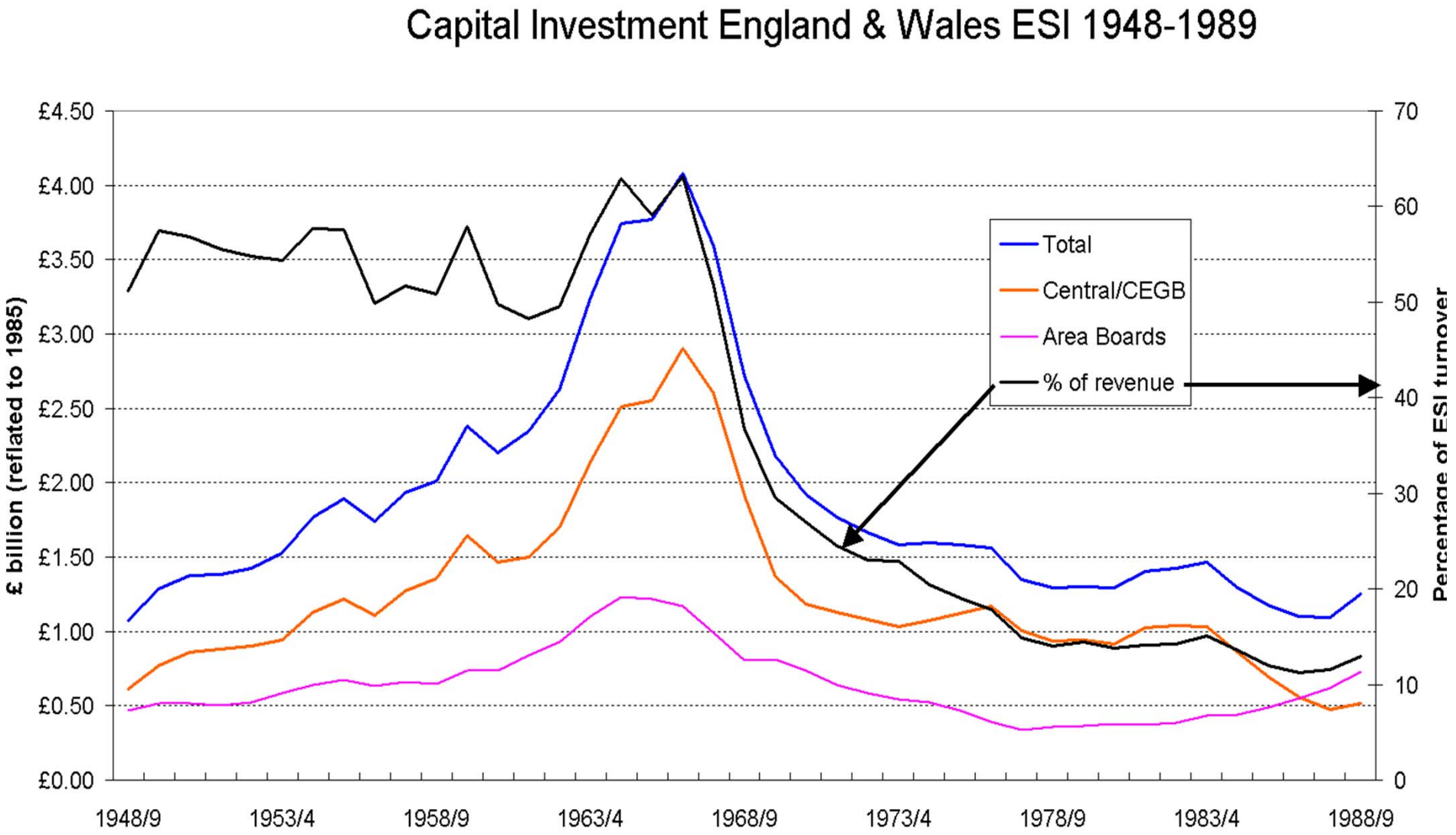
- Vertically integrated regional monopoly G+T
  - Default state-owned, US: investor-owned & regulated
- Developed countries: state can sustain high investment
  - Weak capital discipline, low (nominal) cost of borrowing

  => low electricity prices relative to LRMC
  - Fuel mix set by energy policy => from oil to coal or nuclear

  => Do we trust the government to invest wisely and efficiently?
  - Perhaps in France – doubtful in UK
- Developing countries: mixed, IFAs provide funds

  => under-price, unable to finance own investment=> black-outs

State finance supports massive investment

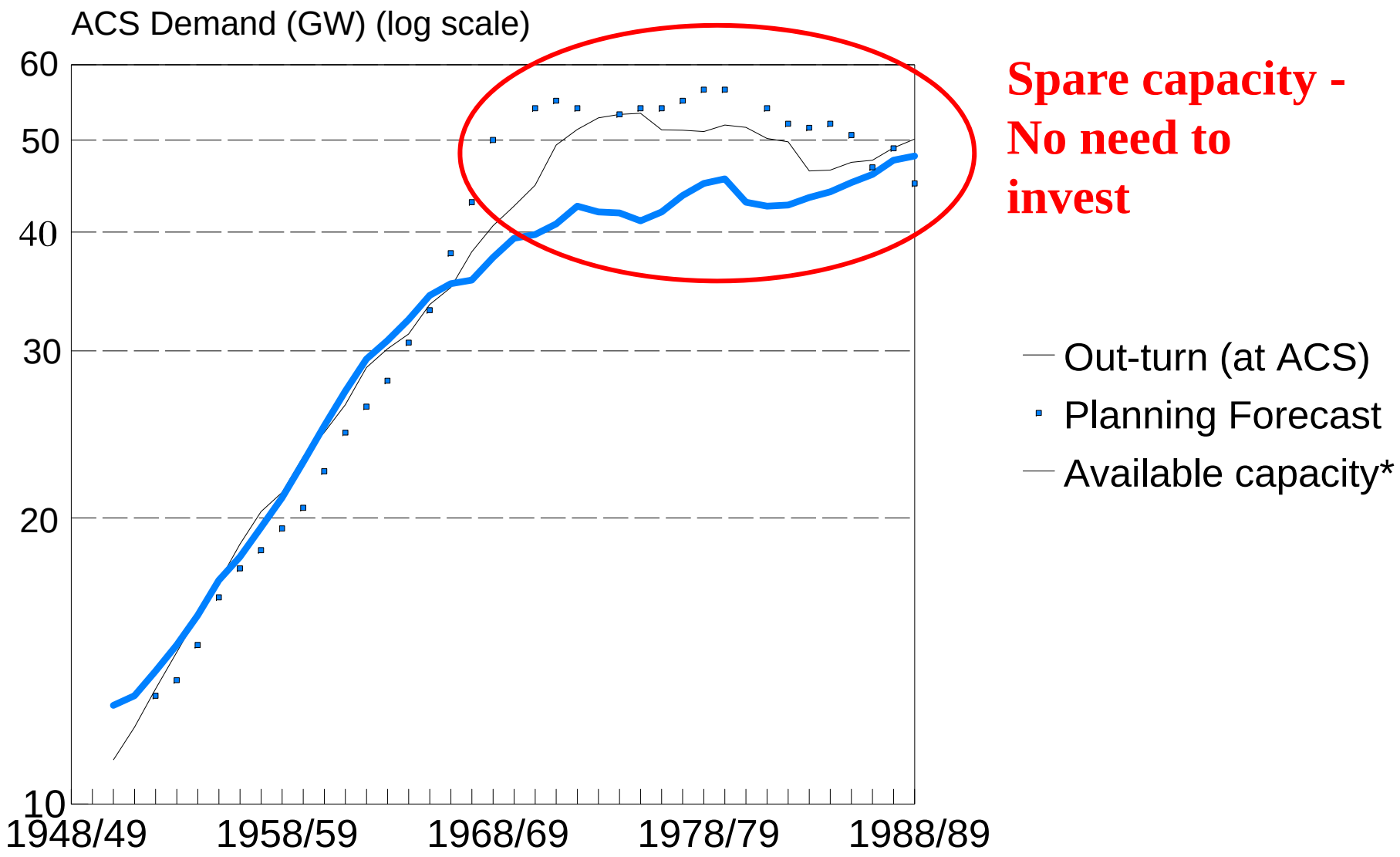


Pressures for reform

- UK: poor management control; failed White Papers, concerns over nexus of coal and miners' union strength
- State planning suspect: "Roll back frontiers of the state"
  - Privatize oil, telecoms, gas – why not electricity?
- Lessons of earlier privatizations learned:
  - Restructure ***then*** sell, Act creates regulator, licences to ensure competition where possible, incentive regulation where not
- ESI restructuring hard, aided by spare capacity

Different structures deliver different outcomes

Forecasts and outturns CEGB 1950-88



*assuming 10% planning margin
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Restructuring the GB ESI

- Contrast restructuring:
  - CEGB (England and Wales) with Scotland
- 1 regulator, 2 models, 3 grids
- Electricity Act 1989:
  - restructured and unbundled CEGB in 3 Gencos, National Grid, Distribution companies (domestic franchise to 1988)
  - set up Electricity Pool for GB
  - Scotland: retained 2 incumbent vertical integrated utilities
- set up Offer to regulate under RPI-*X*
- 25yr Licences for all companies as contracts
  - P_0, X can be reset for wires companies at periodic review

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Benefits of privatizing in GB

Cost savings:	*PDV at 6%*	*£ (95)billion*
	CEBG	*Scotland*
Consumers	-1.3	-1.5
Govt. excl sales	-8.5	-5.2
After-tax profits	19.4	6.7
Net benefits	9.6	-0.1
Govt. sales proceeds	9.7	3.6
Net govt. position	1.2	-1.6
levelised reduction per kWh	***5.7%***	***0%***

Lessons: Gains modest – easily lost (Scotland)

- competition improves performance
- unbundling needed for effective competition
- Privatization precipitates further reforms?
  - NETA, BETTA, EMR, TransmiT, ….

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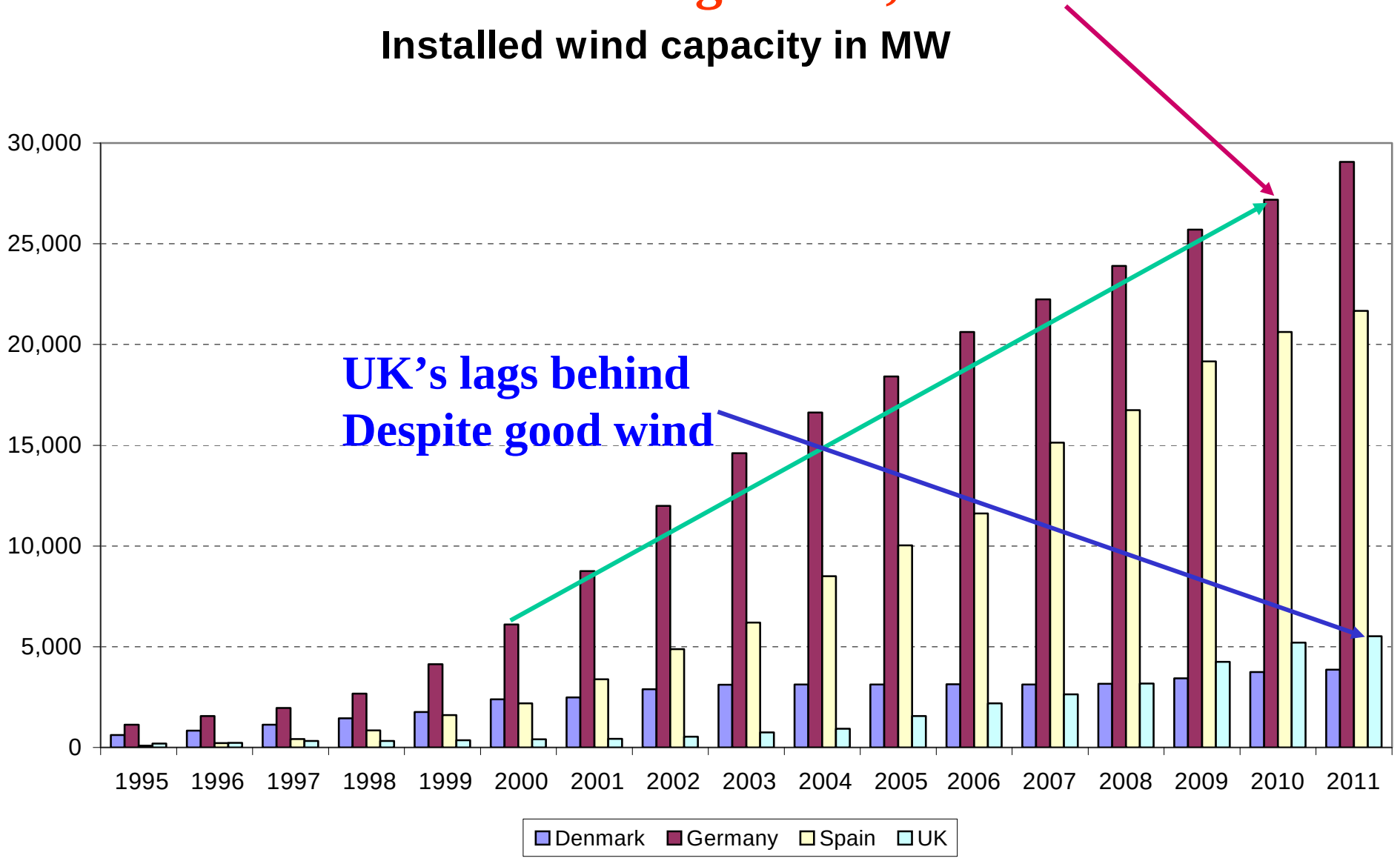
Problems with the UK model

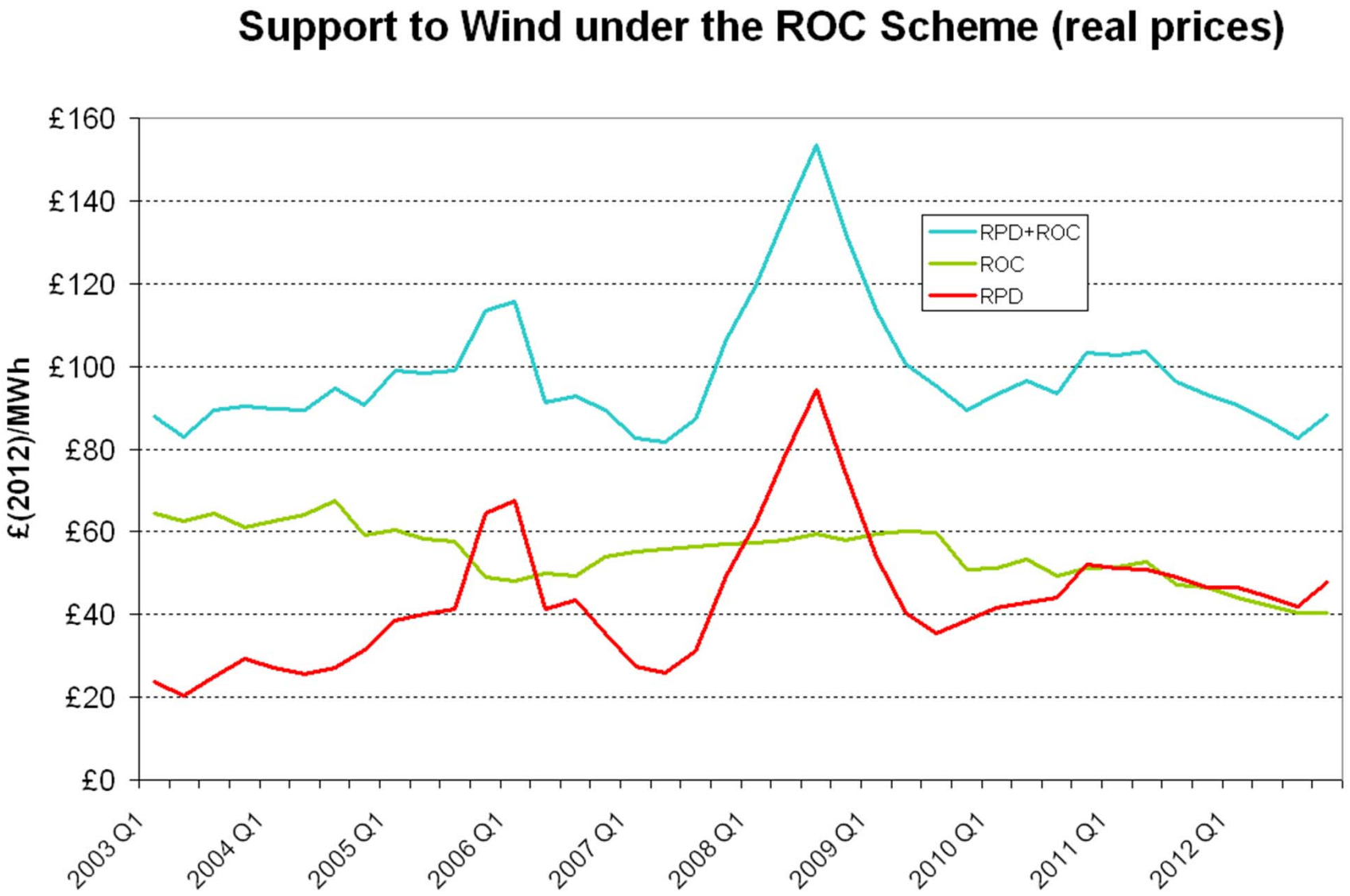
- Supported by “dash for gas” and cheap CCGT
  - And pro-market energy policy under Conservatives
- Labour energy policy: secure, sustainable & affordable
- But ability to deliver sustainability doubtful
  - EU Climate Change policies not credible unaided
  - R&D collapsed
- hard to finance costly nuclear and renewables
- But regulated networks successfully invested

UK Solution (?) - Electricity Market (?) Reform

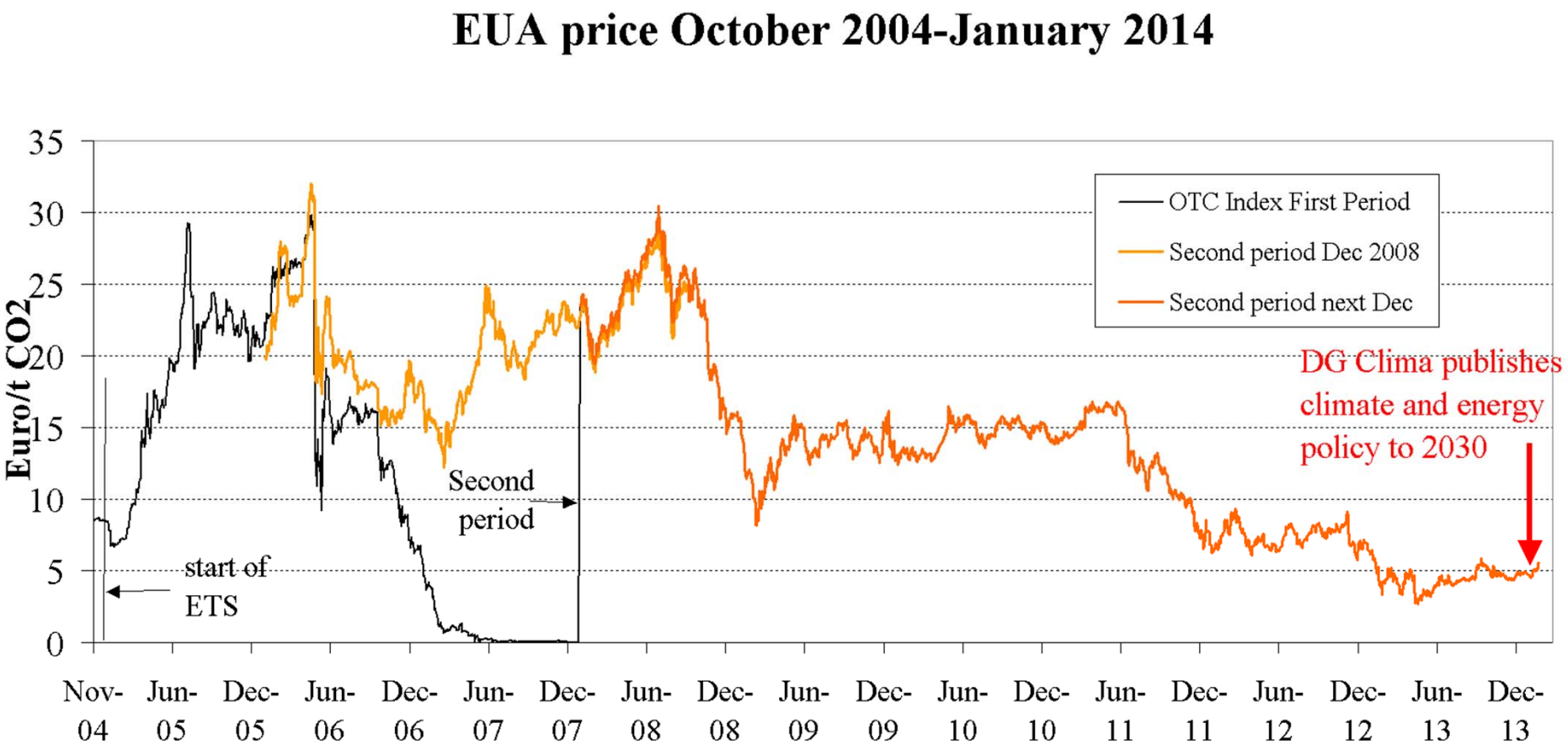
CCC'09 UK 2020 target is 27,000 MW



Premium FiT risky

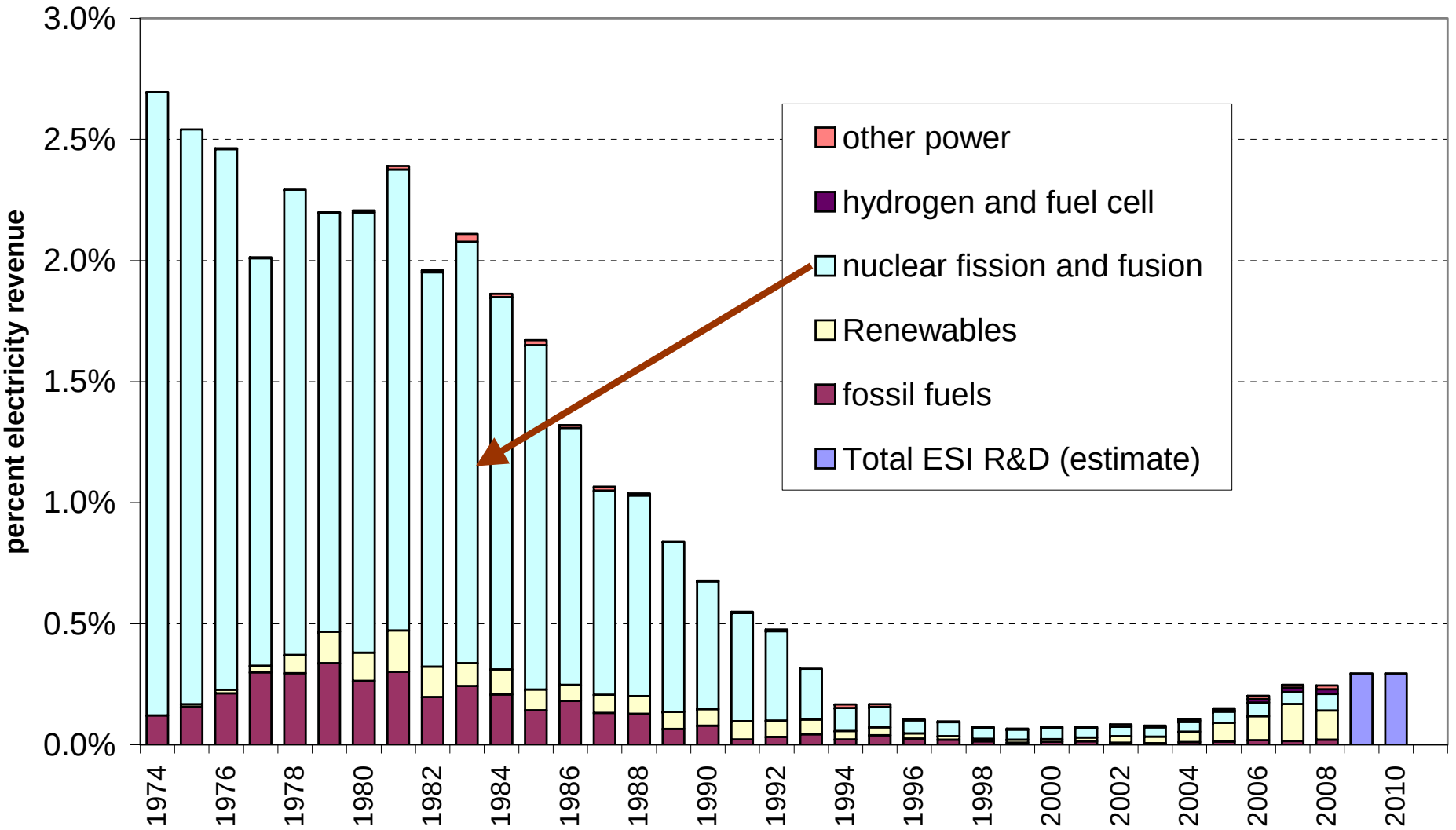


Little recovery after backloading and tightening post 2020

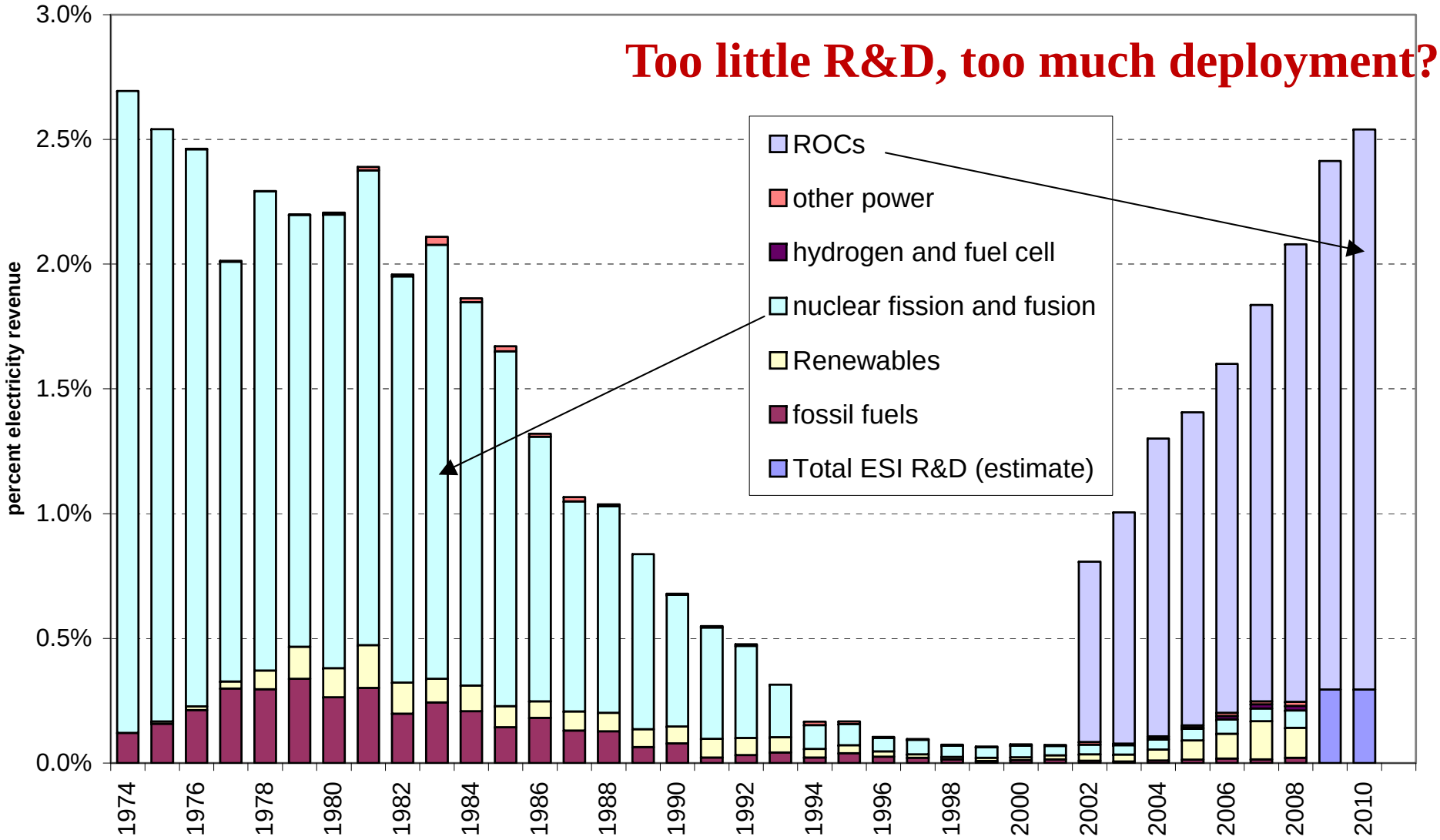


Source: EEX

UK Electricity R&D intensity



UK Electricity R&D intensity



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Electricity Market Reform

- Energy Act 18 December 2013 to address:
  - Security of supply and carbon/RES targets
  - problems with EU ETS
  - Market/policy failures
- To deliver secure low-C in UK affordably

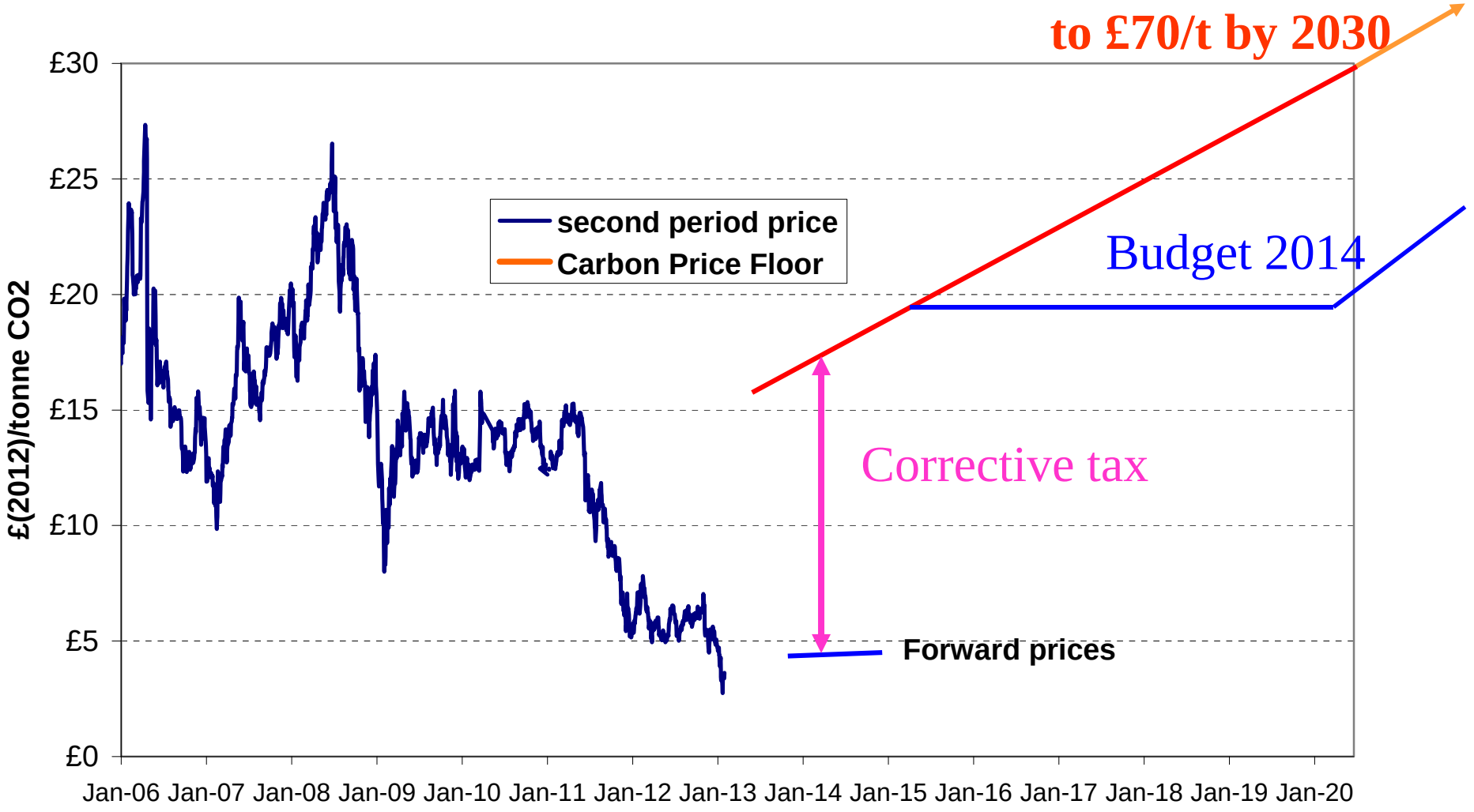
  => capacity payments

  => Carbon Price Floor

  - de-risk investment => Contracts to lower cost of capital

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

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



Source: EEX and DECC Consultation

CfD in *Energy Act 2013*

- 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 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 review)
- May 2014: replace with auctions for mature RES

Finally - sense breaks through

Criticisms of EMR

- "Contracts mark return to Single Buyer Model"
  - but all IPPs in 1990s were 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 low variable cost plant => capacity payments?
- Without govt underwriting contracts no cheaper
  - need guarantees that are defensible under state aid rules

EU role: to address *public goods*

- ETS: need adequate credible future C price
  - Best: backed by CfDs on EU C-price ***or***
  - long-term contracts supported by carbon price floor (UK EMR approach) and/or
  - emissions standard for new plant: tonnes/MWyr plus sector-wide emissions target set 20 years ahead
- Integrate deployment, demo and R&D support
  - Financial targets for MSs, competitive tendering and benchmarking for efficiency

What electricity models?

- Decarbonising: high capital cost, low variable cost
  - Need to de-risk, lower cost of capital

⇒ hard in liberalised market without credible C-price

⇒ contracts, capacity payments, price caps – where is market?

- Renewables are intermittent, paid high price per MWh
  - RES support distorts prices, location, trade => Reform!
- Options
  - Adapt US Standard Market Design
  - Single Buyer model based in ISO
  - State: owns nuclear; procures & auctions RES sites

Aims: cheap capital, socialize risks, efficiency

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Several possible solutions

- Real public sector interest rates now near zero
  - Govt finance attractive when backed by productive assets
  - Aggregate risks low, markets amplify company risks

  => finance low-C generation from state development banks
- ***But*** need contestability to deliver efficiency

  => tender auctions for PPA contracts?
    - Or regulated revenues if flexibility needed? (but generating is simple!)

  => single buyer (ISO) for efficient dispatch? Or Pool?
  - Or complex audited bids & central dispatch (SMD) e.g. SEM

Design market to fit technology

Commodity markets not good models

Objectives

- First fix public good problems
  - C-pricing (or C-intensity cap), RDD&D support
- Then address market/policy failures
  - Retain contestability via auctions and spot markets
  - Reduce cost of capital via state funding/counterparty

=> market friendly long-term contracts

  - With incentives for performance and efficient trade

Solution may depend on market power & size

EU Standard Market Design?

- Central dispatch in voluntary pool
  - SO manages balancing, dispatch, wind forecasting
  - LMP + capacity payment =LoLP*(VoLL-LMP)
  - Hedged with reliability option (RO)

  => reference prices for CfDs, FTRs, balancing, trading
- Auction/tender LT contracts for low-C generation
  - Financed from state investment bank
    - Credible counterparty to LT contract, low interest rate
  - CfDs when controllable, FiTs when not, ***or***
  - Capacity availability payment plus energy payment
    - Counterparty receives LMP, pays contract
- Free entry of fossil generation, can bid for LT RO
  - To address policy/market failures

Conclusions

- Liberalized ***competitive*** markets deliver efficiency
  - So does incentive regulation of natural monopolies
  - But gains modest, depend on spare capacity
    - And cheap investment options like CCGT
- Investment needed is capital-intensive
  - Balance shifts to reducing risk and cost of capital

  => Contracts, capacity payments, state finance/ownership
- Best choice depends on institutional endowment
  - And some options ruled out by State Aids

⇒EU needs to think carefully how best to decarbonise

Challenge is to reform markets, finance and support

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Spare slides

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Electricity Market Reform

Belfast 28th March 2014

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

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Acronyms

BETTA	British Electricity Trading & Transmission Arrangements
CCGT	Combined cycle gas turbine
CEGB	Central Electricity Generating Board
CfD	Contract for difference
CP	Capacity Payment
EMR	(UK) Electricity Market Reform
ESI	Electricity Supply Industry
ETS	Emissions Trading System
EUA	EU Allowance for 1 tonne CO_2
FiT	Feed-in tariff
FTR	Financial Transmission Right
G+T	Generation and Transmission
IPP	Independent Power Producer
ISO	Independent System Operator
LMP	Locational marginal price or nodal price
LoLP	Loss of Load probability
LRMC	Long-run marginal cost
LT	Long-term
NETA	New Electricity Trading Arrangements
PPA	Power purchase agreement
RDD&D	Research, development, demonstration and deployment
RES	Renewable energy supply
RO(C)	Renewable Obligation (Certificate) or Reliability Option
SMD	Standard Market Design (the US model)
SEM	Single Electricity Market (of the island of Ireland)
VOLL	Value of Lost Load

Background to EMR

- Security of supply: reserve margin falling fast
  - 12 GW coal decommissioned by 2015 because of LCPD (20% of peak demand)
  - 6.3 GW nuclear decommissioned by 2016
  - extra flexible generation needed to handle wind
- Climate change challenge: reach <100gm/kWh 2030
  - Renewables falling short of targets
  - Nuclear not attractive at current CO_2 price
  - Carbon not properly priced in EU ETS
- Cost rising: 2020 *energy* targets might cost £200 bn
  = £760 per household/yr, current energy bills = £1,100/yr
  - electricity alone £120 bn; £80+ bn on generation

Conclusions on EMR

- Low-C generation needs long-term contracts needed as no credible futures markets for corrective carbon tax
- FiTs make sense for unreliable RES (wind etc)
  - need to avoid exposure to balancing etc.
- EMR hampered by existing RO scheme
  - will be more expensive than intended
- Should move to auctions asap

Subsidies should come from general taxation

Capacity payments

- GB will have capacity payments from 2018
  - in return for capping wholesale price at £6,000/MWh
  - VoLL taken as £17,000/MWh, LoLE = 3 hours
- Efficient trade over interconnectors requires efficient scarcity pricing

⇒LoLP*(VoLL - SMP)

But EU auction platform has price cap of €3,000