

***Wholesale and retail electricity  
market reforms in the UK:  
What not to do***

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*FAEE, Paris*

# Outline

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- Thanks to Aoife Brophy Haney and CRIEPI
- Introduction and background
- Wholesale electricity market
- Retail electricity market for domestic customers
- Implications for other countries

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# INTRODUCTION AND BACKGROUND

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# Context for recent reforms: what's new?

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- Wholesale market
  - Increase investment to decarbonise
  - Renewables
  - Security of supply
- Retail market
  - Rising prices
  - Fuel poverty
  - Competition?

# The objectives of UK energy policy

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- The impossible trinity:
  - Energy Security (secure)
  - Decarbonisation (clean)
  - Competitiveness (affordable)
- Also:
  - International action on mitigation of climate change
- The other ones:
  - Elimination of (energy) poverty
  - Renewables
  - Green jobs/economy/technology

# UK Decarbonisation targets

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- UK in 2011 GHGs: -28.3% relative to 1990
- Kyoto Target: -12.5% by 2012; UK Target -34% by 2020
- 2008 Climate Change Act:
  - 80% reduction by 2050
  - Climate Change Committee
  - Five Year Carbon budgeting
  - Latest projections: 90%+ decarbonisation of electricity by 2030
  - Latest target: -50% relative to 1990 by 2023-27.

# UK Renewables Targets

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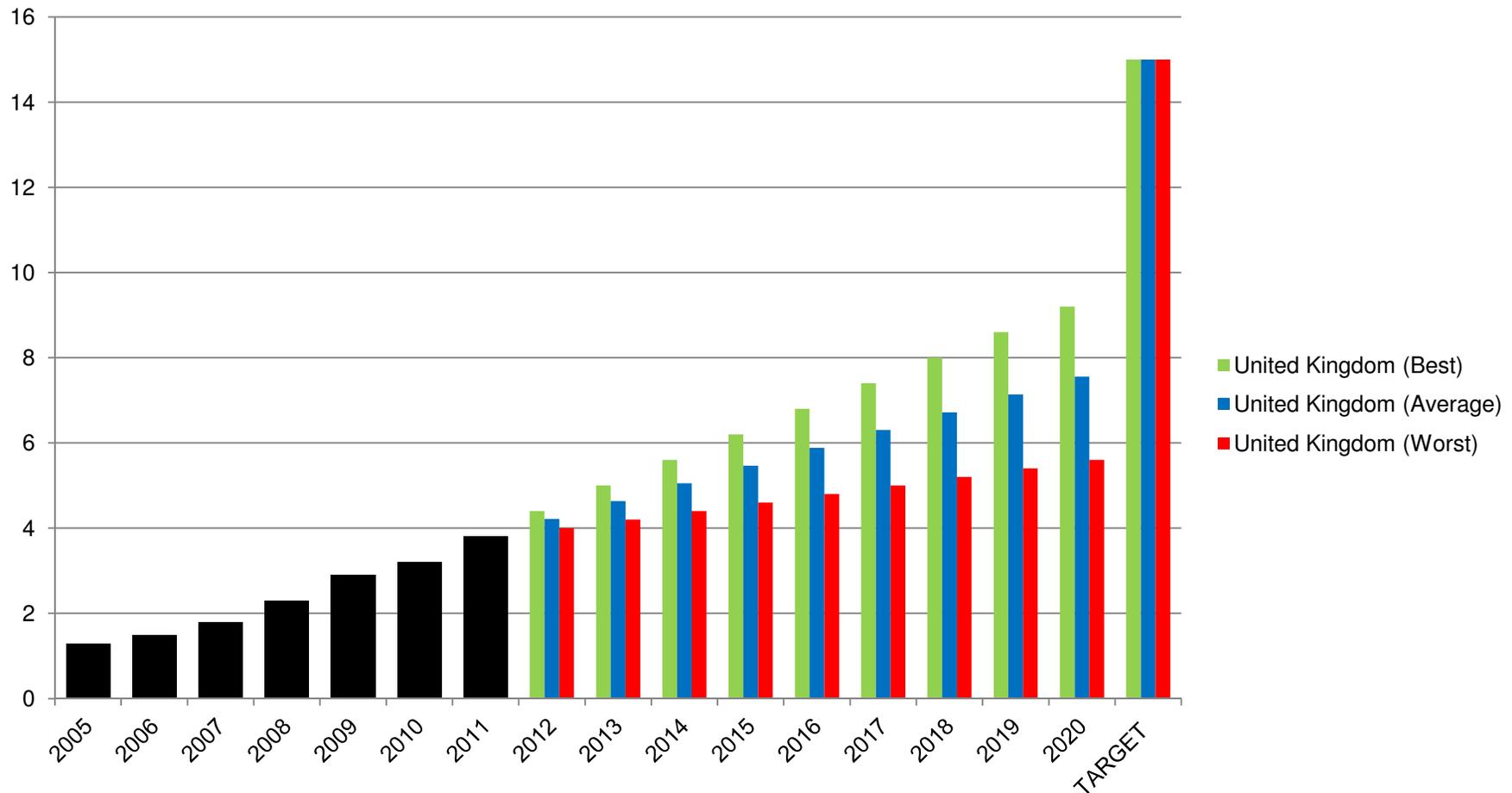
- UK committed to 15% target for renewables contribution to total final energy consumption in 2020 (2009/28/EC) (3.8% in 2011)
- Currently support regime only envisages 15.4% renewables in electricity by 2015-16. (8.6% in 2011)
- 2010 target of 10% for electricity from renewables (2001/77/EC). 7.3% was achieved.
- Clearly, current policies not working.

# Aims for retail market

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- Value, choice and simplicity for customers
- Action on fuel poverty
- Competitive market with low margins
  
- BUT more investment in large, risky investments needed ..... conflict

# Can wholesale market reform work? UK renewables target credible?



Methodology for three scenarios: Using the highest, average and lowest differences in figures between 2005-2011, we project the best, average and the worst cases from 2012 onwards.

# Can wholesale market reform work? Can we fix it for nuclear power?

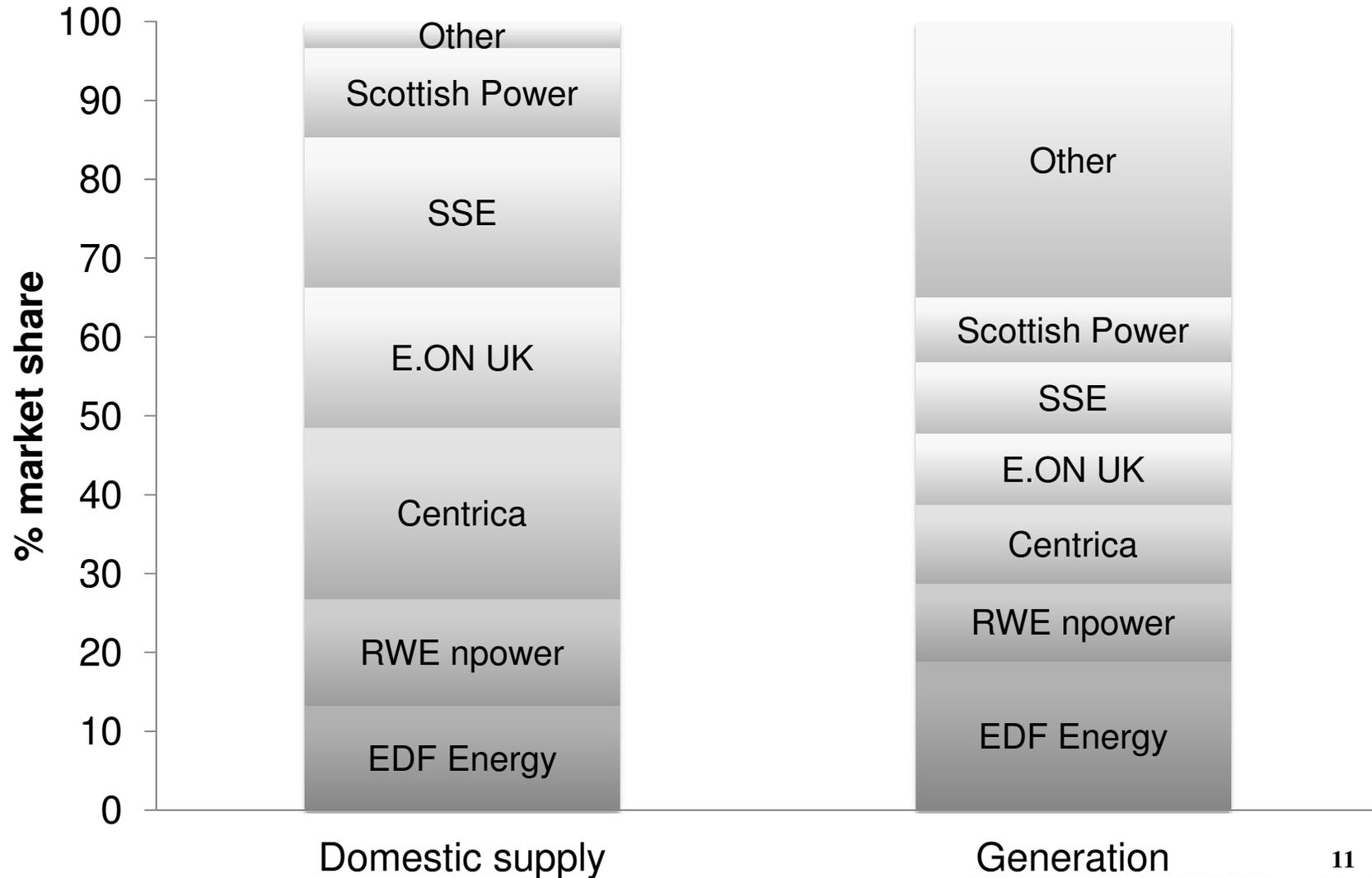
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- **If EMR is about reducing the risk of nuclear investment, then the environment is challenging:**
  - History of negative learning in (western) nuclear (Grubler, 2010).
  - Nuclear costs are high and rising – e.g. MIT 2009 study on nuclear costs has doubled its estimates compared to 2003 study.
  - Recent escalating construction costs due to higher commodity prices.
  - History clearly shows that estimated costs are less than outturn costs:
    - E.g. Olkiluoto 3 in Finland:
      - reported contract price in 2004 was 3 billion of Euros. Today it is estimated at 5 billion (+).
      - Now due to take 9 years to construct (against 4 planned).
      - Design of the deal in fact makes consumers' bear the risk (Schneider et al. 2009).
    - E.g. Flamanville 3 in France:
      - Cost estimated at 3.3 billion Euros in 2006, 4 billion in 2008, 4.5 billion in 2009, 6 billion in 2011, 8.5 billion in 2013. Now due to take 9 years to construct.

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# Can retail competition work?

## Electricity Generation and Supply in GB - 2010



Source: Data from Bloomberg New Energy Finance 2012

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# WHOLESALE MARKET REFORM

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# EMR – Electricity Market Reform

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- Four elements proposed in December 2010:
  - 1. Fixed prices for low carbon generation (CfD-FiTs)
  - 2. Carbon Price Support (CPS)
  - 3. Capacity Market (CM)
  - 4. Emissions Performance Standard (EPS)
- Draft Energy Bill issued in May 2012, in Parliament November 2012, due to be legislated in 2013.

# Origins of EMR proposals

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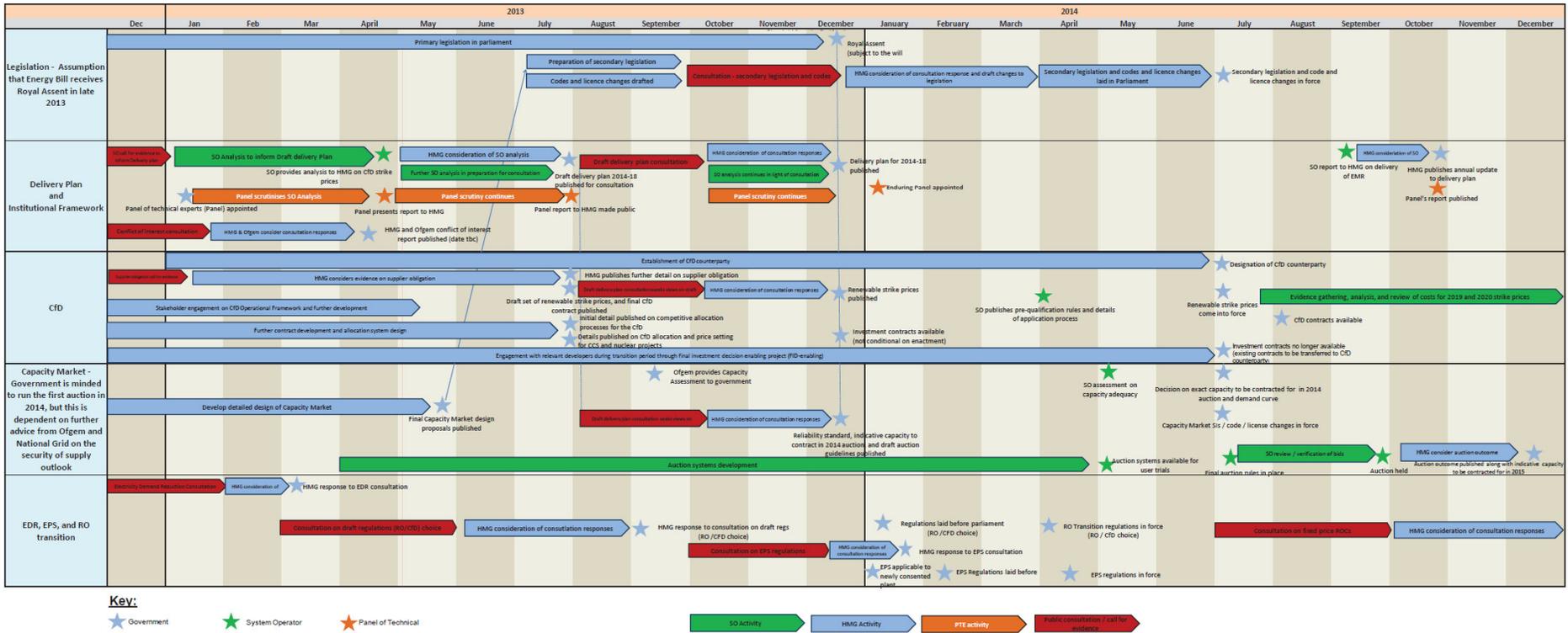
- Nov 2008: Climate Change Act (passes 463-3 on third reading in HoC).
- December 2008: First report of Committee on Climate Change:
  - sets up electricity as lead sector for decarbonisation, with 90% per kWh decarbonisation by 2030.
  - Electricity identified as key to decarbonising heat and transport.
- 12 October 2009: Committee on Climate Change First Progress Report details key EMR elements.
- May 2010: Coalition Agreement, somewhat surprisingly, specifies 4 elements of EMR.
- Dec 2010 DECC publishes EMR proposals...
- It is absolutely clear that motivation for EMR lies with Committee on Climate Change, 5 year carbon budgeting and the Climate Change Act.

# How the four EMR elements fit together

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- Need to achieve carbon and renewables targets. Electricity is first sector in line for large scale decarbonisation.
- CfD-FiTs offer price (energy+carbon) certainty and are high enough to support low carbon generation such as nuclear etc.
- CPS needed to raise price of carbon for fossil generation to encourage switching and have added benefit of reducing CfD payments *and* raising some tax revenue.
- Under CfD-FiTs and CPS, fossil generation gets pushed to margin and has low plant utilisation, but is needed to back up intermittent sources such as wind, therefore needs an availability payment, via capacity market.
- Then just in case, we don't get price based incentives right, EPS ensures that high CO2 fossil plants do not get built.
- There is a logic, is it good economics?

# EMR Implementation Timeline



Source: DECC

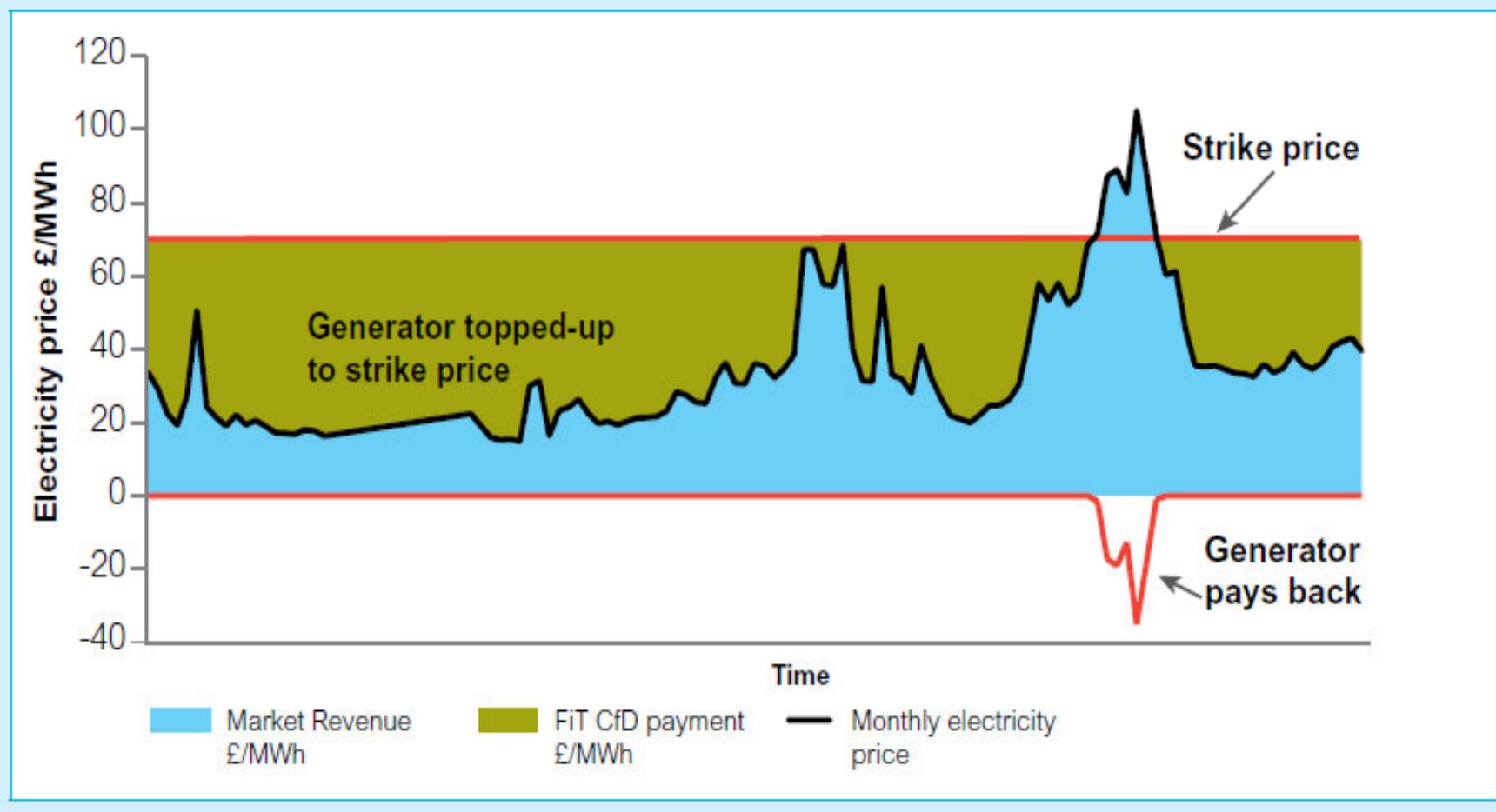
## (i) Support for Low Carbon Generation

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The reform proposes the setting up of a system of contracts for differences (CFD-FITs) whereby the government would contract with low-carbon generators to supply electricity at fixed prices for a prolonged period. These contracts would pay the generators the difference between the average wholesale price of electricity and the contract price.

# The proposal: CfD-FIT

Figure 5: The operation of an intermittent Feed-in Tariff with Contract for Difference



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Source: DECC (2011), *Planning our electric future: a White Paper for secure, affordable and low-carbon Electricity*, p.38.

# The argument for CfDs

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- The argument is around the volatility of the EUETS price. EUETS is not volatile if hedged by a simple buying strategy, but the average price is low.
- CfD-FiTs will raise the average price, however no real evidence that it will reduce the cost of capital (as is claimed).
- Any remaining risk is transferred to the counterparty. This will be the consumer, but ultimately the government. It does not go away.
- The main risks for nuclear are construction risk and appropriation of cash flows once built (as in Germany) these are not addressed.
- CfD-FiTs are still subject to uncertainty around the strike price of future plants (e.g. second and third nuclear plants).
- In the end the theoretical argument for CfD-FiTs versus a price of carbon does not pay sufficient attention to the theory of finance.

## Some Practical Problems with CfD-FiTs

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- *What will be the reference price?* Over 40 years it is not at all clear that there will be one meaningful market price for residual fossil generation.
- *Who will be the counterparty?* The System Operator (NG) refused to take this role. The government will be the counterparty via agency to be determined and CfD payments will be a state aid.
- *How will there be competition in the CfD-FiT market for low carbon generation, especially if there is technology banding?* Only one company still in the first nuclear competition/negotiation.

# Current plans for CfD-FiTs

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- The intention is to have a series of auctions in the long term, in the short term there will be technology specific reference prices.
- CfD-FiTs will be within levy control framework of maximum allowable expenditure.
- CfD-FiT payments to generators will be recovered by a supplier levy. Certain energy intensive users will be exempted.
- The counterparty will be a government agency, government will design contract.
- The strike price will be a long term indexed price to provide price certainty. The contract length will be determined but minded to be 15 years for renewable generators.

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## (ii) Carbon Pricing

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The reform has already introduced a carbon price support (CPS) based on the existing climate change levy (CCL). This involves increasing the rate and coverage of the climate change levy to effectively increase the price of carbon emissions from the electricity sector in the UK above that in the rest of the EU.

Begins in April 2013, target CO<sub>2</sub> price is £30/tonne (in 2009 terms) – forward EUA price + CPS - by 2020 (possibly £70/tonne by 2030).  
Note: that with inflation CO<sub>2</sub> price in UK could easily be 50 Euros per tonne by 2020.

# CPS – a theoretical analysis

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- The CPS is fundamentally a tax policy. It needs to be analysed in the light of the principles of optimal tax theory.
- It is a carbon tax implemented on electricity, not on domestic gas or any other source of CO<sub>2</sub>, and hence distorts the use of electricity relative to other energy carriers.
- The CPS distorts international competition and trade in electricity. Energy intensive industry will shift to continental Europe and electricity imports (which can't be taxed on trade grounds) will be encouraged. This is simple tax arbitrage. Diamond and Mirrlees (1971) show that industry should be exempted from intermediate goods taxes for these reasons.
- The CPS will directly impact the wholesale price via raising the price of marginal fossil generation. In 2014 it will raise household bills by 3-6%.

# Practical problems with CPS

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- There is also a political problem, unlikely that the Treasury will want to reduce the total revenue from the tax to zero from its initially highly significant level, so the rate may not be increased as expected.
- CPS complicates the economics of CCS and CHP which will require more subsidy at higher carbon prices.
- CPS will lead to messy exemptions with arbitrary cut off points for energy intensive users.
- CPS, like CfD-FiTs, by reducing the number of EUA permits required by the UK undermines the EUETS.

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## (iii) Capacity Mechanism

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The reform proposes the introduction of a (market wide?) capacity mechanism (CM) to contract for the necessary amount of capacity to maintain security of supply. This would involve the introduction of payments to generators for maintaining availability, supplementing the market for units of electrical energy that exists at the moment. This deals with predicted low capacity margins by 2018/19.

Note: The amount of capacity to be contracted for would be decided by the government. The date of introduction could be in the 2020s!



# Theory of Capacity Markets

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- This is the theory of supply and demand. In most capital intensive goods markets payment is for production, not capacity.
- Indeed competitive markets strongly incentivise excess capacity (while government owned industries, usually suffer from shortages due to unwillingness to raise finance for new capacity), due to strong non-delivery penalties and duplication of reserves.
- The actual issue is not capacity but willingness to pay to avoid interruption. This is not well expressed by households (in the absence of smart meters), but can be captured directly by regulatory non-delivery penalties.
- What is clear is that capacity mechanisms in electricity (e.g. in the US) only seem to be necessary when energy prices are capped at arbitrarily low levels (Texas considering raising its cap).
- A case for capacity payments may emerge at high levels of renewables but only to encourage entry of small intermittent generators who will find it difficult to contract with fossil generators directly for back up generation. In such cases a capacity market might emerge privately.

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# Practical problems with Capacity Markets

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- Who decides what the required level of capacity is? Is it the government and if so, how.
- Recent US experience suggests that far from guaranteeing revenue for generators, capacity markets can be used by governments to appropriate revenue from generators by licensing new capacity to drive down capacity market prices (e.g. FERC vs New Jersey, who was accused of monopsony activity in the capacity market).
- National capacity markets are problematic in the EU. It may not be possible to stop EU generators bidding into the capacity markets via interconnectors (who are also avoiding the CPS), thus supporting capacity in other countries rather than the UK (if for instance capacity markets are deemed a form of public service obligation).

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# Current Capacity Market plans

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- Annual auctions for 4 years ahead on the basis of predicted peak subject to an enduring reliability standard (Loss of Load Expectation – e.g. 3 hours p.a. as in France).
- ‘This will be informed by updated advice from Ofgem and National Grid which will consider economic growth, recent investment decisions, the role of interconnection and energy efficiency, as well as consideration of the outcome of the review of the 4th Carbon Budget.’
- First auction, potentially, 2014 for 2018/19.
- Bidders need to be available at times of stress.
- In theory, market wide capacity. However CfD recipients will not receive capacity payments.
- DSR and storage will be able to bid.

## (iv) Emissions Performance Standard

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New supercritical coal fired generation has average CO<sub>2</sub> emissions of around 790g/kWh; a modern gas-fired power plant about 360g/kWh. The reform proposes an emissions performance standard (EPS) for all new power plants of 450g/kWh, designed to rule out the building of new coal-fired power plants without carbon capture and storage (CCS) technology fitted (to a substantial part of a new plant).

Note: that new peaking plant will be permitted as maximum emissions are calculated at an 85% load factor.

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# EPS

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- This is a backstop command and control approach to environmental regulation.
- It appears to be innocuous in that no-one currently wants to build the plants that it rules out.
- However it does introduce an instrument which could be ratcheted up to eliminate the building of new gas fired power plants. It can be suspended in interests of security of supply.
- Given the problems that California, Italy, Germany and Japan have had from environmental standards ruling out 'any' timely new build/operation of large conventional power plants. It is a significant threat.
- Given that it serves no useful function in terms of renewables or decarbonisation, it has no place in the EMR package.

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# Proposed Reforms and Bills

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- This has consistently been presented in a **very** misleading way in the documentation, relative to a baseline of an *enhanced* Renewables Obligation. Both the documents and ministers continue to argue bills will fall.
- Relative to 2010, EMR modelled real bill rises(July 2011):
  - Households: +32% by 2030
  - Medium Non-Dom: +56% by 2030
  - Energy intensive industrial: +69% by 2030
  - Wholesale price elements rise by higher percentage.
- Even assuming higher gas prices (as in EMR) 82% of domestic bill rise is policy induced (though not just EMR).<sup>31</sup>

# Conclusion on EMR

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- EMR displays a huge amount of economic illiteracy:
  - on the theory of finance
  - on the theory of optimal taxation
  - on the nature of supply and demand in markets
  - on economic instruments for reducing externalities...
- EMR also suffers from a host of practical and implementation problems and has little empirical efficacy basis.
- EMR, if it is implemented in the UK, will fail to deliver society's overall energy and climate objectives at reasonable cost.
- ***The contrast between the UK government's unwillingness to accept economic analysis vs. its willingness to accept climate change science is striking.***

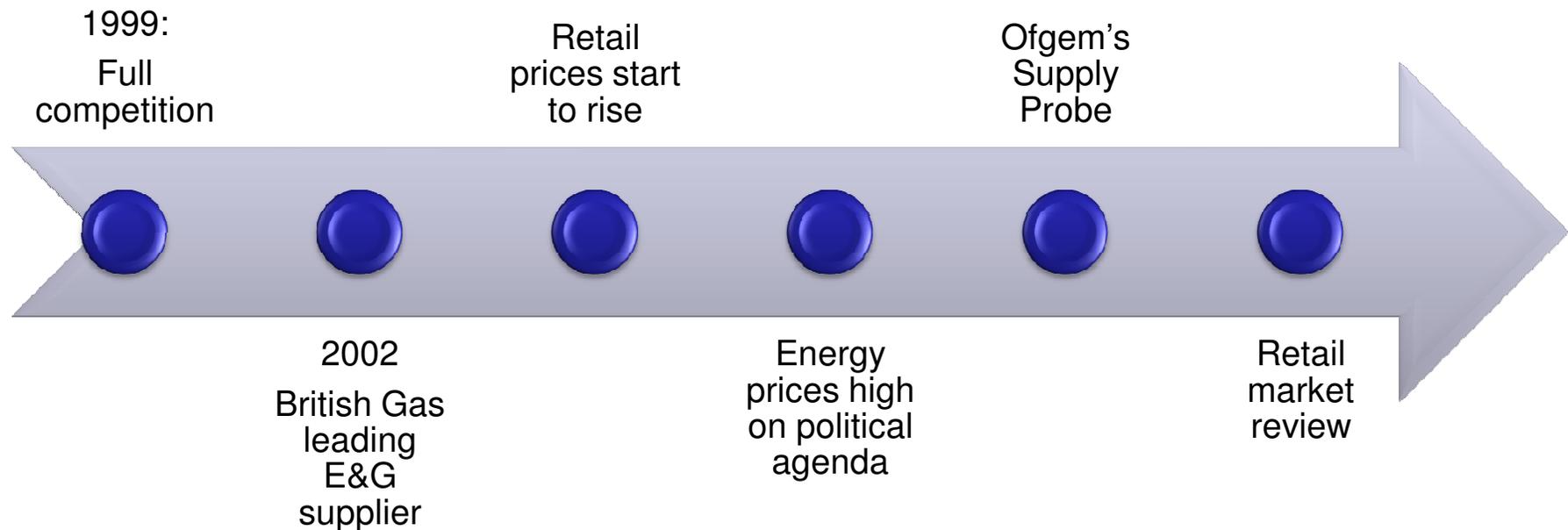
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# RETAIL MARKET REFORM

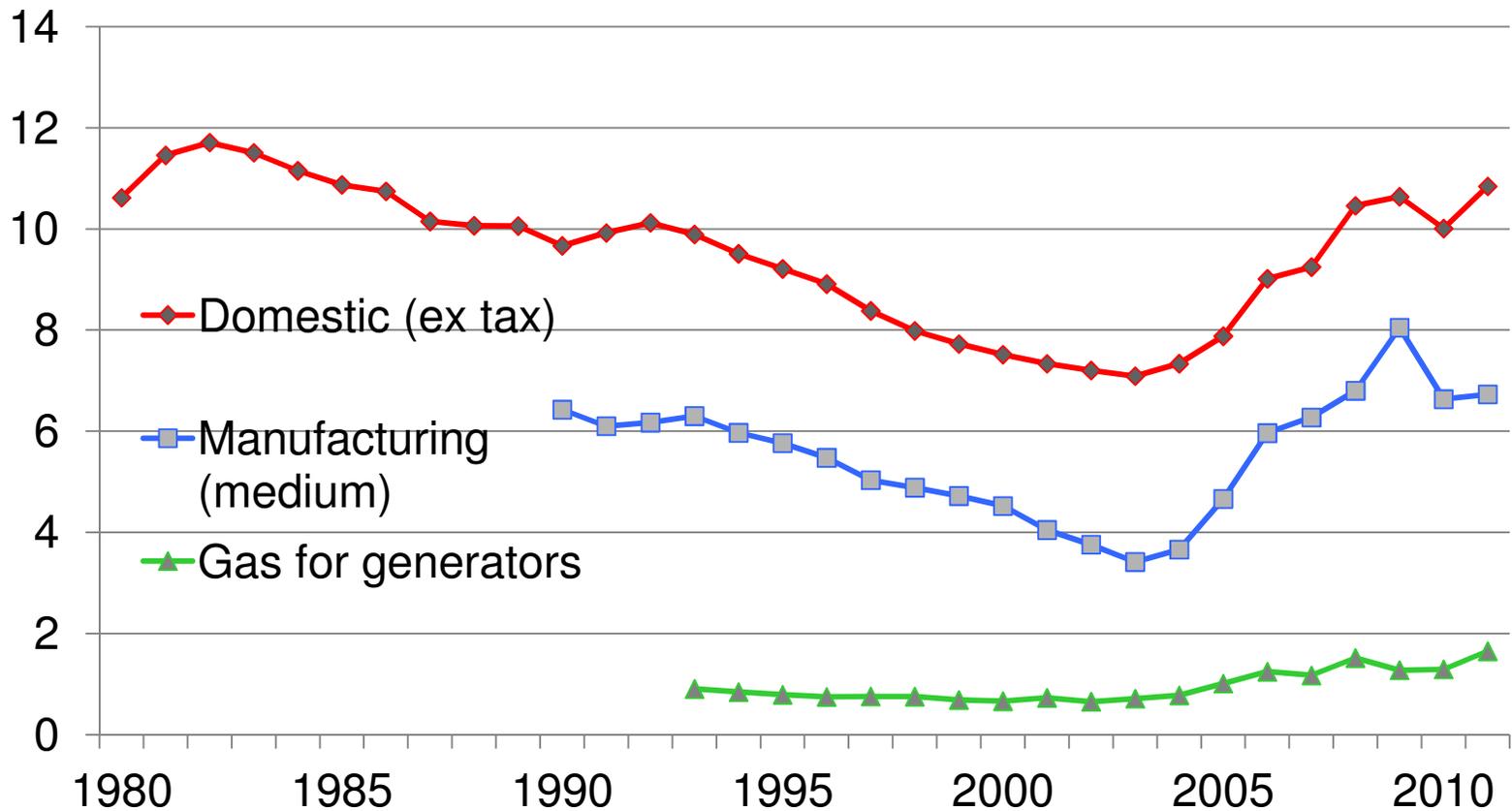
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# Retail (household) Market timeline

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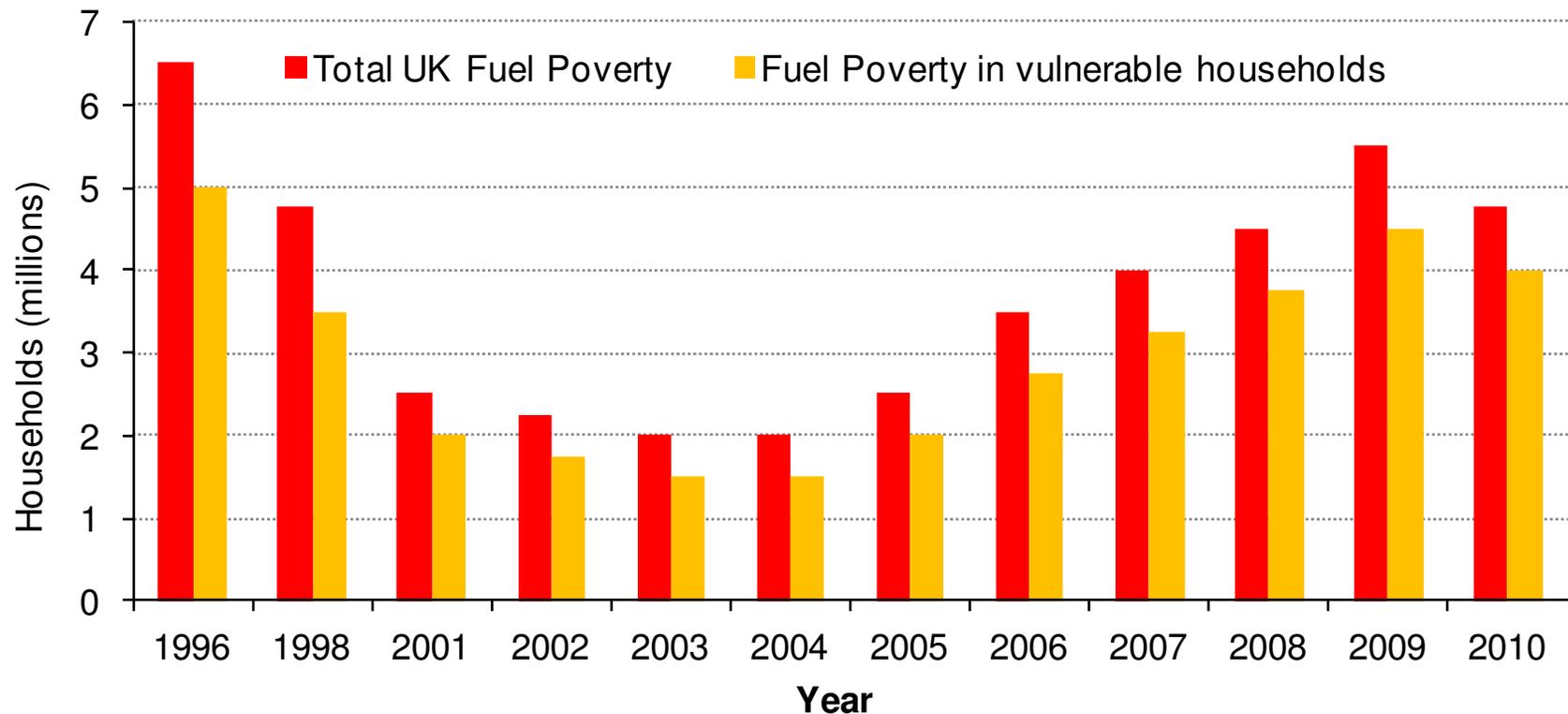


# UK electricity prices – pence per kWh (2005 prices)



Source: DECC

# Fuel poverty in the UK



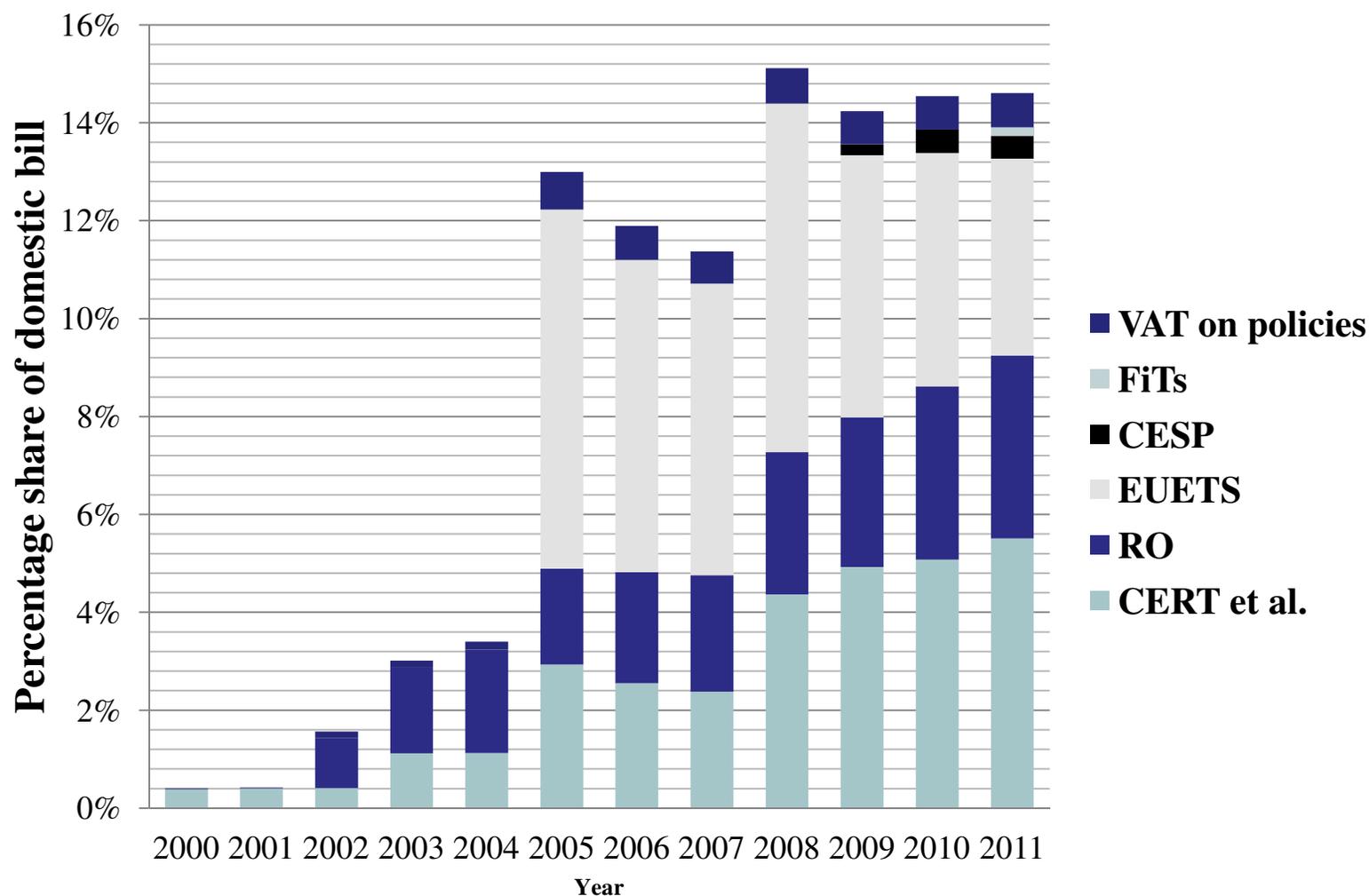
Source: DECC 2012, p. 9

Fuel poverty – More than 10% of income spent on fuel to maintain adequate warmth

A vulnerable household is one that contains the elderly, children or someone who is disabled or has a long-term illness

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# The current cost of energy policy on bills



Note: Generation based only, excludes transmission and distribution policy costs.  
3300 kWh consumption. Source: Chawla and Pollitt (2012).

# 2008 Energy Supply Probe

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- Study of the “state of the GB energy supply markets” launched in February 2008
- Main findings:
  - Big 6 suppliers without a significant competitive fringe
  - Barriers to entry and expansion for new entrants
  - Small group of engaged customers
  - Switching mistakes
  - Differential pricing (within and out-of-area customers; payment types; single versus dual fuel)
  - Vulnerable customers not able to access best deals

# New obligations on suppliers 2009/2010

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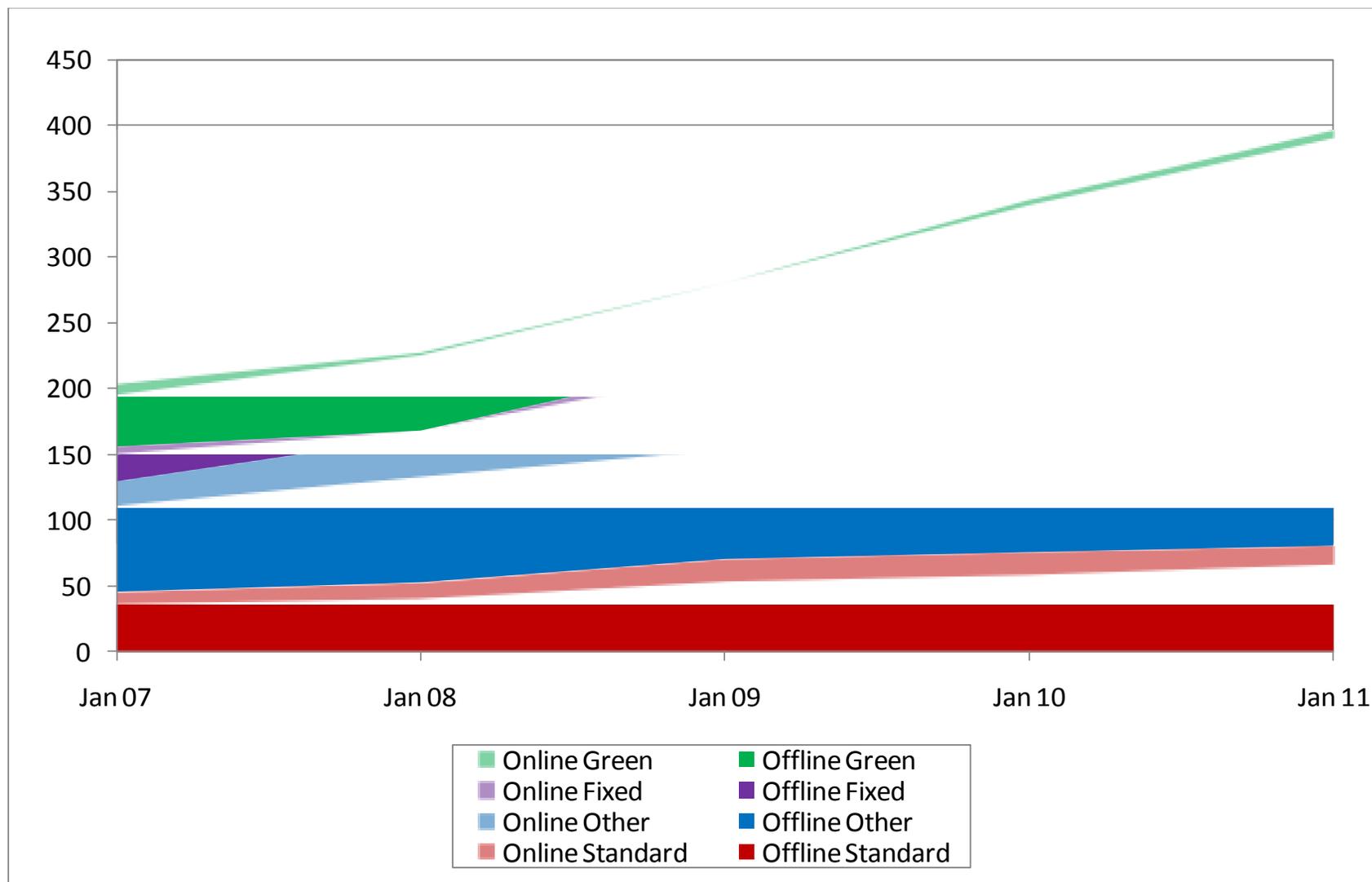
- Remove “unjustified price differentials”
  - Prepayment customers
  - In-area customers
- Promote competition and customer engagement through:
  - Better billing information
  - Helping vulnerable customers
  - Improved sales and marketing

# Retail Market Review - 2011

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- Initial proposals
  - Improve tariff comparability
  - Enhance liquidity
  - Strengthen remedies from the Probe
  - Improve reporting transparency

# Number of tariffs available to domestic consumers on 1 January



Source: Ofgem 2011, p. 22

# Retail market review - 2012

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- 2012 domestic proposals
  - Putting customers on the best tariff
  - Limit of 4 tariffs per fuel, meter and payment type
  - End to multi-tier tariffs, all tariffs as standing charge and unit rate structure
  - Information on bills re: savings if customer switches to cheapest deal
  - Tariff Comparison rate

## Criticism: prices will increase (Littlechild 2012)

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- Putting customers on the best tariff –
  - Suppliers are likely to withdraw the best tariff
- Reducing the number of tariffs, restricting the types of tariffs and use of discounts
  - “Prevents competition in fixed-price fixed-term contracts and temporary offers”
  - Discounts likely to just be reduced or removed

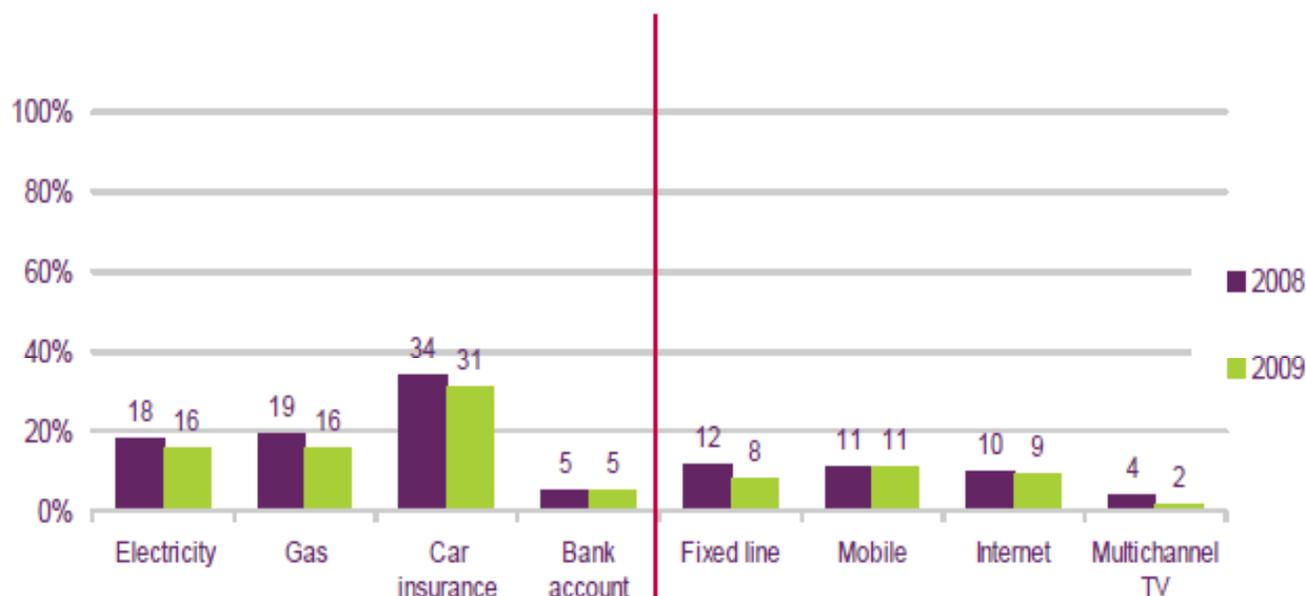
# Criticism: Innovation will suffer (Littlechild 2012)

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- Restrictions in number and type of tariffs
  - Suppliers unlikely to risk introducing new tariffs if they have to withdraw one of four existing ones to do so
- Direct conflict with smart metering
  - Aims of smart metering: increase information, allow for broader range of tariffs and more complex tariffs
  - Limiting tariffs a barrier to evolution of smart metering

# Was there actually a problem?

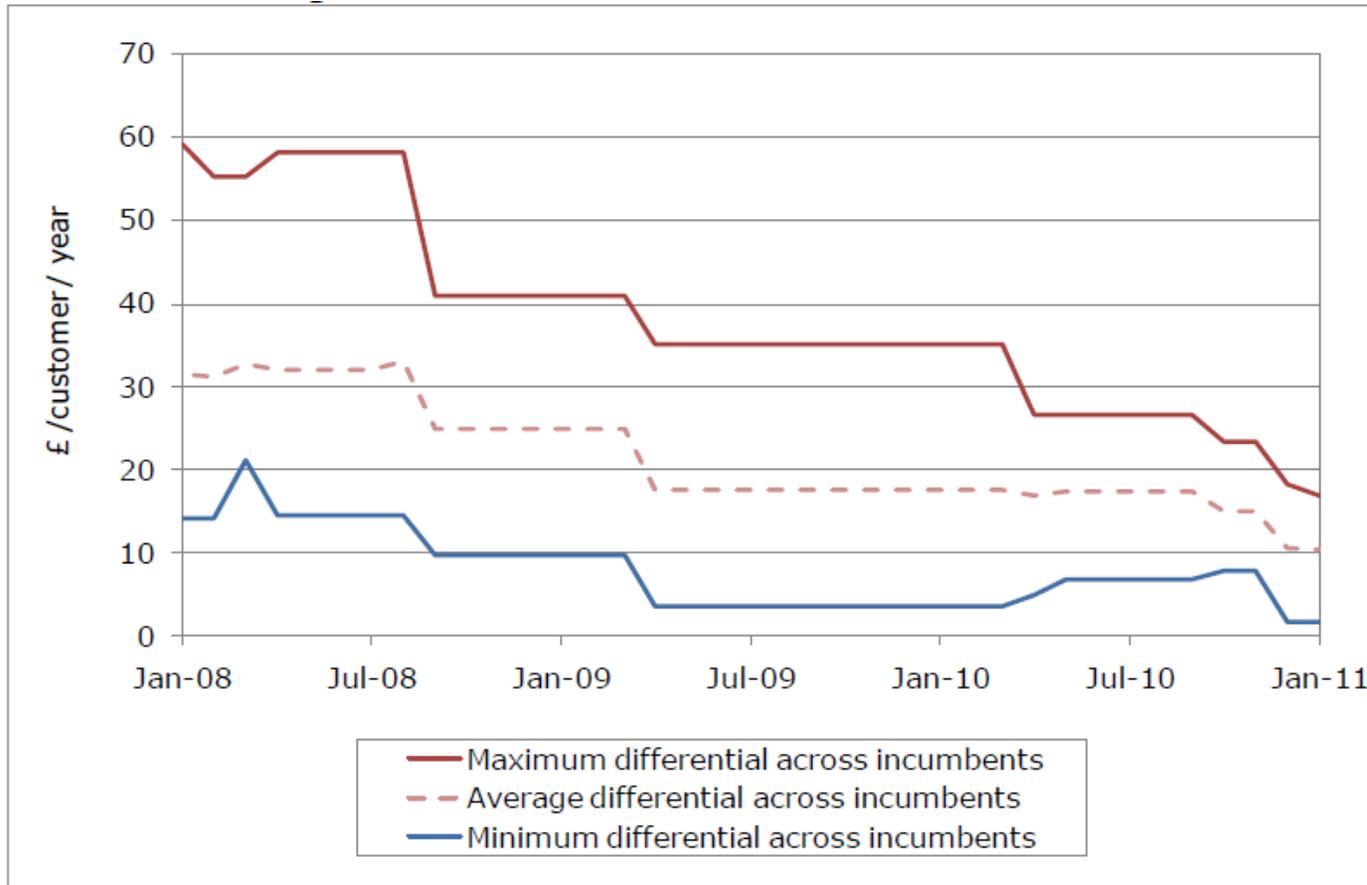
Figure 9: Proportion of consumers who have switched communications and utilities providers in the last 12 months



Base: All adults with fixed line (2008, 941) (2009, 781) mobile (2008, 1270) (2009, 1231) internet (2008, 460) (2009, 388) multichannel TV (2008, 896) (2009, 837), electricity (2008, 1309) (2009, 1226), gas (2008, 1125) (2009, 1069), car insurance (2008, 1107) (2009, 1019), bank account (2008, 1418) (2009, 1350)  
Source: Ofcom Consumer Experience Report 2009

# The benefits of switching

## The impact of intervention?

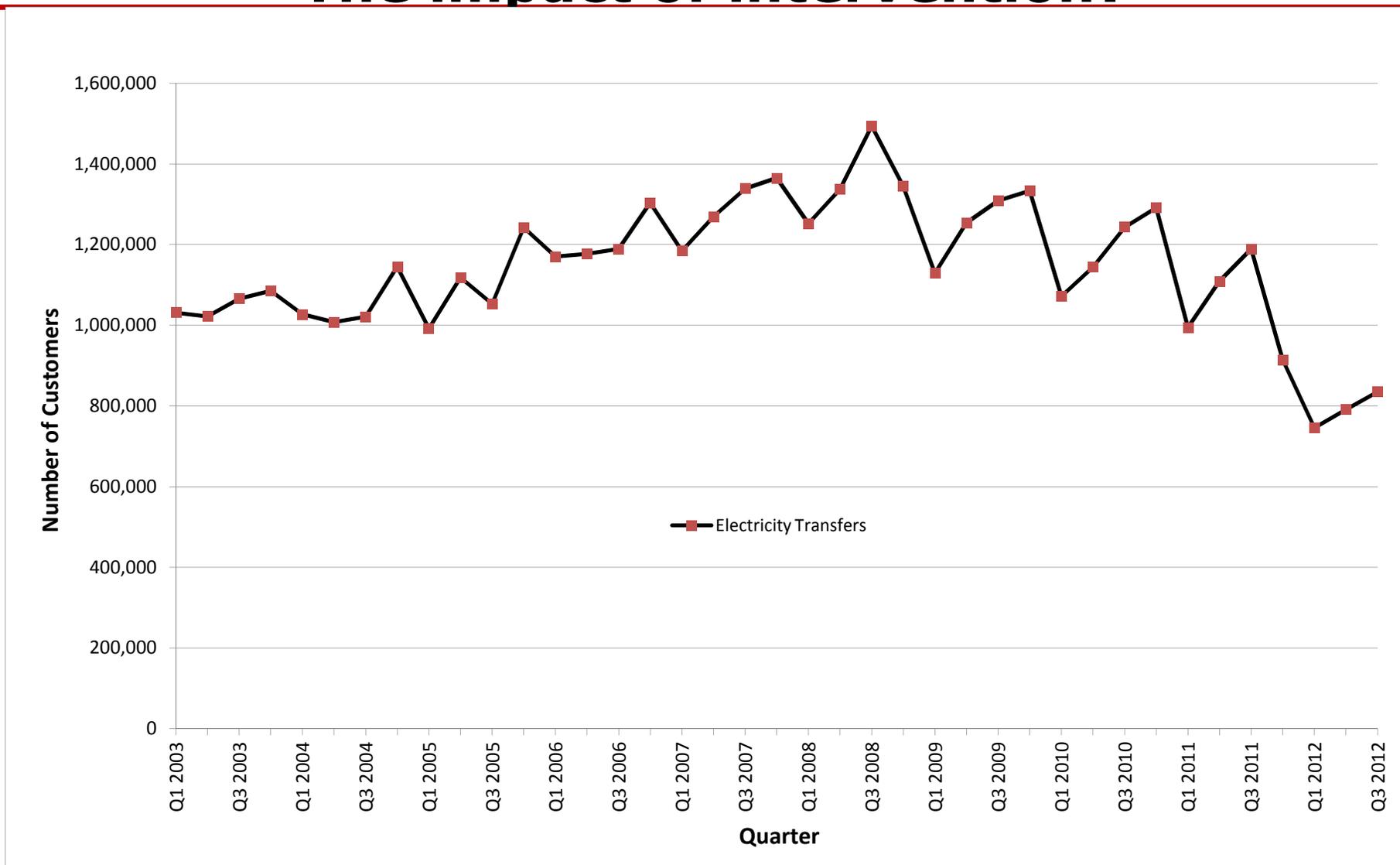


Source: Ofgem analysis on data from TheEnergyShop.com

Differences between areas in which each company is an incumbent and those where it is an entrant, annual bill for credit electricity customers, corrected for network charges

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# Domestic electricity transfers in GB – The impact of intervention?

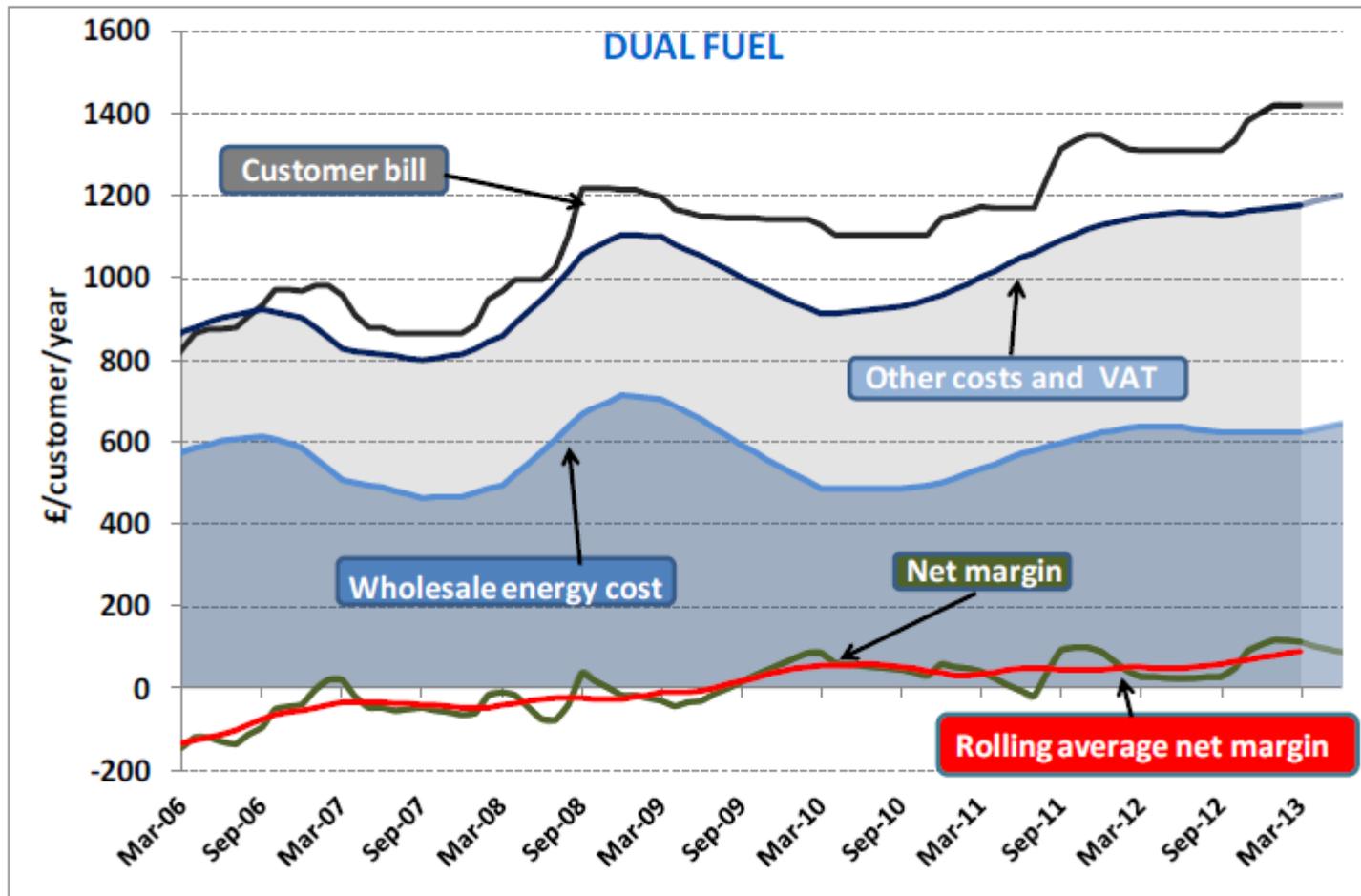


Source: DECC, Table 2.7.1. Transfer statistics  
Total electricity customers 2011 approx. 27.5 million

# Typical Retail Bill Evolution

## The impact of intervention?

Typical dual fuel customer bill, costs and total indicative net margin for the next 12 months



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Source: Ofgem (6 March, 2013, p.2)

# Profit margins

## Generation margin down – retail margin up?

**Table 1: 2009 and 2010 EBIT margin by sector**

	2009 Aggregate margin	2010 Aggregate margin
Generation	22.5%	13.8%
All Supply	1.8%	3.8%
Domestic Electricity	2.1%	0.3%
Domestic Gas	-0.4%	5.7%
Non-domestic Electricity	4.0%	4.7%
Non-domestic Gas	-0.5%	6.2%
All segments	5.8%	5.7%

*Source: Ofgem, 2012, Financial Reporting Information 2010, p.19*

# Conclusions on RMR

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- Recent proposals based on economic fallacy
  - Tariffs available in a competitive market will not remain unchanged as new obligations introduced
  - Experience of this with non-discrimination condition in 2009 (increases in out-of-area prices)
- Conflict between need for investment and keeping competitive market with low margins
- Fuel poverty is a poverty issue not an energy-market issue
  - Helping vulnerable customers not best achieved through consumer bills

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# IMPLICATIONS FOR OTHER COUNTRIES

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# ***Combining subsidies and market via EMR***

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- **Policy impacts significant, but fail social cost benefit test:**

*Bills rise substantially, large welfare transfers to companies, risks transferred to consumers, no impact on global carbon emissions, but more renewables (in UK, but not necessarily elsewhere). Public support for climate change and renewables policy is undermined.*

- **Policy consistency not addressed for investors:**

*EMR increases policy complexity, international carbon strategy undermined. Policy specific risks increased.*

- **Individual policy design not same as a consistent strategy:**

*EMR is not a fundamental redesign of the market based on sound economic principles. Two of four elements redundant, some movement towards comprehensive set of carbon taxes, RES support not rationalised, energy security socialised, need for optimal commodity tax policy not addressed, EU and global policies undermined.*

# Combining subsidies and market via EMRs

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- **Macro-economic impact of EMR for UK not analysed, but impact on real consumption (rather than GDP) high:**
  - Headline rise in bills suggests for electricity of 33% of £14.495 bn (households) and 62% of £15.315 bn (non-households) = £14.275 bn of extra energy expenditure (from Dukes 2012, Table 1.4). This is 1% of GDP (*some* of this is tax and profit transfer).
  - Effect on jobs, 225k jobs in energy intensive industry not assessed. Exemptions from CfD-FiT levy proposed.
  - Long term effect on GDP and consumption per head likely to be negative for no benefit (see Krupnick and McLaughlin, 2011).

# *Is EMR a model for other countries?*

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- A key issue is whether national EMRs could be part of a global solution to climate change.
- Only if EMR can replicate the cooperative solution in equilibrium, but the following undermine this:
  - seams issues – how national policies interact;
  - free riding – how is cheating reduced;
  - inability to calculate national share of global solution.

## ***Is RMR a model for other countries?***

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- By any measure, in 2008 the UK had one of the most competitive retail electricity and gas markets in the world.
- RMR has been a political response to the impact of rising commodity prices in conditions where imposing a final price cap is now impossible.
- *Most* economists are (correctly) only too aware that intervention to increase competition by restricting price discrimination often creates distortions.
- The retail market is being wrongly blamed for cost rises that are driven by a combination of commodity and, now, policy related price rises.
- Competition is best promoted by competitive market structures and an effective competition authority not a politically vulnerable sector regulator.

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## ***What will happen to EMR and RMR?***

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- Difficult to see how the UK political system can extract itself from the policy trajectory it is now on.
- To abandon EMR and revert to a European approach based on EUETS and a European tradeable renewable certificate market would threaten the UK's targets and the whole Climate Change Act.
- However the political difficulty of policy induced bill rises, high segmental profits, nuclear cost overruns and policy induced threats to energy security looks insurmountable.
- So when the irresistible force (of policy targets) meets the immovable object (of economic reality) it is difficult to see how an economically sensible energy policy can emerge.
- If only, *efficiency and equity issues* were not so frequently confused in energy policy!

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# Academic literature: wholesale market

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