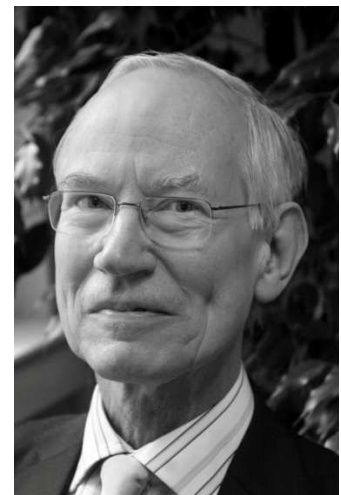
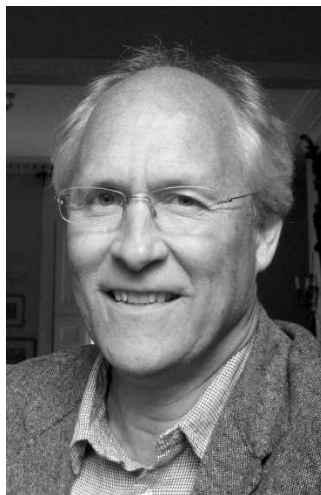


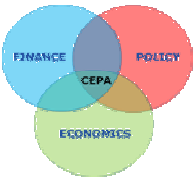
ELECTRICITY AT THE CROSS-ROADS

SEMINAR 8 SEPTEMBER 2010



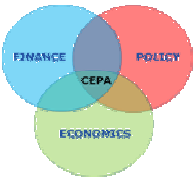
Cambridge Economic Policy Associates Ltd





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WHAT CEPA DOES

CEPA is an economic and financial policy advisory business. Our focus is on issues where economics, finance and public policy overlap:

- We combine rigorous economic and financial analysis with practical experience of energy markets to provide workable solutions.
- We support Government, regulators and industry on energy regulation and market design projects in the UK and abroad.
- We design, implement, and evaluate financial mechanisms and public private partnership arrangements in infrastructure services.

Energy regulation and market design

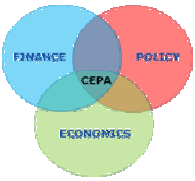
We provide comprehensive economic and regulatory advisory services to stakeholders within the energy sector, including:

- Policy analysis and design – such as support mechanisms for low-carbon generation, including the Renewables Obligation and feed-in tariff structures.
- Market modelling and analysis – to help inform our clients with market design, investment strategies and business planning.
- Economic analysis – including regulatory regime and incentive design, price reviews, efficiency and cost of capital analysis, regulatory asset base valuations and pricing structures.

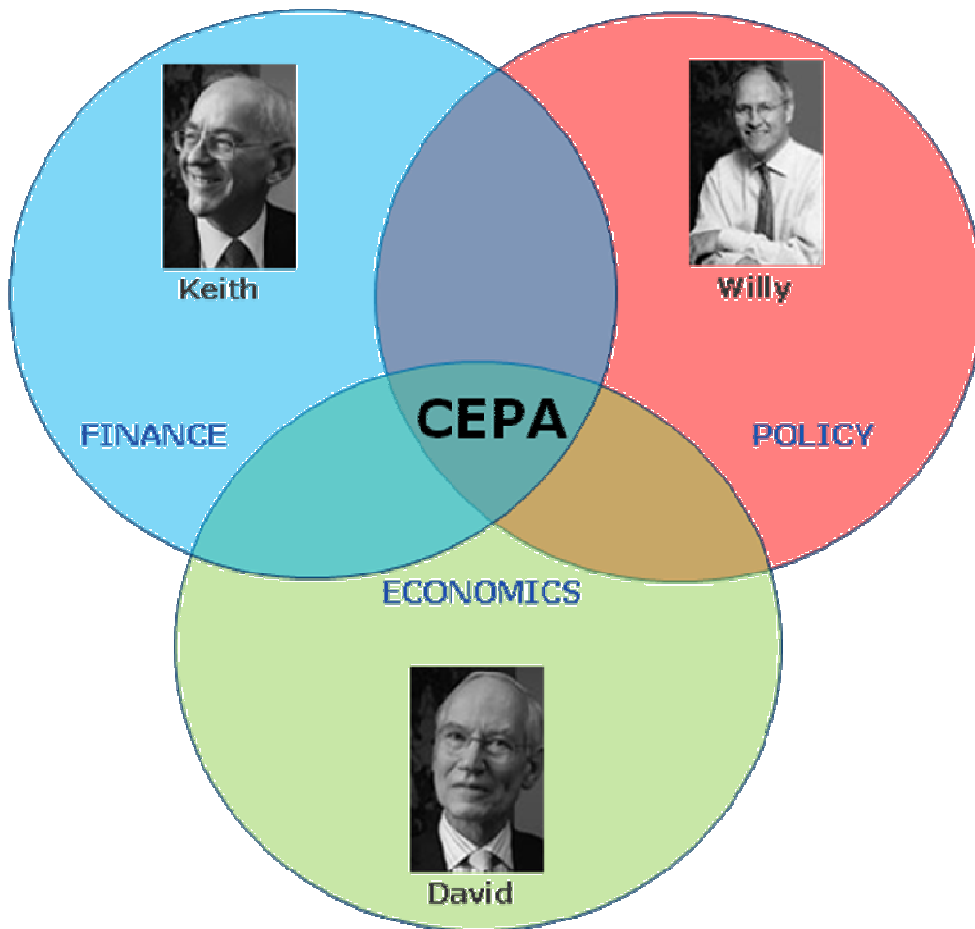
Finance and public private partnerships

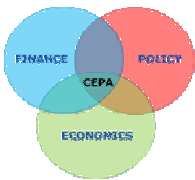
Provision of advice on the structuring and delivery of financing mechanisms and public-private partnerships in infrastructure services, including:

- Transaction advice – procurement approaches, corporate governance, project management of the tender process and financial advice.
- Financial modelling, corporate and project finance advice – including product design, fund design and implementation of financing structures for the delivery of infrastructure.
- Business case modelling and development – to support risk assessment, profitability analysis, service reconfiguration and investment strategies.



WHO WE ARE





FINANCE



Charles Groom

- Director
- Regulatory finance
- Project finance
- Previously with CDC Group



Keith Palmer

- Chairman
- Previously Vice-Chairman of Rothschild
- Corporate/regulatory finance



Hylton Millar

- Managing consultant
- WACC & RAB valuation
- Financial modelling
- Incentive design



Daniel Hulls

- Director
- PPP/PFI expert
- Regulatory finance
- Previously with Rothschild

POLICY



Mark Cockburn

- Director
- PPP expert
- Subsidy design
- Previously with PWC



Willy Rickett

- Senior Advisor
- Energy policy
- Former Director General of DECC



Iain Morrow

- Managing consultant
- Energy policy & modelling
- Carbon markets
- Previously with DECC



Patrick Taylor

- Senior consultant
- Energy / market design
- Modelling
- Subsidy design

ECONOMICS



Ian Alexander

- Director
- Regime design
- Incentive design
- Previously with World Bank



David Newbery

- Vice-Chairman
- Competition policy
- Energy economics
- Cambridge University



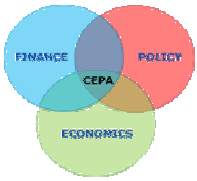
Mattias Bjornfors

- Consultant
- Market design
- Competition policy
- Previously with Ofgem



Jon Stern

- Senior advisor
- Competition policy
- Regulation
- City University



A CROSS-ROADS FOR ELECTRICITY

William Rickett, Senior Adviser, Cambridge Economic Policy Associates and former Director General, Energy in the Department of Energy & Climate Change

Everyone knows that the next government faces tough decisions on public expenditure. Not all are aware that it also faces difficult decisions on the future of the electricity market.

These decisions are important because most scenarios for cutting our carbon emissions envisage electricity progressively replacing gas for heating and oil for transport. They are needed because it is most unlikely that the current policy and market framework will deliver the government's ambitions for a low carbon future. The jury is out on whether it will deliver adequate security of supply.

The Climate Change Committee has called for change. The regulator, Ofgem, has gone further and suggested a range of options. The Conservative Party set out its policy in March. And the Government made proposals in an "Energy Market Assessment" published at the time of the last Budget.

For some time the Government has intervened in the electricity market to deliver its environmental objectives. The biggest interventions are the EU emissions trading scheme (EU ETS), the renewable electricity obligation and the "carbon emissions reduction target" (CERT), which was previously known as the "energy efficiency commitment".

The ETS caps carbon emissions from all EU electricity production. Power companies trade their permits to emit carbon and so establish a carbon price. The renewable electricity obligation requires electricity suppliers to supply a proportion of their electricity from renewable sources. They pass the cost on to their customers so this is in fact a tax on electricity consumers to subsidise renewable electricity. CERT operates in the same way to tax electricity consumers to subsidise energy efficiency improvements in people's homes.

The idea was that the carbon price would drive the market to find the cheapest way of reducing carbon emissions, the renewable obligation would kickstart the deployment of wind farms, and CERT would overcome the inertia of homeowners by subsidising energy efficiency, generally the most economic way of reducing carbon.

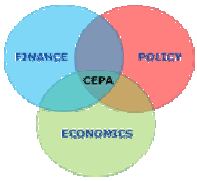
The big change came in 2007 when the Prime Minister signed up to an EU renewable energy target that required a massive increase in subsidy for renewable energy, perhaps two or three times the some £2 billion a year by 2020 envisaged in the 2006 Energy Review and the White Paper that followed it in 2007.

The target applies not just to electricity but to all forms of energy, including energy for transport and heating. But a lot of the challenge of meeting it will fall to electricity, mostly in the form of wind farms. By 2020, some ten times the capacity of current wind farms will need to be deployed onshore and offshore.

If we are to hit our target of reducing carbon emissions by 80% by 2050, then renewable energy is an essential part of our energy mix, alongside nuclear power and the technology for capturing and storing the carbon from coal, gas and oil fired power stations. But subsidising renewable electricity on the scale envisaged has unintended consequences.

First it is not the cheapest way of reducing carbon emissions. The Government itself has estimated that it is three times more expensive than relying on the market to find the cheapest way of meeting the cap set by the EU emissions trading scheme.

Second it reduces the incentives to build nuclear power stations and to develop carbon capture and storage. This is because subsidising people to produce zero carbon renewable electricity reduces demand for carbon



allowances within the ETS and so reduces the carbon price, an important part of the reward for other low carbon technologies like nuclear and carbon capture.

Third it makes investing in power stations more risky. Once built, the cost of producing electricity from a wind farm is close to nothing. So if the building of wind farms is subsidised, and if they are the marginal plant, then the wholesale price of electricity will be zero when they run. The other power stations on the system will have to rely on charging a high price when the wind is not blowing to cover their costs. This raises the risk of investing in power stations which, in turn, may mean the margin of spare capacity is too low, risking security of supply.

This risk might be manageable on its own but investors face other uncertainties. For a start, it is uncertain how much of the EU renewable energy target can be delivered on time. In the electricity sector alone, it requires very large numbers of wind farms to secure planning permission, heavy investment in a larger and “smarter” transmission and distribution system, and the deployment of more concrete and steel offshore in ten years than the oil & gas industry managed in twenty. Then there is the more general uncertainty created by the failure of the climate change conference at Copenhagen to put in place clear rules to guide investment worldwide.

So the risk is that the policy does not deliver the renewable energy target, raises the cost of capital and undermines other investment in the electricity sector, both low carbon and conventional. The risk is also that it will raise the price of electricity, and reduce both household disposable income and our international competitiveness, more than is strictly necessary to hit our carbon targets.

In response, the Government last year announced a new subsidy for the demonstration and deployment of carbon capture and storage (CCS) on coal fired power stations and effectively banned any coal plant without CCS. In the face of subsidies for renewable electricity and CCS, promoters of nuclear power began to talk more loudly about the need for adequate incentives. It was clear that policy needed reviewing.

After the first stage of this review, the Government has proposed four options, all of them designed to reduce uncertainty.

The first is to underpin the price of carbon, possibly by a carbon tax. The Government said it would consult on the options with a view to decisions in the Pre Budget Report in the autumn of this year.

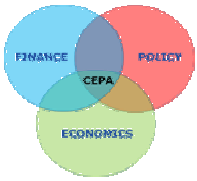
The second is to provide additional incentives for low carbon electricity generation on top of the wholesale electricity price, perhaps through feed in tariffs. This would provide more subsidy but may not sufficiently reduce risk and the cost of capital.

The third option is to create a separate “low carbon market” in which low carbon electricity gets a long term fixed price, so as to reduce risk and the cost of capital, leaving other plant – largely gas fired – to trade in the competitive market. The price for low carbon generation could be fixed as a tariff decided by government, or by competitive tenders, or by a regulated return on assets. Such a market would also need a guaranteed buyer for the electricity generated, possibly an electricity pool into which all generators would be required to sell.

The fourth option is to put regulatory limits on how much carbon generators can emit. The Government did not appear to favour this option, partly because it could raise rather than reduce the risks of investment. An emissions performance standard for individual power stations was ruled out. In any case, the EU ETS already caps emissions from European electricity production.

The Government ruled out a fifth option, which was to create a state electricity purchasing agency. This agency would purchase all electricity in the market and decide the number and type of power stations to be built. In some ways, this would have been the logical option, given that it is the government’s environmental policy that is determining the choice of power station. But such a radical change would be disruptive and the government concluded that the costs would outweigh the benefits.

The Government also announced the creation of a Green Investment Bank, through which the state would provide finance for low carbon investments, initially focused on offshore wind farms. However this was not to be up and running before autumn 2011 and then only on a small scale.



So, reading between the lines, it looks like the favoured options were a carbon tax, a separate regulated market for low carbon electricity, and state financing. The government also acknowledged that it might need to introduce measures to address the risk of too little investment, such as higher penalties for not having enough capacity or subsidies for making capacity available, such as capacity auctions.

The Conservative Party's plans were understandably a little less worked up. Quite a lot of them were about accelerating reforms already announced by the government, such as facilitating nuclear power, demonstrating CCS, promoting the development of a "smart" transmission and distribution system, or increasing the subsidies for home energy efficiency. The new ideas were to reduce the number of quangos involved in the delivery of energy policy, to create a Green Investment Bank, to underpin the price of carbon by reforming the Climate Change Levy, and to establish a "capacity guarantee" in the electricity market, as well as a "security guarantee for gas supply".

The details of these last two "guarantees" were not spelt out. In particular, the electricity "guarantee" appears to require the regulator to decide whether the margin of spare capacity is adequate and, if not, to secure new capacity, whether by obligations on suppliers or directly through auctions. Unless there were some very strict and predictable rules governing such interventions by the regulator, it is hard to see how this would avoid creating uncertainty in the market. If an energy company were exposed to the risk that the regulator might intervene to purchase new capacity, how would it be able to judge the profitability of new investment? The gas security guarantee also needs to be spelt out in more detail before it is possible to judge whether it will work, or even whether it is needed.

Given the importance and urgency of these issues, energy market reform is going to have to be an early priority for the new Government, however preoccupied it may be with difficult decisions on public spending.

There are a number of principles that should guide any reforms. And these seem to have been largely followed by both the Labour and Conservative Parties.

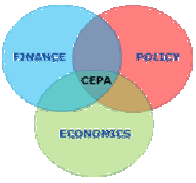
First, the new Government needs to be clear about its objectives. Is the goal to reduce carbon emissions worldwide at least cost? Or can a policy of deploying particular types of low carbon technology in the UK be justified as reducing the costs of currently uncommercial technologies?

Second, the Government needs to reduce the uncertainty in the market which is making it expensive, and in some cases impossible, to raise finance. The government's proposed solution is to create a separate market for low carbon generation offering long term fixed price contracts. The downside is that long term contracts will not be subject to competitive pressures and so may turn out to be too generous. An alternative would be a regulated contract, providing a regulated return on assets. In the short term, there is also a strong case for the proposal to provide public debt or equity finance to invest in infrastructure. Whatever the solutions, the principle should be to deliver low carbon generation at least subsidy.

Third, the Government needs to extend the carbon price to those sectors of the economy not covered by the EU ETS. The fiscal position requires increases in taxation. And it is better to tax undesirable things like carbon. A tax on the carbon content of primary fuels would be simple to administer, even with rebates to take account of the price within the ETS. It would have the added benefit of underpinning the incentives for low carbon investment and is probably necessary to enable nuclear development to be financed.

Finally, the Government needs to tackle the non financial barriers to low carbon deployment. Requiring developers of onshore wind farms to provide community benefits, as suggested by the Conservatives, might ease planning problems. Central despatch of all generation and nodal pricing for transmission and distribution would provide a more liquid market and better incentives for investment in the networks.

Whatever solutions are adopted, the devil will be in the detail. If unintended consequences are to be avoided, the next Government will need expert help. The decisions taken in the next year or so will be as important as the privatization of the industry twenty years ago.



SEMINAR PRESENTATIONS

A CROSS-ROADS FOR ELECTRICITY



Willy Rickett
Senior Adviser
8th September 2010

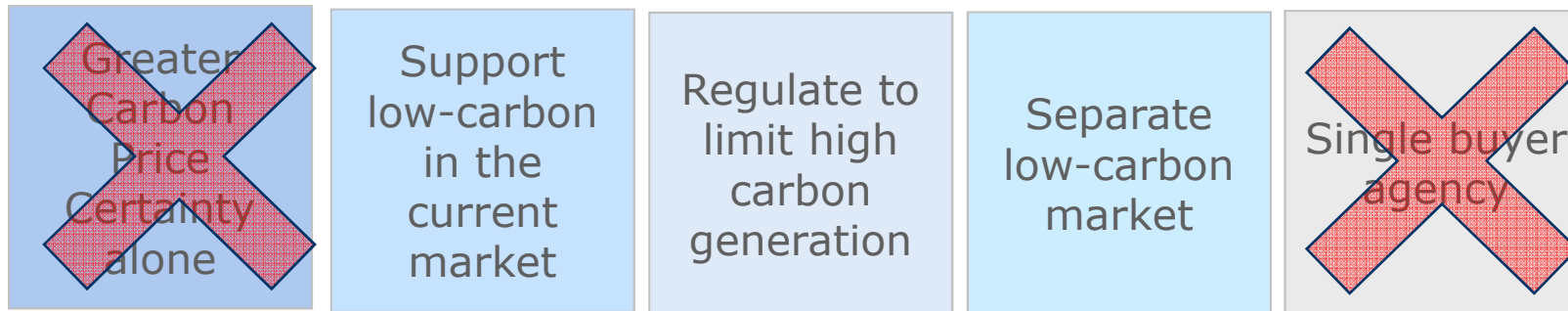
ISSUE: A MARKET SUFFERING FROM UNCERTAINTY

- Worries about the coherence, cost and practicality of current policy and about
- Its impact on the future operation of the electricity market

create

- Uncertainty on future policy
- Which increases the cost of capital and reduces investment

THE ENERGY MARKET ASSESSMENT



NOT ENOUGH

**LIMITED
BENEFITS,
HIGH COSTS**

- Carbon price underpin, separate regulated market, state financing

THE COALITION AGREEMENT

Targets

- Press for a 30% EU carbon target
- Ask the CCC to advise on a higher renewable energy target

Interventions

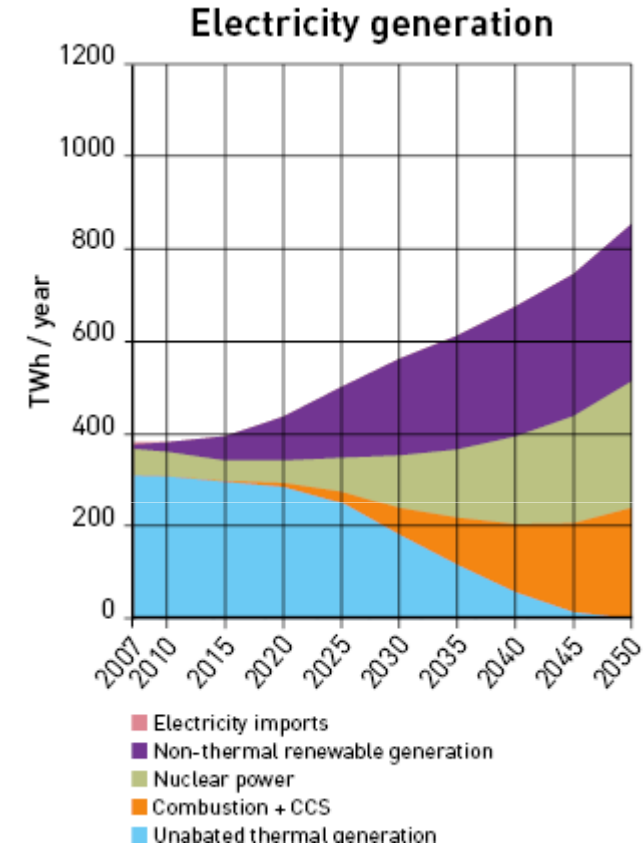
- Underpin the price of carbon
- Create a full FIT regime alongside the RO
- Establish an emissions performance standard
- Reform the electricity market
- Establish a Green Investment Bank

Technology Specific

- Introduce a “green deal”
- Allow industry to replace existing nuclear but with no subsidy
- Promote energy from waste, marine energy, an offshore grid

UNCERTAINTIES

- Our GHG target
- Our renewable energy target
- The path of carbon prices
- Practicality and cost of our renewable energy target
- The impact of policy on energy prices
- The impact of levies on public spending
- The details and impact of an EPS, a “full FIT regime” not to mention the CCC’s call for CCS on gas or the RHI
- And what electricity market reform might mean.....



One possible future... But not the only one

Source: DECC

SOME BASIC QUESTIONS

- Given the uncertainties, do we need a carbon tax or carbon price underpin?
- If we have to meet technology specific targets, do we need a separate low carbon market or can we just rely on any carbon price underpin, the RO, FITs and CCS levies?
- If we need a separate low carbon market, is it best run by tender or by regulated contract?
- If we have a separate low carbon market, can we safely leave the “competitive market” to provide peaking capacity or does this also need subsidy?
- If everything needs subsidy, should we really rule out a central buying agency?

TO GET US STARTED

- An effective carbon price
- A market that enables sufficient finance to be raised at acceptable cost
- Measures that enable low carbon generation to get planning permission

A CROSS-ROADS FOR ELECTRICITY

Economics: An effective carbon price



David Newbery
Vice Chairman
8th September 2010

OUTLINE

The long-term challenge of climate change

- Challenge to reduce CO₂ emissions by 80% by 2050
- Need to price CO₂ to support low-C investment

Problems with the EU ETS

- Increased renewables and energy efficiency do NOT reduce CO₂
- But DO lower EUA price

Solutions

- Need a credible rising EUA floor price
- **Plan B: UK goes it alone: floors, taxes or obligations**

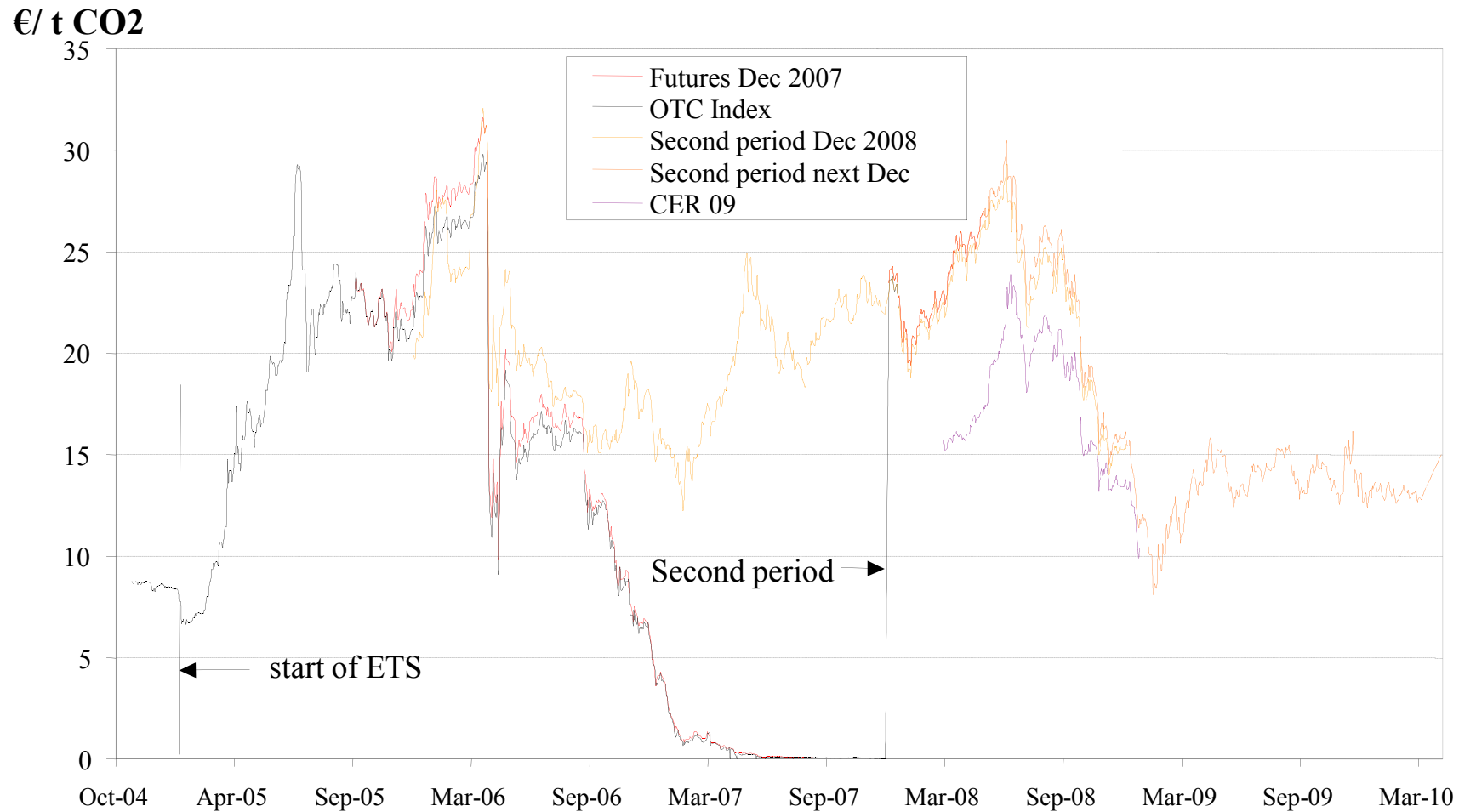
COMMITTEE ON CLIMATE CHANGE 2008

- **De-carbonising electricity is key**
- **What is economically justified?**
 - Renewables *could* make a significant contribution
 - **Wind**: proven, costs have fallen
 - Severn Barrage: doubtful economics, no learning benefits
 - CCS: needed globally, demos needed urgently
 - **Nuclear**: *cost competitive*; economic case strong
 - “once a significant C price is in place”, or high enough fuel prices
- **Investments: commissioned 2015-2020, last 25-50+ years**

Need credible predictable and adequate future CO₂ price

EU ETS CANNOT GUARANTEE FUTURE CO₂ PRICE

EUA price October 2004-April 2010



PERMITS VS TAXES

- **Weitzman: Taxes superior to permits if Marginal Benefit of abatement **flatter** than Marginal Cost and there is uncertainty**
- **CO₂ is a *global persistent stock pollutant***
 - CO₂ damage today effectively same as tomorrow
=> marginal benefit of abatement essentially flat
 - marginal cost of abatement rises rapidly
 - hazard of global warming very uncertain, as are the future abatement costs

Carbon tax superior to tradable permits

but permits easier to introduce

FAILURES OF THE ETS

- **Current ETS sets quota of total EU emissions**
- **Renewables Directive increases Renewable Energy Supply (RES)**

=> increased RES does not reduce CO₂

=> reduces price of EUA

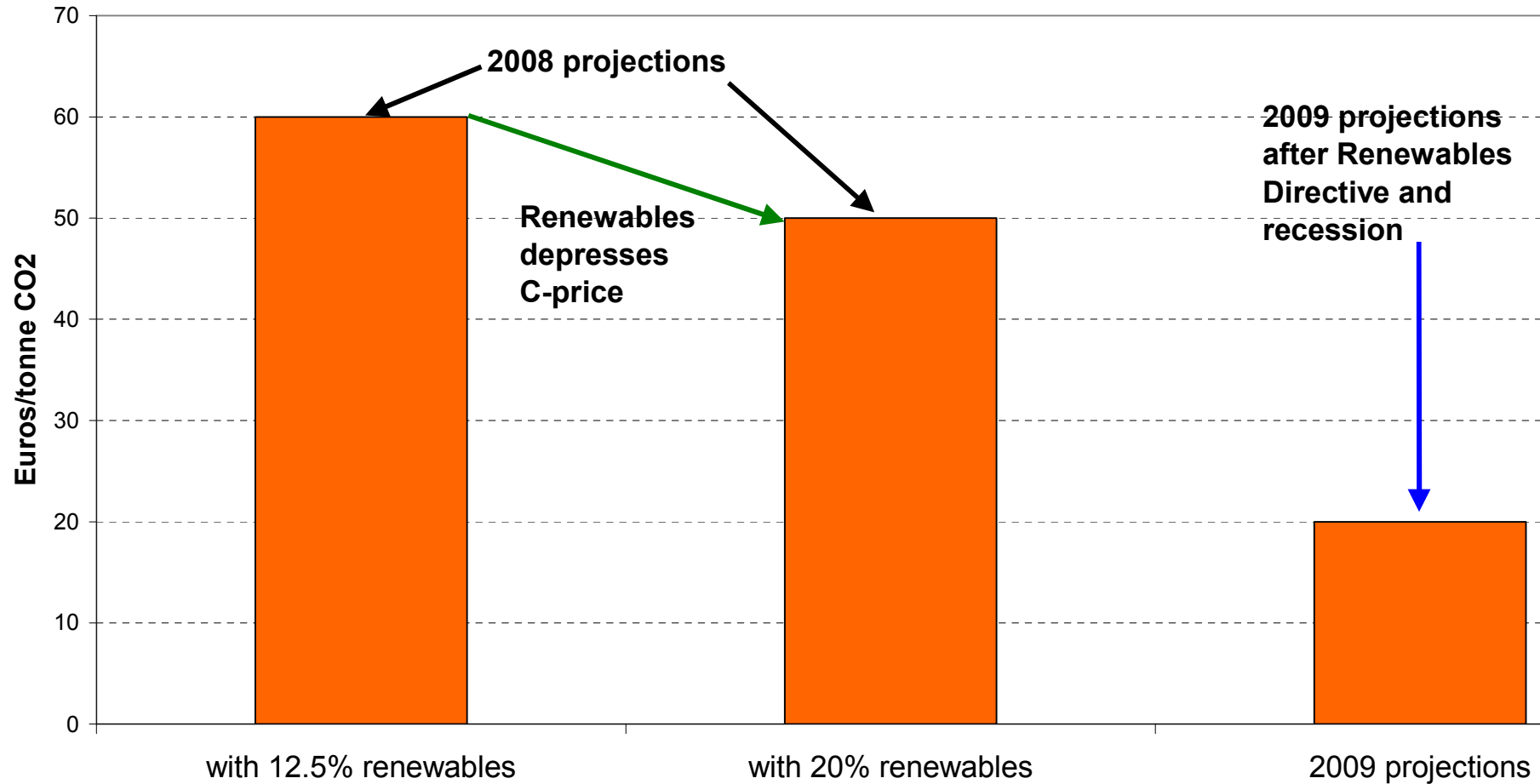
=> prejudices other low-C generation like nuclear, CCS

- **Risks undermining support for RES**

Solved by fixing EUA price instead of quota

20-20 DIRECTIVE DEPRESSES EU CO₂ PRICE

2020 projected CO₂ price



REFORMING ETS

Reform EU ETS to provide rising price floor

- sufficient for nuclear *or on-shore wind if cheaper*

Commitment to raise CO₂ 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

- offer CfD at €45/EUA for 20yr from commissioning?

makes extra carbon savings additional

UK'S PLAN B IF NO ETS REFORM

Underwrite UK CO₂ price

- for power sector? **Cash negative**

Change CCL into Carbon Correction Levy

- a tax on carbon content of fuel **Cash positive**
- rebated by EUA price for covered sector
- starts at current CCL rate say £12/t CO₂ 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

CONCLUSIONS

CO₂ price is too low

- new coalition supports floor price
 - auctioning will not help, raising reduction to 30% will

RES Directive undermines ETS and does not reduce CO₂ emissions

- risks bringing ETS into disrepute

Credible future CO₂ price trajectory needed for low-C investment

- if we want investment in a liberalized market
- rather than tender auctions and back to central planning

A CROSS-ROADS FOR ELECTRICITY

Financing the renewable energy targets:
Key issues and possible solutions



Keith Palmer
Chairman
8th September 2010

THE CONUNDRUM

Electricity market
Carbon price (ETS)

} = to deliver least cost generation mix for given carbon budget

+

Renewable Directive = absolute volume obligation regardless of cost

➔ Interaction causes major problems/perversities

Key financing challenges

1. High uncertainty = high cost of capital = high customer bills
 - Offshore wind 9% post-tax real WACC

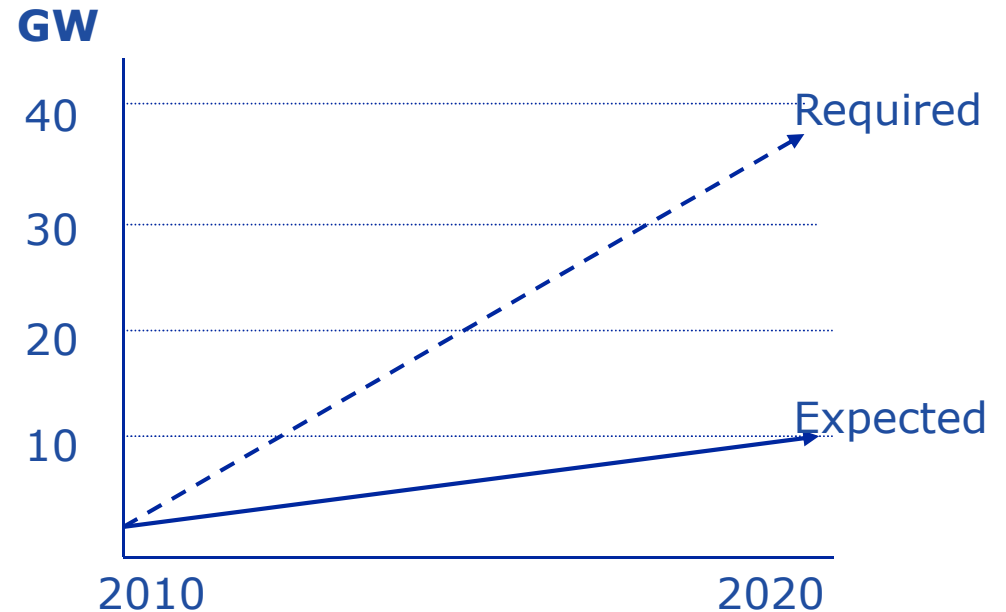
2. Corporate sponsor balance sheet constraints = insufficient capital available even if ROI high enough
 - Aggregate investment run rate in UK c £4-6 billion pa

 - Compares to required investment by 2020 £100-120 billion (£10-12 billion pa)

 - Aggregate EV of corporate generation investors c £50 billion

Status quo

- Projected renewables to 2020
= 10 GW (c. 32 TWh)
- Required renewables to 2020
= 38 GW (c. 120 TWh)
- Gap = 88 TWh
- Annual renewable inv cost
c. £3 billion
- Estimated cost of offshore wind: £135/MWh



	10 GW	Target
Cost to consumers (9.5% real WACC)	4.3	16.2
'Excess' cost over CCGT	3	11.4
<i>(figures are average £ billion per year)</i>		

RAB FINANCING OF RO OBLIGATION

- If market funds RO investment at 4.5% real WACC (RAB mechanism)
- Cost of offshore wind £90/MWh (cf £135/MWh)

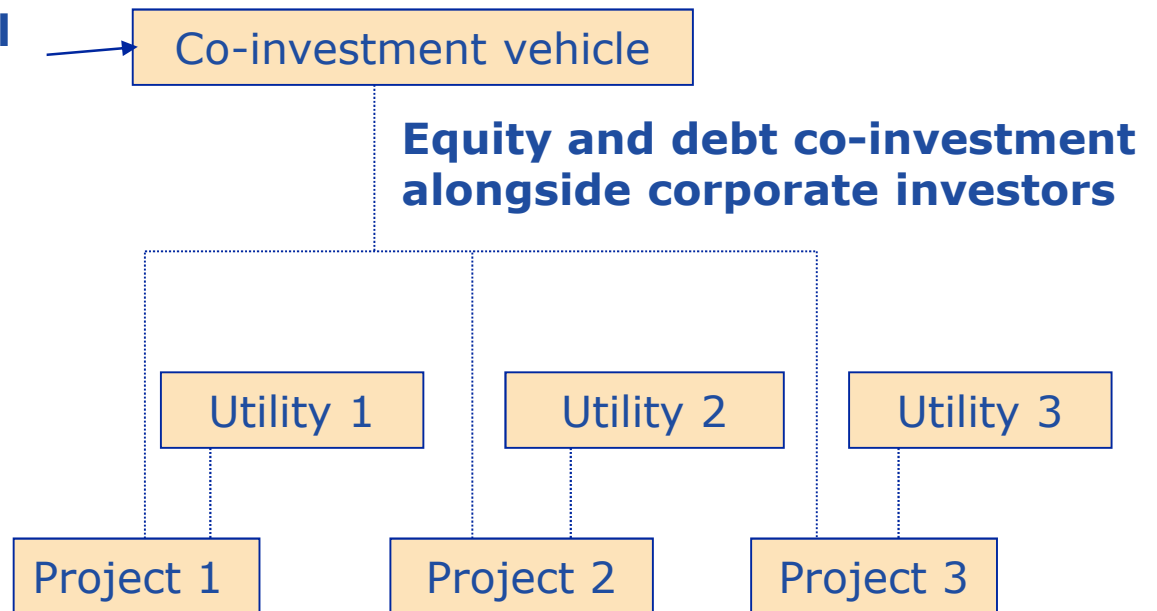
	10 GW	Target
Cost to consumers (4.5% cost of capital)	2.9	10.8
'Excess' cost over CCGT	1.8	6.7
Saving compared to status quo	1.4	5.4

(all figures are average £ billion per year)

- Consumer cost highly geared to cost of capital
- Could whole of RO capacity be funded via RAB mechanism?

CONSUMER CO-INVESTMENT VEHICLE (GREEN INFRASTRUCTURE BANK)

- Equity and debt from capital markets
- Contingent tariff surcharge (RAB mechanism)



- Addresses balance sheet financing constraints
- Large increase in RO funding at low cost of capital

CONSUMER CO-INVESTMENT VEHICLE

- Assumed cost of capital is blend of 50% corporate/50% co-investment (=7% post-tax real)
- Cost of offshore wind £110/MWh

	10 GW	Target
Cost to consumers (7% real)	3.5	13.2
'Excess' cost over CCGT	2.4	8.9
Saving compared to status quo <i>(all figures are average £ billion per year)</i>	0.8	3.0

- Co-investment permits doubling of investment rate
- Substantial reduction in cost of funds for RO capacity

POSSIBLE REVISED POLICY PACKAGE

- Scrap ROCs mechanism – replace with FITs
- Either carbon tax or certain, rising carbon forward price – establish by auctioning two way CFDs?
- Reformed electricity market to facilitate entry + capacity pricing mechanism
- Create a co-investment vehicle with contingent tariff / RAB mechanism

- **Retains market disciplines to some extent**
- **Removes greatest perverse incentives/distortions**
- **Enables financing of RO capacity at lower cost to consumers**

CONTACT INFORMATION

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