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Some inconvenient economics of Energy and Climate Policy

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E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Plan

- Three problems for energy and climate policy:
  - The Financial Crisis
  - The failure of Climate Negotiations
  - The confusion of Industrial and Climate Policies
- UK Energy Policy Bill Impacts
- UK Electricity Market Reform Implications
- Conclusions

Problem 1:
The Financial Crisis

The Stern Review calculation

•The Stern (2007) calculation can be crudely summarised as reducing the economics of climate change policy to
-Cost of: 1% of world GDP forever starting now;
-Benefit of: 5% of world GDP forever starting in 100 years.

•This should be discounted at the Social Discount Rate (SDR), which should be the value of undistributed public funds (the 'consumption rate of interest').

•Formally: SDR = $p + eg$

•p = rate of pure time preference (catastrophe risk)

•e = inequality parameter (inequality aversion)

•g =growth rate of consumption per head (change in income of future generations)

•Stern Review set SDR = 0.1 + 1 x 1.3 =1.4%

The Stern Review calculation

NPV Calculation:
Cost of: 1 forever starting now;
Benefit of: 5 forever starting in 100 years.

Discount rate		Benefit		Cost
1.40%		90.1		72.4
1.50%		76.3		67.7
2.00%		35.2		51
6.00%		0.3		17.7

Note how sensitive this calculation is to the move from 1.4% to 2%.

The impact of the Financial Crisis

- Delay in emissions due to lower world growth (benefits reduced).

- SDR rises due to:
  - Rise in catastrophe risk (due to financial meltdown)
  - Rise in inequality aversion
  - Credit constraints in public sector

- Higher social discount rates and reduced long run benefits imply optimal to delay climate/energy investments.

Problem 2:
The Failure of Climate Negotiations

Failure of Climate Negotiations

EU \ ROW	High Emissions Reduction Target	Low Emissions Reduction Target
High Emissions Reduction Target	(10,10)	(2,12)
Low Emissions Reduction Target	(12,2)	(5,5)

ROW= Rest of World

(x,y), x=EU payoff, y=ROW payoff. Classic Prisoners' Dilemma: EU pre-commits to High implies ROW chooses Low.

Failure of Climate Negotiations

- EU mistakenly thought it could lead by example and that reciprocity, at the heart of the EU's own negotiations, would work at world level.
- Clear variation between expected payoffs from Low Emissions reductions targets:
  - So some thought co-ordinated action not beneficial (e.g. Russia and Saudi Arabia).
- Also problems of hold-up, by denying agreement can hold out for compensation from EU payable out of EU's gain (e.g. India).

Impact of Copenhagen

- Game theory suggests the importance of a sustainable and credible strategy.
- At EU level, EU emissions reduction negotiation strategy looks in need of a rethink.
- At the national level, not clear what the game theoretic rationale for tough targets without conditionality is.
- The introduction of the UK carbon price support has revealed starkly the problems of ‘going it alone’ with tougher targets in traded sectors.

Why a national 80% CO2e reduction target?

1. UK makes a difference to climate outcomes.
2. UK demonstrates mechanisms and technologies for carbon reduction for others.
3. Morally the right thing for UK to do.

- UK defence budget = 2.7% GDP (2009)
  - Av. 1.9% (2.6%), ex.US (inc.US).
- UK overseas aid budget = 0.5% GDP (2009)
  - Av. DAC = 0.3%.
- UK climate policies: 0.3%? GDP

Problem 3:

The confusion of industrial and climate policies

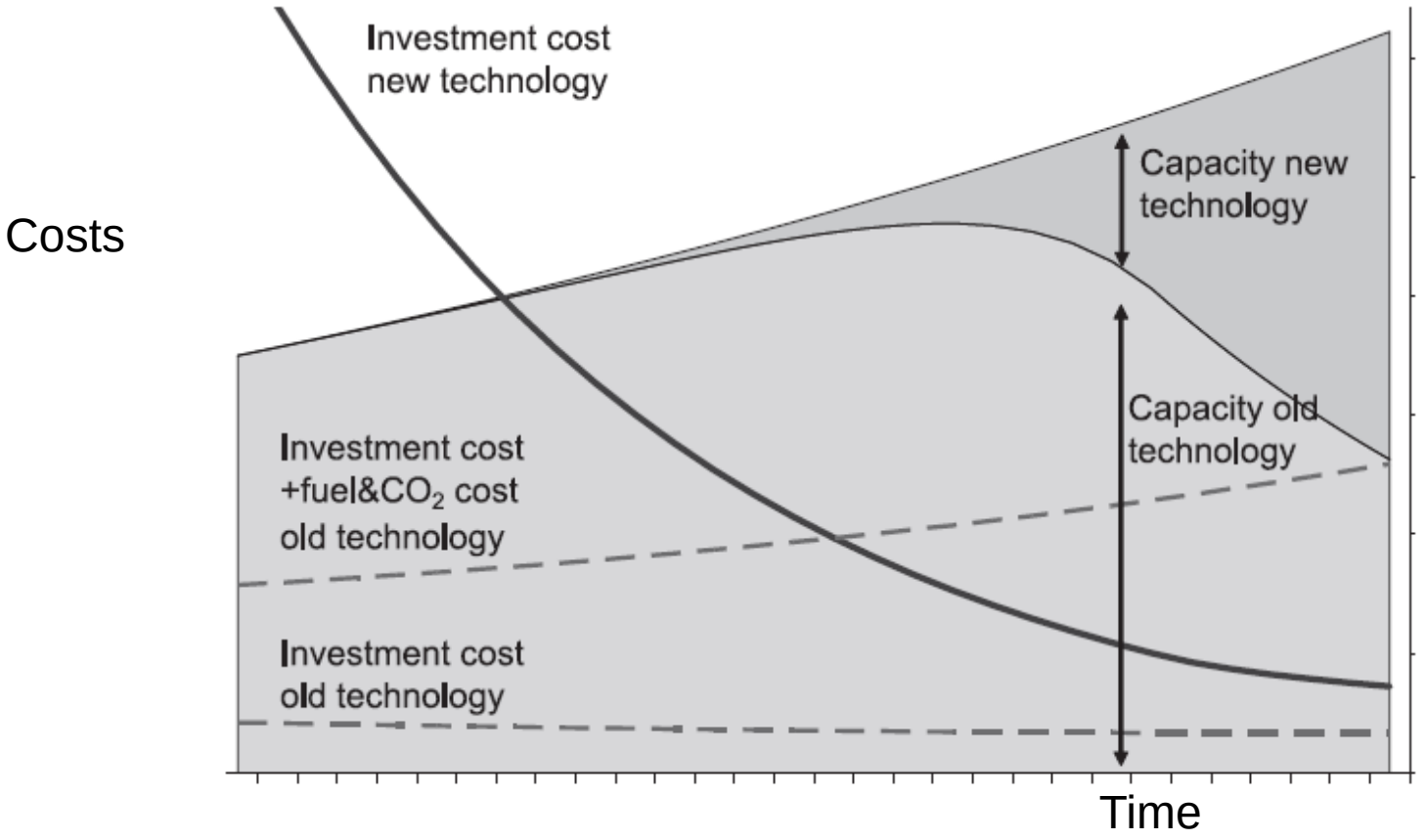
Industrial policy and climate policy

- Large shares of climate policy costs relate to early stage technology support (perhaps 50% in the UK, out of costs of c.£4.5bn in 2008-09)*.
- Why?
  - Learning benefits of strategic roll-out of early stage technologies.
  - Green jobs and green manufacturing stimulated by subsidies to energy sector.
  - Desire for energy independence and reduction of fossil fuel price spikes and fuel supply interruption.

*http://www.publications.parliament.uk/pa/ld200708/ldselect/ldeconaf/195/19509.htm

Learning Benefits

Figure 2. Evolution of Generation Share and Levelised Costs of Coal and Photovoltaic



Source: Neuhoff, 2008, *Energy Journal*, p.173.

Problems with Learning subsidies

- In theory can have optimal subsidies, which switch off if costs don't fall fast enough on track to cost parity with CCGT with carbon price (Lange, 2010).
- However:
  - Need to pick right technologies and control subsidy costs on individual technologies.
  - Demonstration may be cheaper than learning.
  - Learning is international (e.g. wind, solar) and cross-sectoral (e.g. software), not clear what extra learning is induced by a national strategic roll-out.
  - Much history is woeful, e.g. negative learning in French nuclear (Grubler, 2010).

Green jobs and green manufacturing

- Problem is that green industries not job intensive.
- Significant general equilibrium effect of rise in electricity prices across industry (e.g. Hughes, 2011).
- Subsidy per wind job currently £54,000 (Constable, 2011).
- Only c.90,000 in *German* Wind (of which, only 35,000 in manufacturing and supply of turbines) (see Wind industry in Germany, Economic Report, 2009).
- Far more jobs in energy intensive industries in the UK (c.225,000).
- Higher energy prices due to national policies will shift jobs to rest of world and reduce national income.

Energy Independence

- Problem is that trade in energy enormously beneficial (fuels 15% of world trade in 2009).
- Nature of significant energy supply risks, mostly national rather than international (e.g. wrong fuse, tanker driver strikes), at least for large countries like the UK.
- Internationalised nature of economies means that mutual insurance beneficial even in the event of external supply shock (e.g. beneficial to help Japan by reducing consumption and paying higher prices).

UK Household Energy Bill Impacts of current Energy and Climate Policies

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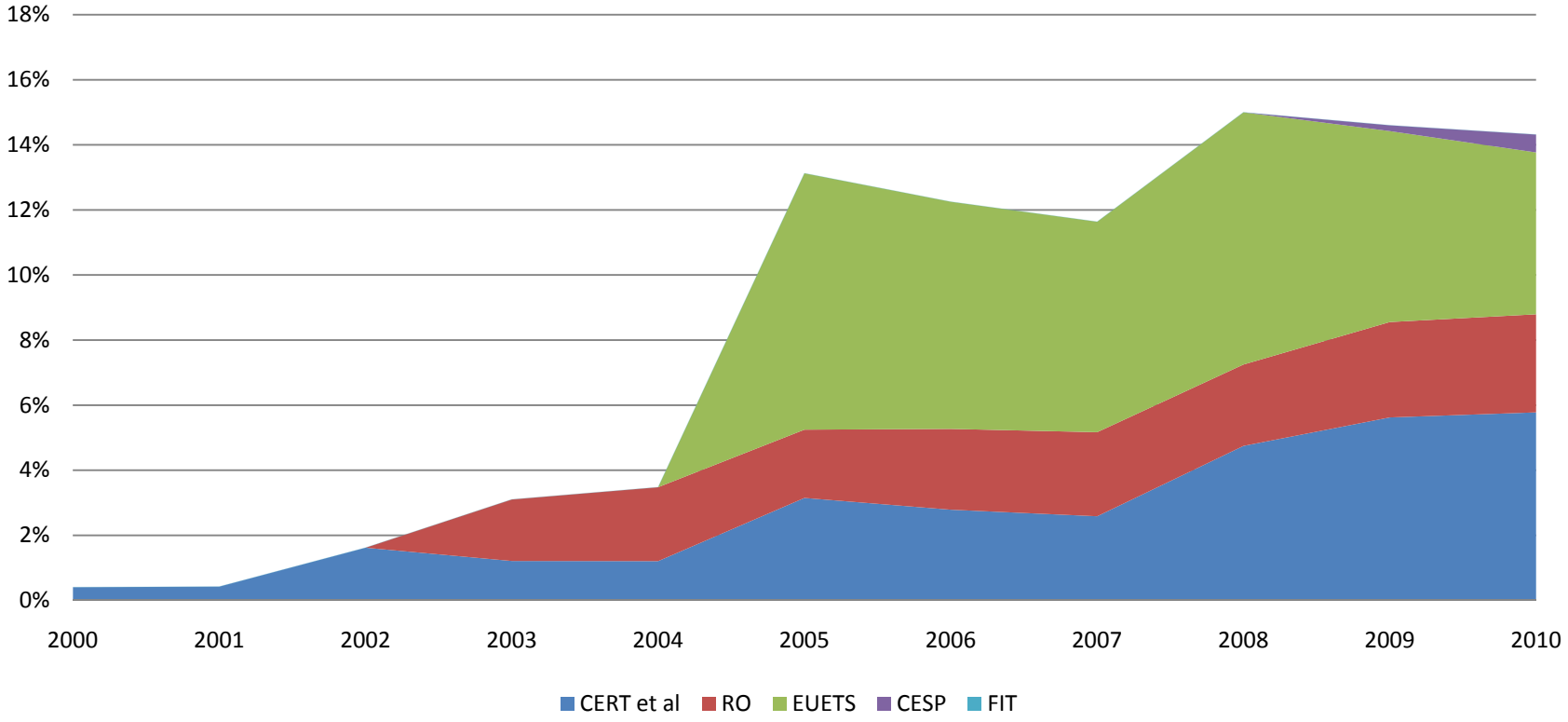
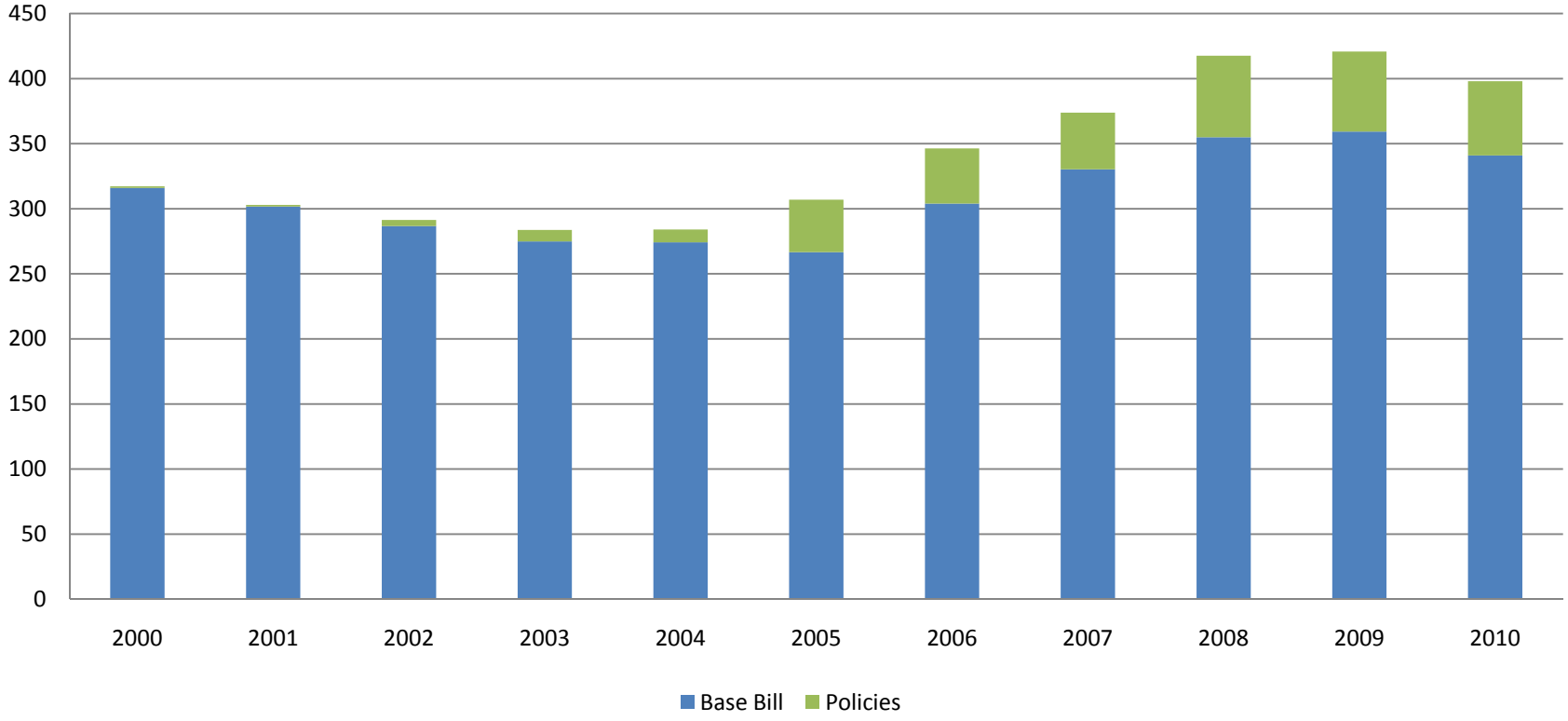
Share of Environmental Policies in UK Domestic Electricity Bills, 2000-2010



Sources: DECC, Ofgem and SDC.

CERT=Carbon Emissions Reduction Target; RO=Renewables Obligation; CESP=Community Energy Saving Programme. EUETS mid-estimate 2005-07. Excludes IFI/LCNF and related VAT. 3,300 kWh annual Direct Debit customer.

UK Domestic Electricity Bills (£ 2010) and Environmental Policies, 2000-2010 (3300 kWh customer)



2000-10: real bills go up 29%, but without policies only 11%.
2004-10: real bills go up 41%, but without policies only 26%.
2004-10: Nominal rise 65%, around 3/10 is due to policy measures.
Note the effect of inflation on diluting the role of policy.
GDP deflator used.

Distributional Impact of Policies

- For all households, not using electric heating:
  - Bottom 10%: Policies = 15% of electricity costs.
  - Top 10%: Policies = 12% of electricity costs.
- E&G Policies are c.£78 for Bottom 10%.
- E&G Policies are c.£108 for Top 10%.
- This equals:
  - c.1% of household income for bottom 10%.
  - c.0.1% for top 10%.
- Implies industrial policy costs should go through taxes not bills.

Bill impacts of UK Electricity Market Reform

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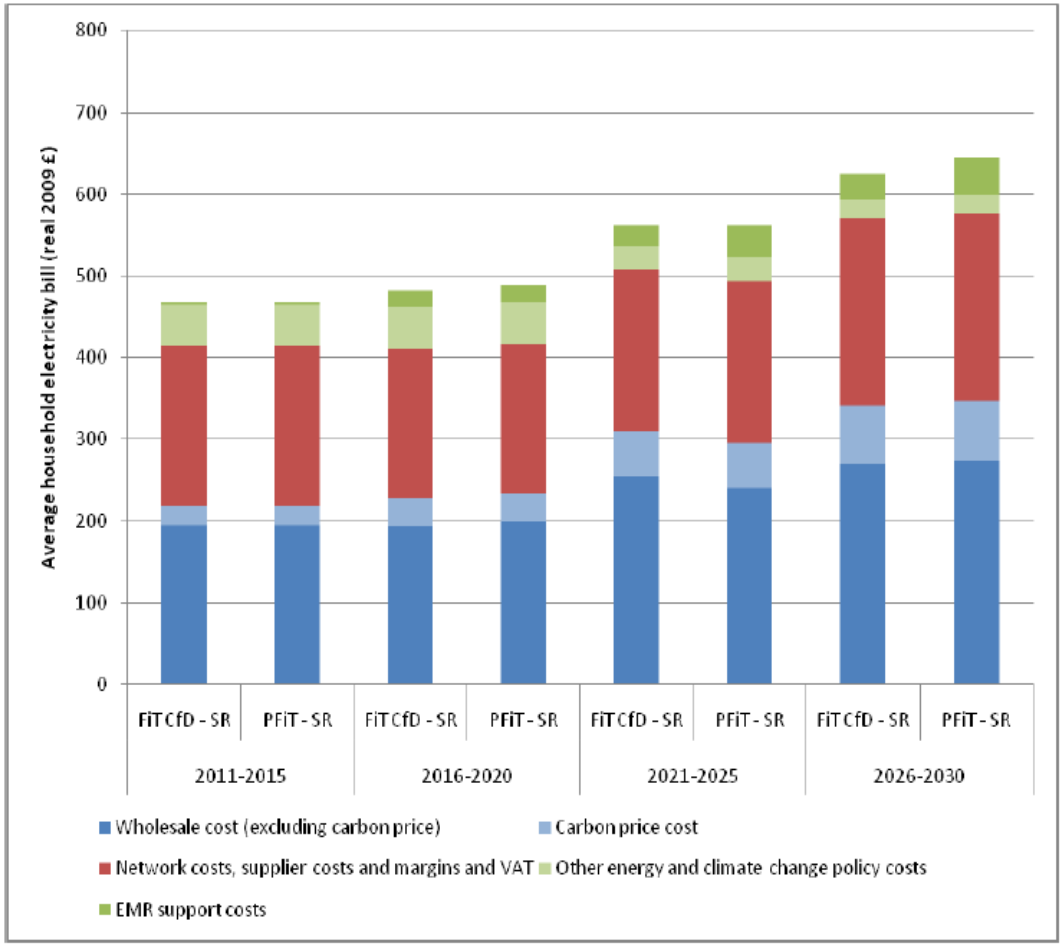
Bills expected to rise under EMR

Figure 18 Average domestic electricity bills under EMR packages with strategic reserve – central fossi fuel prices



Source: DECC 2011

Average bills rise c.£160 pounds from £485 to £642 between 2010 and 2030.

Assumes consumption falls by 10%.

EMR documents argue bills would have risen by more under ‘baseline’.

What Consumers Will Get...

- Lead Package (CFD+CPS30 +EPS+TCM)
  a. Welfare Impact — *-ve (relative to BAU)*
  b. Distributional Analysis — *-ve*
  c. Indirect Impact — *Not analysed*
  d. Renewables — *35% by 2030*
  e. Decarbonisation — *No at EU level*
  f. Energy Security — *-ve NPV*
  g. Cost of Capital and Risk — *Goes down?*
  h. Risk transfer *to* consumers — *Yes*

Bills without new policies

- Analysing the EMR ‘baseline’ assumptions:
  - Underlying fuel bill only rises by c.£16.30 per household at unchanged consumption.
  - Even if price rises by projected gas price rise (27%) and demand falls by 10%, bills rise only by £26.90 per household.
  - The RO to 2015 would add a further £8 per household.
- Thus an EMR consistent BAU raises bills by at most £34.90, or 7%.

Conclusions

Concluding thoughts

- *Policy consistency is important, but credibility is a necessary condition for investor confidence in consistency of policy.*
- *Energy and climate policies have opportunity costs and should not be (or cannot credibly be) invariant if these rise.*

- *Financial crisis does reduce net benefits of early action on climate and on renewables.*

- *Failure (so far) of climate negotiations highlights the importance of conditionality in policy targets.*

- *Industrial policies towards renewables, funded via energy bills, are highly suspect from both an efficiency and equity point of view.*

References

- Constable, J. (2011*), The Green Mirage: Why a Low-carbon Economy May be Further Off Than We Think,* London: Civitas.
- DECC (2010) *Electricity Market Reform: Impact Assessment.* London: Department of Energy and Climate Change.
- DECC (2010a) *Electricity Market Reform: Consultation Document*. London: Department of Energy and Climate Change.
- DECC (2010b) *Estimated impacts of energy and climate change policies on energy prices and bills*. London, Department of Energy and Climate Change.
- DECC (2011) *Electricity Market Reform: Impact Assessment*. London: Department of Energy and Climate Change.
- Hughes, G. (2011), *The Myth of Green Jobs*, GWPF No.3, London: Global Warming Policy Foundation.
- Grubb, M., Jamasb, T. and Pollitt, M. (eds.), *Delivery a low-carbon electricity system,* Cambridge: Cambridge University Press.
- Grubler, A. 'The costs of the French nuclear scale up: a case of negative learning by doing', *Energy Policy*, Vol.38 (9): 5174-5188.
- Lange, R.J. (2010), Optimal support for renewable deployment: A case study in German photovoltaic, Presentation at EPRG Spring Seminar, May 14th, http://www.eprg.group.cam.ac.uk/wp-content/uploads/2010/05/Lange.pdf
- Neuhoff, K. (2008), 'Learning by Doing with Constrained Growth Rates:An Application to Energy Technology Policy," The Energy Journal, Vol. 29(Special I), 165-182.
- Platchkov, L., Pollitt, M. and I. Shaorshadze (2011), *The implications of recent UK energy policy for the consumer: a report for the Consumers' Association*, Available at: http://www.eprg.group.cam.ac.uk/wp-content/uploads/2011/05/ReportforCAFinal100511EPRG.pdf
- Pollitt, M. (2010), *UK Renewable Energy Policy since 1990, EPRG Working Paper No.1002.*
- Pollitt, M. (2011), 'Thumbs up? A little early for that Mr Hulne', *Parliamentary Brief*, http://www.parliamentarybrief.com/2011/01/thumbs-up-a-little-early-for-that-mr-huhne#all
- Stern, N. (2007), *The Economics of Climate Change*, Cambridge: Cambridge University Press.
- White, V., Roberts, S. and Preston, I. (2010), *Understanding 'High Use Low Income' Energy Consumers*, Final Report to Ofgem, Bristol: Centre for Sustainable Energy.