
OFF

SNAPSHOT

- With one of the biggest squeezes on household budgets in memory, and worries about business competitiveness, the cost of the UK's energy policy is a major concern.

- The UK has the most ambitious carbon reduction targets in the world and, according to Ofgem, up to £200bn of investment will be required over the next decade – much of which will be needed to meet environmental targets.

- Comparing levelised costs of the various energy sources is fraught with difficulties, but natural gas, nuclear and a number of low-carbon/renewable sources such as hydro and waste-to-energy are far cheaper than offshore wind and solar. It appears that the UK is putting too much money into the more expensive technologies.

- Policies are estimated to increase retail electricity prices by 34% in real terms for businesses by 2020, although the impact on bills is likely to be less due to energy efficiency measures.

- The big problem is that it's very unlikely that the huge investment costs can be met, which in the absence of a global deal on CO_2 may lead to the targets being watered down.

Energy policy for a less affluent age

Dan Lewis, Chief Executive of Future Energy Strategies and Energy Policy Adviser to the IoD, and Corin Taylor, Senior Economic Adviser at the IoD, set out the high costs of the Government's present energy policies and consider whether a cheaper alternative is possible.

INTRODUCTION

Going green is important. But costs matter too, and never more so than at present. According to the Institute for Fiscal Studies, average disposable incomes will be lower in 2016 than they were in 2006, or, using a slightly different measure, than they were in 2002.[1] That represents the biggest household squeeze since records began in the 1950s.

At the same time, the Chancellor warned of the risks of overly expensive environmental policies in his Autumn Statement announcement last November:

"We are not going to save the planet by shutting down our steel mills, aluminium smelters and paper manufacturers. All we will be doing is exporting valuable jobs out of Britain...It is a reminder to us all that we shouldn't price British business out of the world economy...It's no good endlessly comparing ourselves with other European countries. The entire continent is pricing itself out of the world economy." [2]

But how much does the UK's green energy programme cost, and is it possible to go green more cheaply? This article attempts to answer those questions.

GREEN TARGETS AND INVESTMENT

Carbon emissions

The heart of the UK Government's policy on greenhouse gas emissions is the Climate Change Act 2008, which sets out a legally-binding target to reduce carbon emissions by 80% in 2050, relative to the 1990 baseline.[3] The Climate Change Act also sets out a requirement for five-year carbon budgets, to ensure that the UK remains on course to meet the 2050 target set out in the Act.

[1] Robert Joyce, *What does yesterday's news mean for living standards?*, Institute for Fiscal Studies, 30 November 2011. The IFS used two measures – Real Household Disposable Income per capita, and Real median net household income.

[2] Autumn Forecast Statement by the Chancellor of the Exchequer, Rt. Hon. George Osborne MP, 29 November 2011.

[3] *Climate Change Act 2008*, Schedule 1.

For 2020, the Act specified that the carbon budget covering that period must be set at an average annual level 26% below the 1990 baseline.[4] Interestingly, the Act allowed the 2020 target of a 26% cut relative to 1990 to be amended, after taking advice from the Committee on Climate Change.[5]

This is exactly what happened. The interim budget recommended by the Committee required an emissions reduction of 34% in 2020 relative to 1990, and when the carbon budgets were announced with the Budget in 2009, the 2020 target was increased to a 34% cut. The UK's 2020 target was also left open to rise still further to 42%, should the EU's target reduction increase from 20% to 30% following a global deal.[6]

A global agreement on reducing greenhouse gas emissions was not achieved at the UN climate change conference in Copenhagen in 2009, although there was a strong possibility that the EU would move to a 30% target unilaterally. In July 2011, however, MEPs voted against such a move.[7]

The UK's 2020 target of a 34% reduction is, however, still far higher than both the overall EU target – not to mention the US and China, the world's largest economies – and the target set out in the Climate Change Act itself. And in June 2011, the UK Government passed a fourth carbon budget, for the period 2023-27, set at an average annual level of 50% below the 1990 baseline.[8] The UK is unique in having such a large cut set out in law.

In his statement to Parliament announcing the fourth carbon budget, Energy Secretary Chris Huhne explicitly linked the ambitious level of the carbon budget to the prospect of reciprocal action overseas:

"This will help us reach agreement in Europe on moving to a 30% emissions reduction target – and build momentum toward a legally binding global climate change deal." [9]

The vote of the MEPs rejecting a more stringent EU target occurred shortly after the passing of the UK's fourth carbon budget, and a global deal was not reached at the recent UN conference on climate change in Durban, which merely agreed to make an agreement later in this decade. This leaves the UK as a global outlier.

Renewables and energy efficiency

Government climate change policies are not limited to the carbon reduction targets, but also encompass renewable energy generation and energy efficiency measures.

"The UK's legally binding target is to source 15% of the country's energy from renewable sources by 2020, compared with a 1.3% share in 2005."

Overall EU targets for 2020 were set out in the '20-20-20' package at the end of 2008:

- *a 20% cut in greenhouse gas emissions relative to 1990;*
- *a 20% share for renewables in total EU energy consumption;*
- *a 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency (although this target is not legally binding).*[10]

[4] *Climate Change Act 2008*, Schedules 4 and 5.
[5] *Climate Change Act 2008*, Schedules 6 and 7.
[6] Environmental Audit Committee – Third Report, *Carbon budgets*, 5 January 2010.
[7] "EU votes against reducing carbon emissions by 30%", *The Guardian*, 5 July 2011.
[8] Department of Energy and Climate Change website, Carbon Budgets: http://www.decc.gov.uk/en/content/cms/emissions/carbon_budgets/carbon_budgets.aspx.
[9] 'Fourth carbon budget: Oral ministerial statement by Chris Huhne', 17 May 2011. Text available on DECC website at: http://www.decc.gov.uk/en/content/cms/news/cb_oms/cb_oms.aspx.
[10] European Commission, *Europe 2020* strategy, available on the Commission's website at: http://ec.europa.eu/europe2020/index_en.htm.

The EU 20-20-20 targets are then broken down into targets for each member state. The UK's legally binding target is to source 15% of the country's energy from renewable sources by 2020, compared with a 1.3% share in 2005,[11] which is the largest percentage point increase in the EU.[12] This implies around a 30% share of renewables in electricity generation by that date.[13] Since 2005, renewable generation has increased quite substantially, but the share of renewables in electricity generation was still only 7.3% in 2010.[14]

Level of investment required

Meeting these targets will require high levels of investment in the UK's energy generation, transmission and distribution systems over the next decade, together with investments to improve the energy efficiency of the housing stock. There have been several estimates of the cost of this investment, as shown in the table below.

TABLE 1

Levels of investment required to meet government climate change and renewables objectives

Organisation	Investment required by 2020	Notes	Reference
Citigroup	€320bn	Estimated capex spend 2010-20, comprising €91bn replacement and renewal and €229bn to meet environmental targets.	Peter Atherton, *The €trn Euro Decade – Revisited: Costs up, risks up, but governments are still in denial*, Citigroup Investment Research, September 2010, Figure 4.
Ofgem (Office of the Gas and Electricity Markets)	£95bn-£200bn	Needed to replace ageing energy infrastructure and make progress on decarbonisation; precise figure depends on scenarios for economic growth and pace of decarbonisation.	Ofgem, *Project Discovery: Options for delivering secure and sustainable energy supplies*, February 2010.
DECC (Department of Energy and Climate Change)	£110bn	£75bn for new electricity generation capacity; £35bn (Ofgem estimate) for electricity transmission and distribution.	DECC, *Planning our electric future: a White Paper for secure, affordable and low-carbon electricity*, July 2011.

It is true that a good chunk of this investment will be needed in any case to replace ageing coal and nuclear power stations, but a considerable share will result from green targets. Citigroup, for example, believes that around 70% of the total will be needed to meet environmental goals.

COMPARATIVE COSTS OF ENERGY SOURCES

Assessing the comparative costs of various forms of electricity generation – fossil fuel, low-carbon, and renewable – is fraught with difficulties, relying as it does on numerous assumptions, and forecasting relative costs in the

[11] Ibid.
[12] European Commission, 'Renewable energy, Targets by 2020', available on the Commission's website at: http://ec.europa.eu/energy/renewables/targets_en.htm.
[13] *Carbon Plan,* HM Government, March 2011.
[14] Laura Platchkov, Michael Pollitt and Irina Shaorshadze, *The implications of recent UK energy policy for the consumer: A report for the Consumers' Association*, Electricity Policy Research Group, University of Cambridge, May 2011.

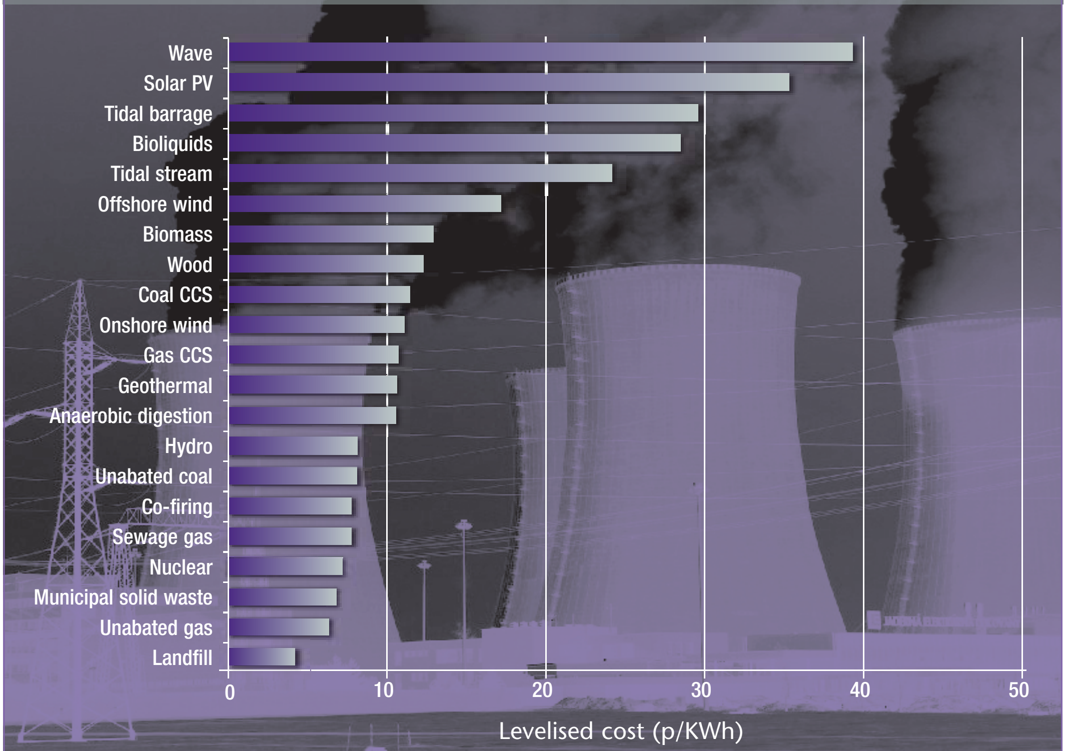
future even more so. Nevertheless, there are some observations that can be made.

Current levelised cost estimates

There are a number of UK estimates of the levelised cost (in pence per kilowatt hour) of the various electricity sources. The costs for each technology vary widely, reflecting the range of uncertainties, but the averages from the various studies are shown in Chart 1.

CHART 1

Average levelised cost estimates for projects starting in 2011 (p/KWh)



Source: IoD calculations using data from the following sources: Committee on Climate Change, *The Renewable Energy Review*, May 2011, data from Figure 1.10; Mott MacDonald, *Costs of low-carbon generation technologies*, May 2011, data from Figure 7.2; Parsons Brinkerhoff, *Electricity Generation Cost Model – 2011 Update Revision 1*, Department of Energy and Climate Change, August 2011, Appendix A; Arup, *Review of the generation costs and deployment potential of renewable electricity technologies in the UK*, Department of Energy and Climate Change, June 2011, Appendix D; Colin Gibson, *A Probabilistic Approach to Levelised Cost Calculations For Various Types of Electricity Generation*, The Institution of Engineers and Shipbuilders in Scotland, October 2011. N.B. For simplicity, certain sub-categories of energy sources have been amalgamated in these calculations, for example thin film and crystalline solar PV.

There are three key observations that can be made from the chart:

- *Firstly, unabated gas is the cheapest of the main electricity sources by some considerable way. It is less than half the cost of offshore wind. Replacing coal with offshore wind would be far more expensive than replacing it with gas.*
- *Secondly, the difference in cost within the group of low-carbon and renewable sources is as significant as the gap between the cost of gas and renewables. Hydro, nuclear, various forms of waste-to-energy and onshore wind are far less expensive than offshore wind and solar.*
- *Thirdly, it appears that the UK is putting too much of its renewable investment into the more expensive technologies.*

How the UK decarbonises, therefore, is probably as important as *how quickly* emissions are reduced.

"It appears that the UK is putting too much of its renewable investment into the more expensive technologies."

Assumptions and implications

A good explanation of levelised cost is provided by the US Energy Information Administration, which conducted its own study into levelised costs in the US:

"Levelised cost is often cited as a convenient summary measure of the overall competitiveness of different generating technologies. Levelised cost represents the present value of the total cost of building and operating a generating plant over an assumed financial life and duty cycle, converted to equal annual payments and expressed in terms of real dollars to remove the impact of inflation.

"Levelised cost reflects overnight capital cost, fuel cost, fixed and variable O&M [operation and maintenance] cost, financing costs, and an assumed utilisation rate for each plant type.

"For technologies such as solar and wind generation that have no fuel costs and relatively small O&M costs, levelised cost changes in rough proportion to the estimated overnight capital cost of generation capacity. For technologies with significant fuel cost, both fuel cost and overnight cost estimates significantly affect levelised cost.

"The availability of various incentives including state or federal tax credits can also impact the calculation of levelised cost." [15]

This explanation shows just how many variables there are in such a calculation, and therefore how many assumptions need to be made:

- **Capital costs.** *This is potentially the most significant assumption. Capital costs are at least 75% for most renewable technologies, around 75% for nuclear, around 50% for coal CCS (Carbon Capture and Storage), around 20% for gas CCS, and slightly over 10% for unabated gas.*[16] *The cost of capital, therefore, is absolutely vital in determining the cost of renewable sources of electricity in particular. The UK studies tend to use a 10% real discount rate for annualising capital costs across all the technologies, which is a particularly flawed assumption. The Committee on Climate Change commissioned the consultancy Oxera to consider discount rates across electricity generation technologies. Oxera found discount rates to vary widely, from an average of 7.5-8.5% for gas, hydro and onshore wind, to an average of 11% for nuclear, 12% for offshore wind and 14.5% for CCS. Using a constant discount rate will therefore tend to understate price differentials.*

- **Carbon price.** *The levelised cost figures tend to assume a rising carbon price for unabated gas and CCS, in line with the carbon price floor set out in Budget 2011, increasing the cost of these sources. Given that the carbon price floor policy is in place, it is reasonable to include a rising price for carbon in the cost of unabated gas and CCS technologies. It must however be remembered that a policy that makes fossil fuels more expensive does not in itself make renewables cheaper. Without a carbon price, the cost differential between gas and most renewables would be larger.*

- **Fossil fuel prices.** *Fossil fuel prices are not fixed, and future prices are difficult to predict, which makes assessing the cost of generating electricity from either gas or coal, with or without*

[15] US Energy Information Administration website, 'Levelised cost of new generation resources in the Annual Energy Outlook 2011', November 2010, available at: http://www.eia.gov/oiaf/aeo/electricity_generation.html.
[16] Committee on Climate Change, *The Renewable Energy Review*, May 2011, Figure 1.5.

"The UK's approach could be described as a big green gamble, with high costs and uncertain benefits."

CCS, rather difficult. It should be noted that this is particularly relevant to natural gas costs, which are heavily dependent on fuel prices. This is significant given that natural gas prices in the UK are around three times those in the US – if natural gas prices in the UK fell to closer to those of the US, the cost of electricity from gas could be lower than projected.

- **Plant lifespan and maintenance costs.** *These are clearly important variables for any electricity source.*
- **Technology maturity.** *A number of technologies are at very early stages of development, for example tidal stream, or have not yet been proven commercially, for example CCS. It is therefore difficult to assess current costs, or how these costs will develop.*
- **Intermittency.** *The figures generally do not include additional system costs associated with intermittency, which are particularly pertinent for certain renewables such as wind and solar. Additional system costs include the need for back-up generation that will often lie idle, which in many cases may be gas-fired.*

This range of assumptions, which is far from exhaustive, shows how difficult it is to calculate and compare costs accurately. If anything, however, it reveals that the gap between the costs of natural gas and a number of the more expensive renewable technologies could be larger than that found in the various UK studies.

The future

Given the difficulties of assessing levelised costs for current projects, future projections can never be more than highly tentative. Projections by the Committee on Climate Change show the gap between unabated gas and most renewables falling steadily over the next few decades,[17] but this is an inherently uncertain area. Whether or not costs reach parity in 20 or 30 years' time, the fact that a significant programme of investment in renewables is needed now to meet the 2020 targets suggests that comparing current cost estimates is more fruitful.

POLICY COSTS

The UK's approach – the most ambitious greenhouse gas emissions targets in the world and a programme of investment geared towards the more expensive renewable technologies – could be described as a big green gamble, with high costs and uncertain benefits.

If the set of targets described earlier is not complicated enough, the range of overlapping policies at the EU and UK levels designed to implement them is more complex still. A recent report from the Renewable Energy Foundation listed around 60 policies and measures.[18]

In a general sense, policies will tend to have one of four impacts:

- *Increasing bills through raising the unit cost of electricity and/or gas;*
- *Reducing bills through improving energy efficiency (although energy efficiency measures may themselves cost money);*
- *Increasing the level of government spending, requiring either higher taxes, higher borrowing, or spending diverted from other areas of government;*

[17] Ibid., Figure 1.10.
[18] Renewable Energy Foundation, *Energy Policy and Consumer Hardship*, 2011, Appendix 1.

- *Increasing the level of taxation, although an un-hypothecated green tax is likely to be a substitute for a higher level of tax somewhere else, which may or may not be more damaging to the economy.*

Energy prices and bills

The Government does provide estimates of the impact of a number of its policies on energy prices and bills. The most recent were published by the Department of Energy and Climate Change in November 2011.[19]

The following tables give DECC's assessment of the impact of policies on gas and electricity prices, expressed in real 2010 £/per megawatt hour (MWh). The impact on prices is different for domestic and non-domestic users, because a different policy mix applies. The transport sector, relying mainly on oil-based products, is not included.

By 2020, policies are expected to increase retail gas prices by 7% in real terms for domestic consumers and by 11% for medium-sized businesses. Policy-related increases in retail electricity prices are expected to be 27% in real terms for consumers and 34% for medium-sized businesses.

TABLE 2

Estimated impact of government policies on domestic and non-domestic gas prices

Real 2010 £/MWh	2011	2020
DOMESTIC RETAIL GAS PRICES		
Estimated average price without policies	39	44
Price impact of Energy Company Obligation (ECO) support cost	N/A	2
Price impact of Smart Meters	N/A	0
Price impact of Carbon Emissions Reduction Target (CERT) extension	1	N/A
Price impact of Community Energy Saving Programme (CESP)	0	N/A
Price impact of Better Billing	0	0
Price impact of Warm Home Discount (WHD) support cost	0	0
Estimated average price with policies	41	47
Estimated impact of policies	**2**	**3**
% impact (on baseline)	**5%**	**7%**
MEDIUM-SIZED NON-DOMESTIC RETAIL GAS PRICES		
Estimated average price without policies	31	36
Price impact of the Climate Change Levy (CCL)	2	2
Price impact of the Carbon Reduction Commitment (CRC)	2	2
Estimated average price with policies	35	39
Estimated impact of policies	**4**	**4**
% impact (on baseline)	**12%**	**11%**

Source: Department of Energy and Climate Change, *Estimated impacts of energy and climate change policies on energy prices and bills*, November 2011, Tables E1 and E3.

[19] Department of Energy and Climate Change, *Estimated impacts of energy and climate change policies on energy prices and bills*, November 2011.

TABLE 3

Estimated impact of government policies on domestic and non-domestic electricity prices

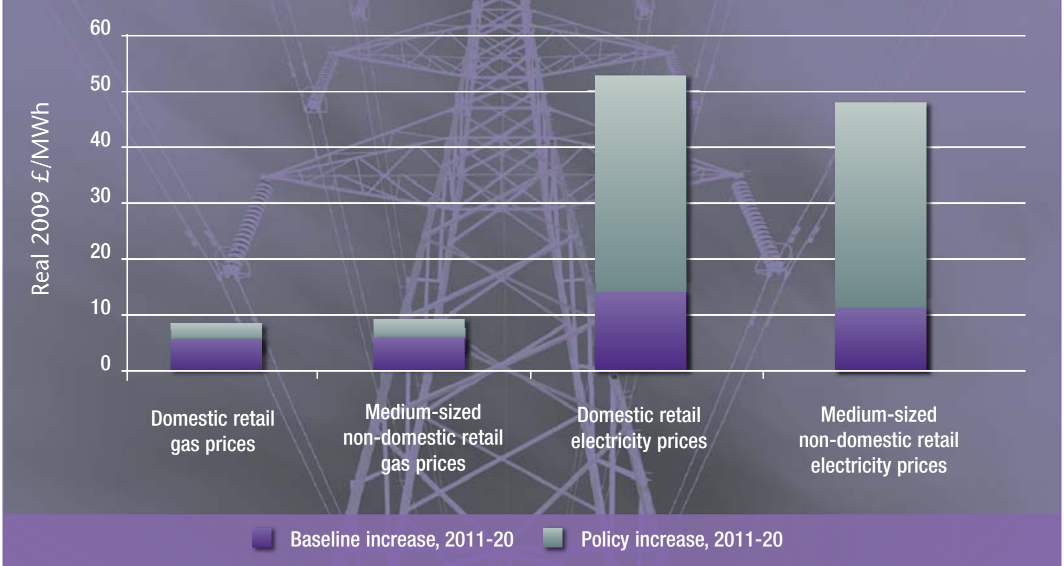
Real 2010 £/MWh	2011	2020
DOMESTIC RETAIL ELECTRICITY PRICES		
Estimated average price without policies	130	144
Price impact of Energy Company Obligation (ECO) support cost	N/A	8
Price impact of Smart Meters	N/A	0
Price impact of Carbon Emissions Reduction Target (CERT) extension	4	N/A
Price impact of Community Energy Saving Programme (CESP)	0	N/A
Price impact of Better Billing	0	0
Price impact of Warm Home Discount (WHD) support cost	1	2
Price impact of merit order effects	3	-5
Price impact of EU ETS and Carbon Price Floor (CPF)	5	12
Price impact of Renewables Obligation (RO) support cost	5	11
Price impact of Electricity Market Reform (EMR) support cost	N/A	9
Price impact of Feed-in-Tariffs (FiTs) support cost	0	1
Estimated average price with policies	149	183
Estimated impact of policies	**19**	**39**
% impact (on baseline)	**15%**	**27%**
MEDIUM-SIZED NON-DOMESTIC RETAIL ELECTRICITY PRICES		
Estimated average price without policies	98	109
Price impact of the Climate Change Levy (CCL)	5	5
Price impact of the Carbon Reduction Commitment (CRC)	4	4
Price impact of merit order effects	3	-4
Price impact of EU ETS and Carbon Price Floor (CPF)	5	11
Price impact of Renewables Obligation (RO) support cost	4	10
Price impact of Electricity Market Reform (EMR) support cost	0	9
Price impact of Feed-in-Tariffs (FiTs) support cost	0	1
Estimated average price with policies	119	145
Estimated impact of policies	**22**	**37**
% impact (on baseline)	**22%**	**34%**

Source: Department of Energy and Climate Change, *Estimated impacts of energy and climate change policies on energy prices and bills*, November 2011, Tables E2 and E4.

As the tables above show, these policy-related impacts are expected to come on top of real increases in energy costs from world market conditions. It is of course impossible to predict the precise outlook for prices a decade hence, but the DECC estimates reveal that the majority of the increase in electricity prices for retail consumers is expected to be as a result of government policy. By contrast, gas prices are expected to be little impacted by policy.

CHART 2

Real terms increase in energy prices 2011-20: baseline and as a result of government policies



Source: IoD calculations using data supplied in Department of Energy and Climate Change, *Estimated impacts of energy and climate change policies on energy prices and bills*, October 2011, Tables E1, E2, E3 and E4.

An excellent Policy Exchange paper calculated the total 'policy levy' on energy consumers by multiplying the policy-related increases in energy prices with DECC's projections for energy consumption. Forecasting future gas and electricity consumption is about as difficult as forecasting future energy prices, but the Policy Exchange calculations show that the forecast 'policy levy' on energy consumers is very significant, already costing £5.7bn a year and reaching £16.3bn a year by 2020 in real 2009 prices. The 2020 figure is broken down into a £9.9bn burden on non-domestic users, and a £6.4bn levy on domestic consumers.[20]

The impact of policies on bills is expected to be different from the impact on prices, given that policies are expected to reduce energy demand through energy efficiency measures. The costs, however, of the energy efficiency measures – for example the upfront cost of insulation and the increased cost of appliances due to higher energy efficiency standards – are not included in the analysis. This is an important omission that will understate the impact of policies on bills.

DECC estimates that average household gas bills will only increase by 1% by 2020 as a result of policies, while household electricity bills will be 16% lower than they otherwise would be.[21]

The picture for businesses, however, looks very different. DECC estimates that by 2020, despite the impact of energy efficiency measures, the average medium-sized business's gas bill will be 6%

[20] Dr. Simon Less, *Green Bills: An analysis of the projected policy levy in energy bills*, Policy Exchange, 2010. N.B. The Policy Exchange paper analysed the larger 2010 DECC estimates of the impact of policies on prices and consumption, not the smaller 2011 estimates – at the time of writing, Policy Exchange's report was the most recent such analysis.

[21] Department of Energy and Climate Change, *Estimated impacts of energy and climate change policies on energy prices and bills*, October 2011, Tables F1 and F2.

higher than the baseline, while the average medium-sized business's electricity bill will be 25% higher.[22]

Taxes and spending

The estimated impact of climate change, renewable and energy efficiency policies on bills is less than in previous such analysis from DECC. One of the reasons for this is the Electricity Market Reform which, if it takes effect, should to some extent lessen the impact of policies on bills. Another is that several policies, most notably the Renewable Heat Incentive and the Carbon Capture and Storage demonstrations, will now be funded from general taxation rather than through a levy on energy bills – this means that the taxpayer, rather than the energy consumer, will now be paying for these policies.

Of course, taxpayers and energy consumers are the same people – a classic case of the Government shuffling policies around to make their impact seem smaller. The CCS demonstrations were expected to cost around £1bn of public money, although part of this pot may be used for other purposes now. The Renewable Heat Incentive is expected to cost around £5bn up to 2020, according to the impact assessment.

In addition, there are a number of green taxes, although they can't reasonably be added to the cost of the green programme given that in their absence other taxes would almost certainly be higher. The most direct is the Climate Change Levy, which currently raises £700m a year, a figure which is forecast to rise to £2bn by 2015.[23]

BOX 1

Facing up to DECC's questionable energy assumptions

In November 2011, DECC published its latest estimates of the impact of policies on energy prices and bills.[24] The analysis revealed some questionable assumptions:

- The precision. The old joke is that the difference between economists and weather forecasters is that economists use a decimal point to prove they have a sense of humour. However, DECC economists appear to be humouring us by placing an inordinate amount of faith in a model that predicts combined consumer gas and electricity bills to the nearest pound.

  In 2010, DECC estimated that the average energy bill with policies would cost £1,477 in 2020 (in real 2009 prices). In the 2011 version of the same report, the cost of the average energy bill with policies was expected to be £1,285 (in real 2010 prices). The cost was deemed to be lower principally because higher energy prices would feed through to a faster return on energy efficiency measures and other policies. Leaving aside DECC economists' failure to model the indirect rebound effect of energy efficiency, there remains a number of new 'black swan' externalities which could quickly render such forecasting ranges void. We can only really have faith in the figures reflecting the cost to consumers today.

- DECC assumes that "energy bills are likely to continue on an upward trend over time, with or without policies, as a result of rising fossil fuel prices and network costs". This seems to ignore the fact that fossil fuel prices – specifically natural gas – are falling massively in the US, even during the winter, thanks to shale gas exploitation. In the US, at the time of writing,[25] natural gas prices were at $3 per million British Thermal Units, three times lower than in the UK. Some of that gas will be exported to the UK over the coming years and we can anticipate UK natural gas prices converging downwards towards those of North America.

continued

[22] Department of Energy and Climate Change, *Estimated impacts of energy and climate change policies on energy prices and bills*, October 2011, Tables F3 and F4.
[23] HM Treasury, *Budget 2011*, March 2011, Table C3.
[24] Department of Energy and Climate Change, *Estimated impacts of energy and climate change policies on energy prices and bills*, November 2011.
[25] December 2011.

BOX 1 *continued*

Facing up to DECC's questionable energy assumptions

Nor do network costs have to rise as much as is assumed. National Grid, a monopoly, may want to increase its regulated asset base as much as possible, but its investors, the parlous state of the balance sheets of the 'Big Six' utilities, and a possible Scottish secession, may quickly put an end to the scale of network infrastructure they were hoping for. One should not assume that English consumers will want to continue subsidising Scottish wind farms and their related infrastructure should Scotland become independent. Indeed, there is a possibility they will become stranded assets.

- DECC takes pride that the UK ranks well internationally for household energy prices. Yet the Department seems impervious to the extreme seasonal volatility – amongst the worst in Europe. This is a direct consequence of government policy failing to incentivise adequate gas storage investment, which would smooth out volatility in the UK, whilst over-rewarding intermittent and expensive technologies like offshore wind. Had a different emphasis been taken and more political interest shown in procuring gas from other sources, it seems unlikely that the utilities would have felt obliged to levy double-digit price rises last year as oil price-linked contracts spiked due to the Libyan conflict and the Arab Spring.
- DECC assumes that "the average household (consumes) 16.6MWh of gas and 4.5MWh of electricity in each year to 2030". This represents a truly heroic assumption that both gas and electricity consumption will show zero growth or even no movement for 20 years. The long-run historical trend in electricity consumption has been of consumption growth at roughly half the rate of economic growth. If gas prices fall as much as some optimists believe, it's just possible that compressed natural gas vehicles will be refuelled not at the petrol station but at the home from the mains, raising home gas consumption even more.
- DECC concedes that "if fossil fuel prices fall, then the benefits of policies would be less and the costs greater". Falling fossil fuel prices may now well be the likeliest scenario and this will further amplify the cost impact of green technologies.

GETTING REAL

These costs matter. Higher energy prices make it harder for UK-based businesses to compete with the rest of the world. The announcement of a package of measures to relieve the pressure on the most intensive energy users in November's Autumn Statement was an admission that government energy policy is damaging to competitiveness.

It seems pertinent to ask whether, given the nation's straitened financial circumstances, the UK can meet its targets more cheaply than now.

Can the UK actually meet all of its targets?

Unfortunately, herein lies the problem because, with some honourable exceptions, few are prepared to admit that the question of meeting the UK's targets more cheaply is void. A number of short to medium-term factors mean that the nation actually can't meet the targets, in 2020 at least.

The 'elephant in the room' is the balance sheet weakness of both National Grid itself and the Big Six – mostly foreign-owned – utility companies, together with their investors' appetites for such a programme. As listed companies, the Big Six must raise funds on the capital markets to make the investment. But as Peter Atherton, head of European Utilities Research for Citigroup, has argued: they have neither the appetite to raise the funds nor the organisational capacity to spend it; the supply chain doesn't exist to match their expenditure; and, last but not least, they could not afford the cost of such a large amount of capital.

"These costs matter. Higher energy prices make it harder for UK-based businesses to compete with the rest of the world."

As if that wasn't bad enough, we have another beast in the room – a rhino, posing as the consumer. Given the highly adverse reaction of consumers to the double-digit price rises from utilities last year, it's hard to see them enthusing about prices going up to fund a vast offshore wind expansion which would require replacing after just 20 years.

The trouble is that at the heart of these targets lie some assumptions and calculations made by DECC that either no longer stand up or have become invalid. The UK now has just one new nuclear power station that might be ready at the beginning of the next decade (Hinckley C, proposed by EDF); an expensive renewables programme still failing to scale-up with some subsidies now scaling down; and a population set to be 5 million larger in 2020. All of these factors make it highly improbable that gas consumption will fall by nearly 20% as DECC believes will happen. A 20% increase seems a lot more likely.

Population really is very important. Every extra million people in these islands requires at least a gigawatt of peak power capacity. As combined cycle gas turbines are low-risk, modular, cheap and easy to add to the grid close to the geographical point of demand, it's hard not to see that gap being filled by natural gas. For investors, the alternatives like nuclear, wind and solar are starting to look very risky in comparison.

The Secretary of State for Energy and Climate Change has said that he wants to see a technology race in the 2020s with the cheapest renewable winning. But the awkward question is: when consumers and businesses are feeling the pinch from higher energy bills, why doesn't he think we need a race now?

As explained earlier, the current subsidy regime tends to reward the least cost-effective technologies the most, and the most effective the least. Levelling and distorting the playing field towards the top is no pathway to competition, innovation and the lower prices these could bring about. Cheaper energy technologies will only come about if we accept that there must be losers as well as winners.

Can the UK meet some of its targets more cheaply?

So this new post-financial crisis reality leads to another question: can we deliver some of the targets – i.e. scrap the renewables one but keep aiming to reduce carbon – and make a big saving?

Here again, it's difficult to give a straight answer. Certainly, calling a halt to the renewables programme would save some expenditure and reduce the pressure on bills to some extent, but probably not quite as much as is assumed and not just because the Renewables Obligation is 'grandfathered'.[26]

Natural gas really starts to save carbon emissions when it is used to replace coal or oil-fired power stations and thus produces the same power with roughly half as much carbon dioxide. A new dash for gas will happen again, just as it did in the 1990s. Nearly all the UK's coal-fired stations, however, were scheduled to close anyway due to the EU's Large Combustion Plant Directive, so increasing the penetration of gas because of an investment shortfall of nuclear and renewable power seems likely to reduce the cut in carbon emissions.

> *"Cheaper energy technologies will only come about if we accept that there must be losers as well as winners."*

But, as explained above, the money probably isn't there for the full renewables programme in the first place, so abandoning the renewables target may not make a huge difference in practice to the level of carbon emissions.

[26] In other words, even if the Renewables Obligation was stopped tomorrow, payouts for projects already agreed would continue for many years.

> *"It's high time that energy policy was re-engineered along low cost, technology-neutral and evolutionarily flexible lines."*

What could be the least costly approach?

All this then leads to the question of what would we do if we were solely focused on reducing costs to the consumer and not too concerned about renewables, carbon emission targets or even energy security.

A pure market approach like this, although politically impossible for now, might not be as far away as some might think. The failure of the world's biggest economies to agree a global deal on reducing carbon emissions (an agreement to make an agreement is not a deal) means that the EU's – and especially the UK's – emissions reduction programme is increasingly an outlier. European governments faced with implementing massive austerity programmes may decide that their 2020 targets are not as vital after all.

A lowest cost approach could yield some tangible results, not least rebuilding the strained balance sheets of the utilities and National Grid. Even then, some political involvement from the very top of government would be required.

The most important factor affecting energy costs in the UK is the price of natural gas. For politicians wanting to fight fuel poverty and increase competitiveness, that should be the biggest concern. To bring it down, the UK must seek to renew all existing gas supply contracts that are linked to the oil price – still stubbornly high – and link them instead to the National Balancing Point or even the Henry Hub of the US.

Breaking the oil-gas price link, as has occurred in the US, is crucial to achieving lower gas prices. The UK should also seek to speed up imports of natural gas from North America. With natural gas prices three times higher here than in the US – $9 per million British Thermal Units compared with $3.13 – it would be in their interests as well as ours. In the years to come, the UK's own shale gas resources will come online too, depressing the market price still further.

Nor is cheaper gas the only option. There's clearly scope for cross-stabilising our grid quickly with additional zero carbon electricity interconnectors from Norway's hydropower, Iceland's geothermal and France's nuclear stations. Once they are in place, they will last for a human lifetime.

The truth is that getting to grips with electricity costs is fraught with caveats, dependent on time-decaying assumptions, and subject to external shocks over which governments have no control. The discovery, and economically successful exploitation, of shale gas in North America is one such example. This is still a game-changer that has yet to reach our shores. For the UK, a major new dash for gas clearly beckons. Perhaps all of this goes to show that, in energy policy as in life, permanence is the illusion of every age. So it's high time that energy policy was re-engineered along low cost, technology-neutral and evolutionarily flexible lines.