

This month's Idea for Economic Growth is urgently to reduce the cost of energy. This edition features two articles from leading experts who argue that Britain's rising energy costs, driven by the Coalition's carbon reduction strategy, are greatly damaging the British economy and manufacturing in particular. Dr John Constable is Director of the Renewable Energy Foundation, a UK charity publishing data on the energy sector, and author of *The Green Mirage: Why a low carbon economy may be further off than we think* (Civitas: London, 2011). Jeremy Nicholson is Director of the Energy Intensive Users Group, a board member of IFIEC Europe (the International Federation of Industrial Energy Consumers), Ofgem's Sustainable Development Advisory Group, and a Fellow of the Energy Institute. Both articles are based on talks given by the authors at a meeting of the All Party Parliamentary Group on Rebalancing the Economy, at the House of Commons on the 13th of February 2013. The session topic was the impact of the cost of energy on the economy. Taken together, these articles serve as a warning to the government that, if present carbon reduction policies continue, the competitiveness of UK manufacturing will be gravely harmed.

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Why British Energy Policy Imperils Manufacturing Industries

Jeremy Nicholson

The Energy Intensive Users Group (EIUG) is an umbrella group that represents a dozen or so energy intensive sectors, such as steel and chemicals, that compete in international markets and for whom energy costs are hugely significant. In certain cases up to 70 per cent of their operating costs can be attributable to energy. These industries are therefore very sensitive to the relative price of energy in the

UK compared with our neighbours in Europe and further afield. It is this relative difference, rather than whether the international price of energy is high or low, that matters for energy intensive industry. One wouldn't hear the industry voicing concern about the dollar price of a barrel of oil because by and large the rest of the world has to absorb that as well. While it may have implications

for economic growth, it doesn't have an impact on competitiveness.

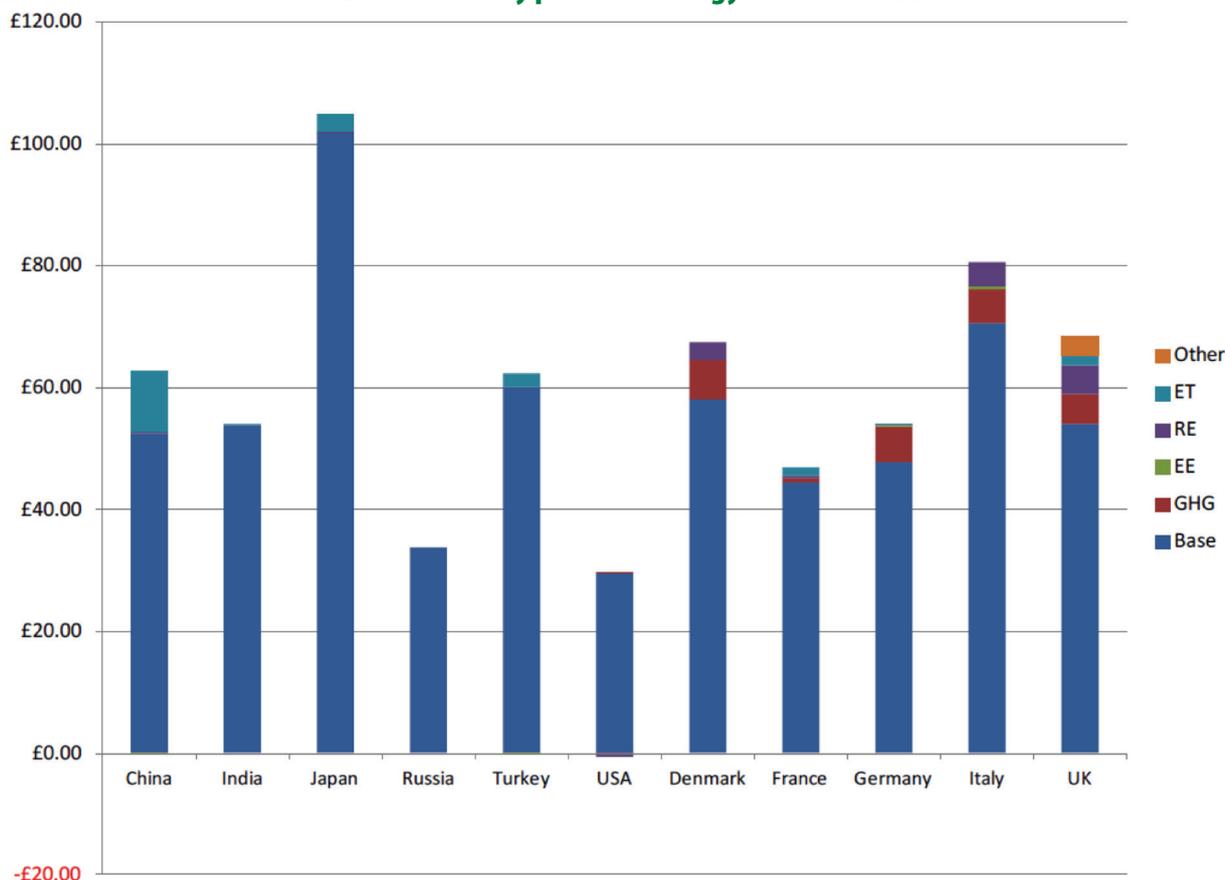
However, the problem we face at the moment is that for a variety of reasons – some to do with the necessity of reinvesting to maintain our power infrastructure and others with the long-term goal of decarbonising our energy supplies – energy prices are rising faster in the UK compared even with Europe, let alone emerging economies. The EIUG do not take issue with the long-term goal of decarbonising our energy supplies but do take issue with the loss of competitiveness that arises from going faster than our neighbours. In 2010 I wrote a report with Ruth Lea describing the impact of energy prices as they then were on British manufacturing.¹ At the time, figures from the Department of Energy and Climate Change (DECC) suggested that we would see a 60-70 per cent increase in industrial electricity prices by the end of this decade and a 40 per cent increase in industrial gas prices. However, there have been some developments since then, not least following the election of the Coalition government. As a result we won't experience quite the same increase

in gas prices because the costs of the Renewable Heat Incentive – proposed by the previous and implemented by the current government – will be borne through general taxation rather than as a levy on gas bills, much to the relief of energy intensive industries.

Nevertheless, turning to the present we can see that UK energy prices are still significantly higher than those of competitor countries.

Chart 1 comes from a report commissioned by the Department for Business, Innovation and Skills (BIS) last year, who were concerned about the threat of 'carbon leakage'. This occurs when carbon intensive industries relocate from countries with strict carbon controls to less carbon constrained countries, thereby increasing carbon emissions. The BIS report was carried out by independent consultants ICF. The UK bar is among the highest of European figures with the exception of Italy which is an outlier. Energy costs there are high not due to carbon costs but to other problems to do with the Italian electricity market. France's relatively low costs are understandable because it has a largely low carbon electricity supply – for reasons not to do with countering climate change but the historical accident of having invested in nuclear for other reasons.

Chart 1: 2011 electricity prices for energy intensive industries



Key: ET = Energy Taxes RE = Renewable Energy mandates EE = Energy Efficiency measures GHG = Green House Gas trading (carbon) X = net impact

Source: ICF International²

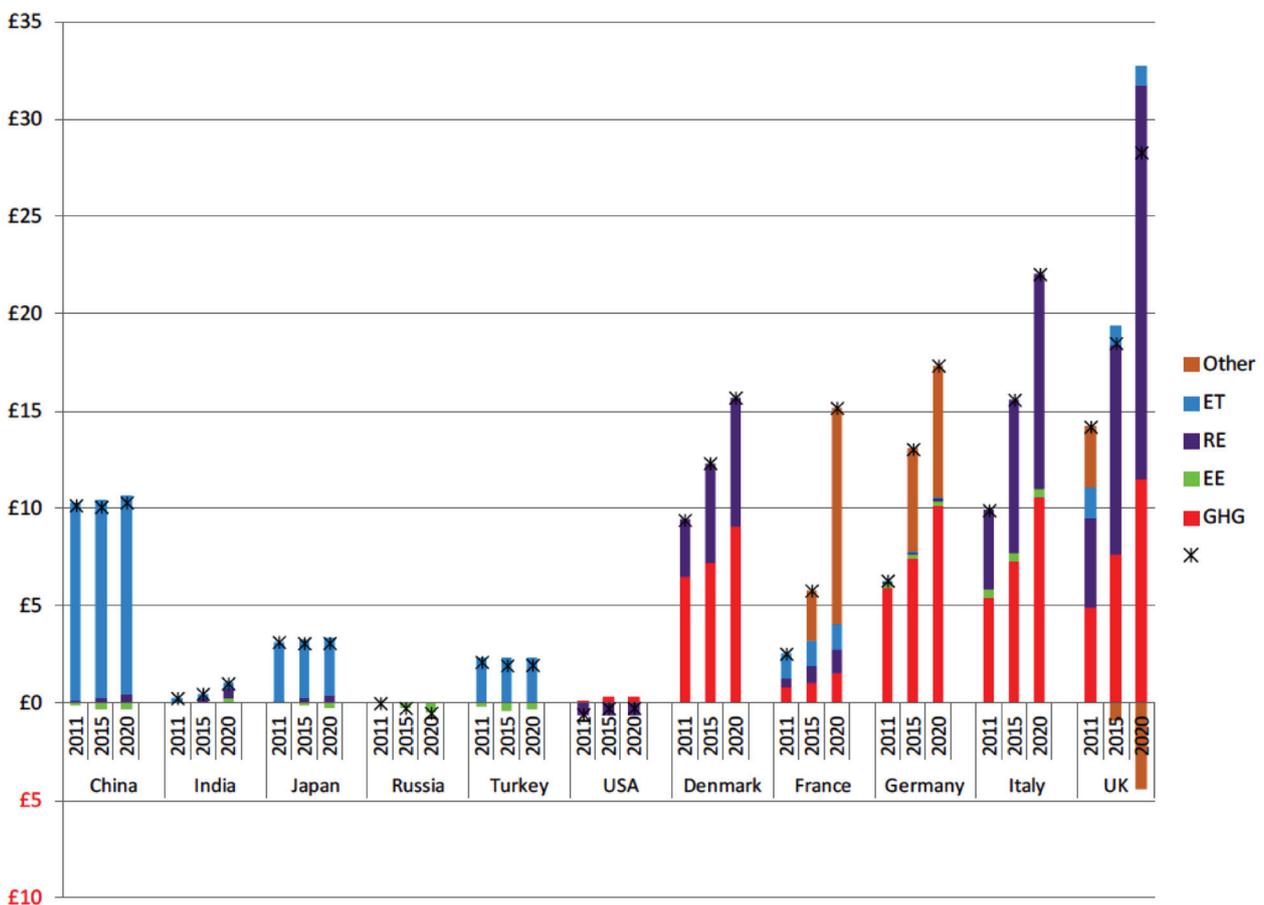
Very significantly, Germany's industrial electricity costs are lower than the UK despite it having some of the most ambitious renewable targets in the whole of Europe, possibly the world. They are certainly the most expensive renewable policies. Germany has achieved this because its approach to decarbonisation is very different. Despite being bound by the same European legislation on this subject, they have combined a hugely expensive renewable programme with huge discounts for trade exposed energy intensive industries in order to preserve competitiveness. So instead of the German industrial consumer paying over €40 a megawatt hour for their renewable energy subsidies and €20 for their Eco-tax, as in the UK, they have a 90 per cent discount on their Eco tax and are paying €0.5 for their renewable subsidy. Setting aside whether the German approach is good or bad for the German economy overall, this is why heavy industry has managed to cope with such an ambitious programme.

The elements that are inflating the bill for UK industrial consumers are the Climate Change Levy, which is a tax on energy consumption; the Carbon Price Floor, set to start in April 2013, which is a unilateral UK charge on carbon emissions; and particularly the cost of renewables, both Feed-in

Tariffs (FITs) for small scale renewables and the Renewables Obligation, the cost of which rises every year.

Chart 2 shows the direction we are headed towards. It shows the increase in industrial electricity prices that BIS, and by inference DECC whose figures were used, predict we will face by 2015 and 2020 as a result of climate policies. By the government's own estimates, UK electricity prices are going to increase by over £30 per megawatt hour by 2020. This is a larger increase in industrial prices than anywhere else in Europe, let alone countries like Russia, China, and India and principally of course America – which not only doesn't have direct climate costs but also has the benefit of cheap shale gas, which is good for both gas and electricity consumers there. It's because of this data that the Chancellor announced, just over a year ago, a £250m compensation package for energy intensive producers to help defray some of these costs. It would only defray 75-85 per cent of the costs of the Carbon Price Floor and the EU Emissions Trading System (EU ETS) in the UK. There is no compensation, as yet, for the

Chart 2: Impact of climate policies on industrial electricity prices in 2011, 2015 and 2020



Source: ICF International³

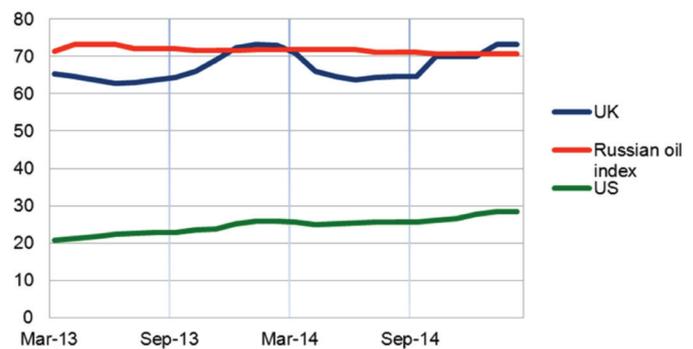
considerable costs of the Renewables Obligation or the FITs for renewables, of which even small scale feed-in-tariffs are costing around £2 per megawatt hour, which is approximately double what the government thought that policy was going to cost by 2020. Therefore, although £250m sounds like a lot of money on a personal level, it is a drop in the ocean compared with the costs of these measures across industry. It is also nowhere near the equivalent package in Germany, which is roughly costing €8-9bn per annum.⁴ It is true that the German economy is larger than the UK's and manufacturing represents a larger portion of that economy for which climate costs are currently more expensive compared with the UK. Nevertheless, it does show that Germany has been careful not to put its own industry out of business while pursuing decarbonisation.

Chart 3 shows the independent Committee on Climate Change's (CCC) estimates of what all these individual costs will do to electricity prices by 2020. Their own analysis confirms that the climate policies we have in place, such as renewables policies, taxation, the EU Emissions Trading Scheme and in due course the Carbon Price Floor, have already added 21 per cent to industrial electricity prices. Furthermore, by 2020 carbon policies will drive up electricity prices by the order of 58 per cent. These are increases which won't be experienced by our competitors elsewhere. As mentioned above, if

these were part of a global agreement on climate change, industry would be quite relaxed about this as the inflated energy costs could be passed on to the end consumer. It may have an economic impact but it wouldn't have a competitive one. However, this strategy is not feasible when international competitors don't have comparable costs that they need to pass on.

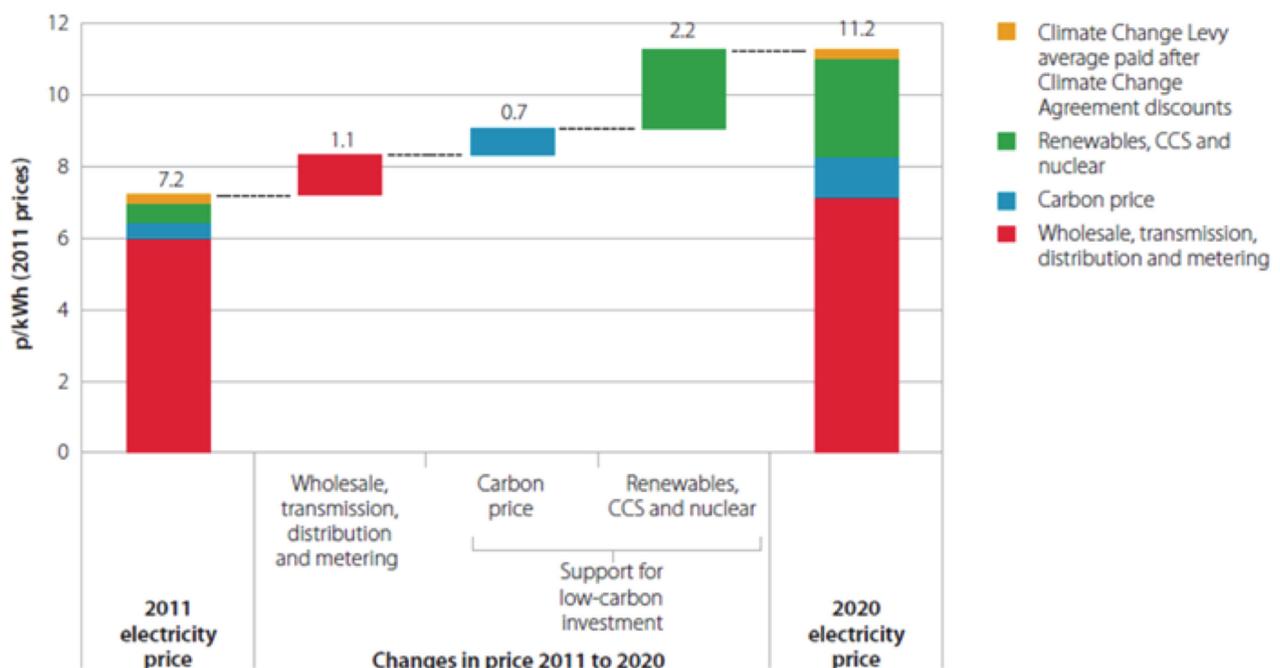
Moreover, I would add some mild criticism of the CCC analysis. I suspect that, despite their claims to the contrary, they haven't fully taken into account the costs of maintaining a back-up capacity as the country increases its reliance on wind power – which on current investment plans is expected to reach 30 gigawatts by 2020. Similarly they haven't included the cost of upgrading and extending the transmission and distributions systems to accommodate the introduction of new nuclear and other more far-flung renewable sources.

Chart 4: UK, US and Russian Gas forward prices (p/therm)



Source: Energy Purchasing Specialists Limited, 2 September 2010

Chart 3: Outlook for Industrial price for electricity price supplied from the national grid (2011 and 2020 projection)



Source: Committee for Climate Change⁵

Chart 4 shows two year forward prices for natural gas. The blue line shows the effect of seasonality in the UK market - higher forward prices in the winter and cheaper in the summer, as one might expect. The red line shows oil indexed contract prices, the way that much gas is sold in the European market to industry. The UK has slightly lower prices on average. However, what is striking is the low price of American gas. Even if we can't exactly replicate the American experience with shale gas but experience something similar, we can close the competitiveness gap. America has undergone reindustrialisation because of these low energy prices. We have seen the expansion of steel production there, which would have seemed far-fetched only a few years ago. Likewise the chemical industry there has made new investments

in petro-chemical plants. Not only has this been beneficial for the American economy but, by virtue of the fact that increasing shale production involves substituting gas for coal, power sector emissions have also gone down.

If we can capitalise on the opportunity that shale gas offers in a similar way then the benefits for the UK will be numerous. It could facilitate a similar reindustrialisation here in the UK, improve treasury tax revenues and substantially improve the wider economy. It may not be the answer for all our current economic and environmental challenges but it's certainly a big part of the answer.

Notes

1 'British energy policy and the threat to manufacturing industry', Civitas 2010. Available at: <http://www.civitas.org.uk/pdf/EnergyPolicyApril2010.pdf>

2 ICF International report for the department for Business, Industry and Skills, 'An international comparison of energy and climate change policies impacting energy intensive industries in selected countries', July 2012, p. 9, available at: <http://www.bis.gov.uk/assets/biscore/business-sectors/docs/i/12-527-international-policies-impacting-energy-intensive-industries.pdf>

3 IBID, p 202

4 See Table 2, 'Total support for energy intensive industries (EIIs) in Germany 2010-2013', in submission by the TUC to parliament on the impact of rising energy costs on the energy intensive sector. Available at: <http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenvaud/writev/669/eii03.htm>

5 Committee for Climate Change (CCC) calculations, 13th December 2012, available at: http://hmccc.s3.amazonaws.com/ENERGYbill12/Energy_Bills_Exhibits_Final.xlsx



Are Green Times Just Around the Corner?

John Constable

The 2009 European Union's Renewable Directive requires that 15 per cent of the United Kingdom's final energy consumption is from renewable sources in 2020, one of the largest proportional increases in the EU27. Not only is the UK's burden share disproportionate, but the distribution of costs is also iniquitous, with the government's own estimate showing that the UK would carry 25 per cent of the total EU-wide cost of the directive. The target entails that over 30 per cent of the UK's electricity consumption is from renewable sources, with the bulk of the contribution coming from heavily subsidised wind, on- and offshore, and biomass, much of which will be burned in converted coal stations.

The scale of these subsidies is increasingly well known, but bears repeating: the Renewables Obligation (RO) is now costing consumers about £2 billion per annum, and will have to rise to nearer £8 billion a year in 2020 if there is to be any chance of meeting the EU Renewable Directive targets. It is less widely understood that the recently introduced Carbon Price Floor actually adds to these subsidies by increasing the wholesale price in the electricity markets thus benefiting renewables that do not pay the carbon tax. In practice as a result of the Carbon Price Floor, all currently built renewables and anything constructed before 2017 will see an increase in subsidy. In the case of on-shore wind, this will amount to a 40 per cent increase

in subsidy, an extraordinary outcome given that much of these generators are thought to be over-supported by the existing Renewables Obligation.

It is possible to estimate the total additional subsidy for wind generation arising from the carbon price floor policy. Assuming that all the wind farms currently consented are built, which is not improbable given the scale of the incentive to do so, and that a quarter of the generators currently in planning are also built before 2017, the Carbon Price Floor will add about £1 billion a year to renewables subsidies in 2017, a consumer burden that cannot be justified from any perspective. On top of this there are system expenses, including additional power lines and grid management measures, as well as the cost of maintaining conventional generation equivalent to peak load to guarantee security of supply, for example on a windless winter's afternoon. These costs are difficult to estimate, but one authority, Colin Gibson, a former Power Network Director for National Grid, has established principles that allow us to calculate the likely additional system cost of the projected wind fleet to be around £5 billion a year in 2020.¹ Chart 1 charts the growth in subsidy and ancillary costs of renewable energy up to 2030:

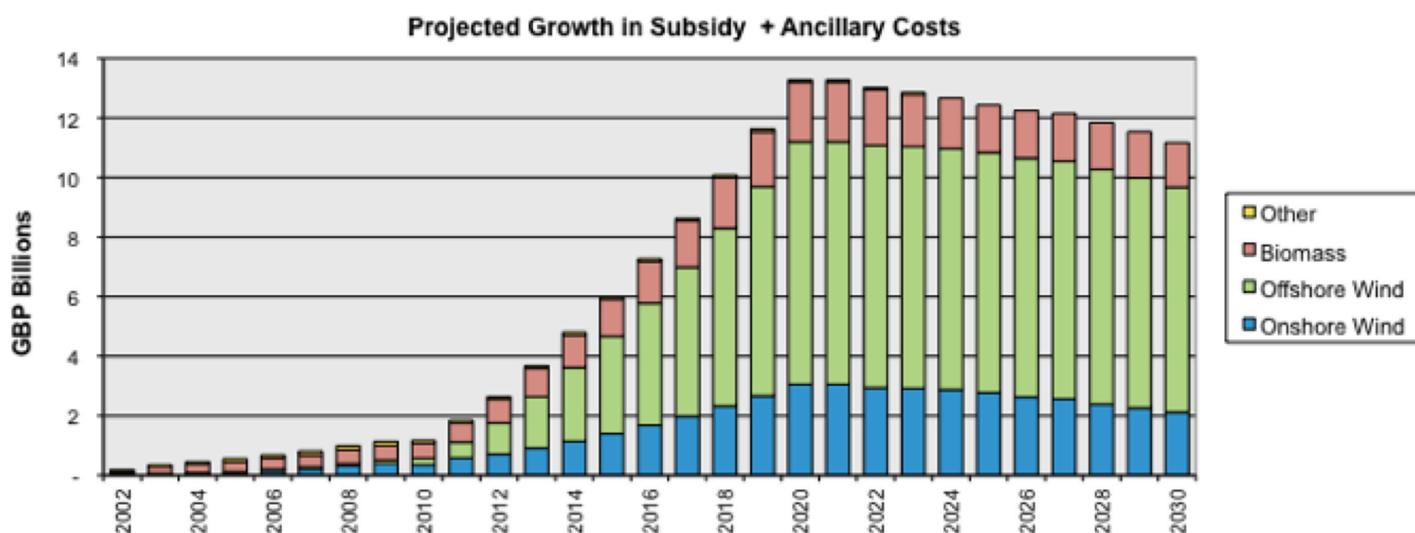
Together with VAT this would bring the annual additional cost to consumers to upwards of £16 billion a year in 2020, over 1 per cent of current GDP. One third of this cost would hit households directly through their electricity bills, regardless of income, making it an intensely regressive measure. The remainder of the cost would be passed through

from industrial and commercial customers and eventually be met by households from increases in the cost of living. The total impact would be in the order of £600 per household per year, assuming 26 million households.

Even if no further targets are brought forward in that year, the need to support investments to the end of their lives creates a legally committed on-cost of twenty years for each generator. In other words, a renewable generator built in 2020 will remain as a burden to consumers in 2039. Because of uncertainties about build rates, we cannot be precise as to the total programme expenditure, but it seems likely that the annual cost in 2020 will persist for around a decade, giving a total programme cost between 2002 and 2030, including system integration costs and VAT, in the region of £200 billion. Such an estimate can be indicative only, but establishes the order of magnitude; this is an extremely expensive policy, and fossil fuel prices have to rise to super-high levels to make this look competitive.

Some will suggest that this enormous cost is worthwhile since it will facilitate the transition to a green economy. Mr Davey gave a speech on the 12th of February to this effect; and the Prime Minister hinted at something similar in the previous week. Is such a green economy possible? The simple answer is yes. After all, we had a low carbon economy, if that is what is meant by a green economy, only a few hundred years ago. However, it had properties that are very different from those we observe in our economy today. Specifically, a much smaller population lived in much less prosperous conditions, with peak levels of health and wellbeing that would probably be regarded

Chart 1: The Annual Subsidy and System Costs of the United Kingdom's Renewable Electricity Targets (£bns), 2002 to 2030



Source: UK government data, and Renewable Energy Foundation estimates.²

as only moderate in the contemporary world. In addition, there were higher levels of mortality, particularly amongst reproductive women and infants.

But no one, at least no one sane, wants a return to that state. What people mean when they ask 'Is a green economy possible?' is 'Can we have a low carbon economy that is as prosperous as today's fossil-fuelled economy?' We can only answer *Yes* to that question if the green economy has the same fundamental property as the carbon-based economy. Namely, it must be equally productive or even more so. But that is a very tall order. Carbon energy sources are very *dense stocks* of energy, and consequently cheap to the consumer; whereas renewables draw on low density flows from natural energy cycles.

An example from a crucial period of our economic history will illustrate the point. In 1851, 130,000 coal miners produced energy equivalent to 150 per cent of the potential wood output of the entire land area of England and Wales (if managed sustainably). By comparison there were 1,140,000 agricultural workers in that year, producing less than one per cent as much energy per head as the coal miners, implying lower productivity and higher costs. The very high level of productivity in the coal sector powered the industrial revolution, avoided the economic stagnation predicted by Smith and Ricardo, and permitted rapid and continuous growth that brought widespread wealth and increases in the standard of living. The low carbon economy of the time was by comparison a high employment, low wage, low productivity economy, and was driven, quite literally, from the field.

Of course, modern renewables are not just wood or agricultural produce, though, by the same token, we should not forget that modern fossil fuels are not just coal; there is oil for one thing, and gas continues to spring surprises. But modern renewables, wind, solar, photovoltaic, are different from their predecessors, and perhaps it is plausible to offer them as ready or almost ready to offer a prosperous green economy. The question, then, is 'Are modern renewables as productive as fossil fuels?' The many industry and governmental references to the large numbers of jobs that are likely to result from the green transition should give us pause; high rates of employment are not characteristic of a richly productive energy sector, indeed quite the reverse.

On investigation we find that modern renewables are still extremely capital intensive and have a low load factor. Solar in the UK produces less than 10 per cent of its theoretical maximum over a year,

and wind around 25 per cent. In addition, there are the very high system integration costs noted above. It is simply facile to say, as the industry often does, that 'the wind is free'. Coal and gas are free in the ground; but we have to extract, convert, and deliver the usable energy to a consumer, all of which activities have costs. Exactly the same is true of wind power, and for renewables the extraction, conversion, and delivery costs remain extremely high compared to fossil fuels.

The crude subsidy levels confirm this point. Even onshore wind, a relatively cheap renewable, needs a near 100 per cent income top-up, and if systems costs, extra grid and balancing costs (a hidden subsidy since these costs are socialized over the entire system), are taken into account the cost to the consumer of onshore wind is three times that of fossil fuels. Offshore wind is still more expensive, perhaps four or five times as expensive as conventional energy. Furthermore, these cost estimates may well be too low, since there is emerging evidence, published by REF in 2012, to suggest that the economic life of current wind turbines is only half that claimed by the industry, roughly doubling the levelised costs of the energy generated.³

One might quibble with all the estimates given above, but no plausible revision can change the order of magnitude involved. The fact is that renewable energy is still far from competitive with fossil fuels, and nowhere near as economically productive. Consequently, shifting to current renewables for the bulk of our energy would result in a reversal of the long-run economic trend since the industrial revolution. More people would be working for lower wages in the energy sector, energy costs would rise, the economy would stagnate, and there would be a significant decline in the standard of living. The population would begin to step back towards the condition of 'laborious poverty' noted by Jevons as characteristic of the pre-coal era.

Now, one might reply that there is a great deal of green growth at present, and that this seems to run counter to the observations given above. However, all this activity is funded by subsidies drawn from the wealth created by the high productivity of the fossil-fuelled economy. Green energy, the current green economy overall, is a costly output of the fossil-fuelled economy. A luxury consumable, one might say. The green energy industries are not sufficiently productive to be self-sustaining; that

is to say they are not economically sustainable without continued support from the fossil-fuelled economy.

Moreover, there is no sign that the green industries are making sufficient progress to become as productive as fossil-fuelled industries in any foreseeable future.

Part of the problem is intrinsic to the energy sources: renewables have the enormous disadvantage of low energy density to overcome, implying that the capital cost of their conversion devices, as well as the delivery costs, must be very low indeed if they are to be competitive and as economically productive as fossil fuels. But it is also true that the use of subsidies to drive the adoption of existing technologies in order to meet the arbitrary EU targets is very unhelpful. Investors have no deep incentive to put capital at risk to support the innovation required since they are already making money. Indeed, it would be irresponsible of fund managers to put their clients' capital at high risk when they can obtain perfectly satisfactory returns through lower risk, subsidized, investments.

In other words, innovation is positively

discouraged by subsidies; capital that might have gone into research and development is actually better invested in existing technologies. Consequently, we shouldn't mistake the frenzy of deployment for healthy growth. Subsidies, those transfers of wealth from the fossil-fuelled economy, are providing remarkable rates of return for short-term investors, but when these transfers cease, as they will when consumers tell politicians that the prospective or actual reductions in standards of living are unacceptable, the current green growth will evaporate like dew before the rising sun.

A long term future for the green economy is only possible if the green energy sector is as economically productive as the fossil-fuelled one, but the renewables of today simply are not so. Yet it is those existing technologies that our subsidies and arbitrary mandates are forcing into the market. The renewables of tomorrow might, perhaps, be different, but we won't discover these high productivity renewables, if they exist at all, by rewarding investors for building the current generation of inadequate technologies. A green economy as prosperous as today's fossil-fuelled economy is a theoretical possibility, but we can't be more definite. However, we can be certain that our current policies are taking us further away from that possibility, not closer to it.

Notes

1 Colin Gibson, 'A Probabilistic Approach to Levelised Cost Calculations For Various Types of Electricity Generation', The Institution of Engineers and Shipbuilders in Scotland (2012), available at:

<http://www.iesenergy.org/cost/LCost-Paper.pdf>

2 Up to December 2011 the chart shows actual subsidy costs, with estimates thereafter. From 2011 the chart adds to the subsidy costs a scaled estimate of system cost based on the principles of Colin Gibson. The chart assumes a linear growth rate in the capacity of renewable electricity generation

from 2012 up to that required to meet the target in 2020. The proportions of offshore wind, onshore wind and biomass reflect the UK government's central assumptions. After 2020 the estimate assumes that no further plant is built, and that total subsidy paid declines as generators reach the end of their twenty-year lives.

3 See Gordon Hughes, *The Performance of Wind Turbines in the United Kingdom and Denmark* (2012), available at www.ref.org.uk.

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