# Carbon Commentary Newsletter #10

*A critical appraisal of issues in the move to a low-carbon economy*

Sunday 21 September 2008

**Articles in this edition:**



This edition of collected pieces from Carbon Commentary includes data on UK energy consumption trends, an assessment of the economics of Scottish wind power and on using offshore wind farms as part of the pension planning of individual investors. Articles on global average temperatures in spring 2008 and UK government energy policy complete this newsletter.

My new book *Ten Technologies to Save the Planet* will be available in the UK from early November. Some of the articles in this newsletter, for example the commentary on biochar and on fuel cells, form the basis of chapters in this book. I am very grateful to readers of this website for their comments which helped me improve my understanding of what I think are the ten best global opportunities for cutting emissions.

Now that the book is safely at the printers, I hope to revert to publishing more articles on topical issues in climate change on a much more frequent basis.


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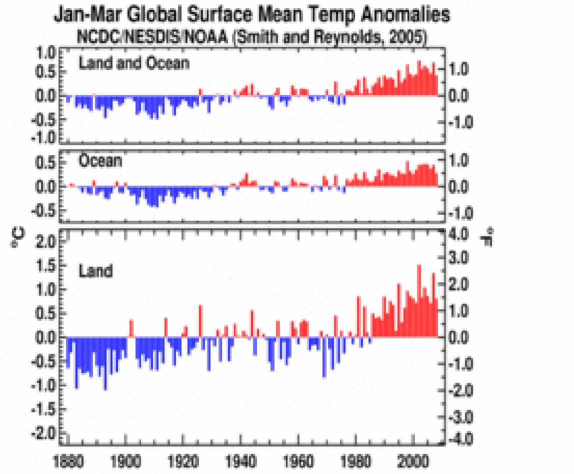
*Ten Technologies to Save the Planet*, a popular science book on low-carbon technologies, will be published by Profile Books on 6 November.

## The global warming ‘standstill’




Nigel Lawson and others are suggesting that temperatures have 'stabilised' since the late nineties. 1998 saw the highest global average temperature and only 2005 has closely matched it. Since no year since 1998 has exceeded the record, some commentators are saying the global warming has stopped. The implication, sometimes stated, sometimes not, is that the increasing rate of growth of CO2 concentration is having no effect on temperature.

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The sceptics have also written extensively about what they saw to be an extremely cold northern-hemisphere winter. The Sunday Telegraph commentator Christopher Booker called it 'the winter from hell'. To those unconvinced by the man-made climate change hypothesis, this is further evidence that climatologists don't understand how CO2 affects temperature.

Both UK and US sceptics are too influenced by climatic conditions in America. Although parts of the United States did have an unusually cold winter, global temperatures have been high.

Here is the summary from the US National Climatic Data Centre of northern winter averages:

> The combined global land and ocean surface temperature was the 16th warmest on record for the December 2007-February 2008 period (0.58°F/0.32°C above the 20th century mean of 53.8°F/12.1°C). The presence of a moderate-to-strong La Niña contributed to a boreal winter and February temperature that were the coolest since the La Niña episode of 2000-2001.

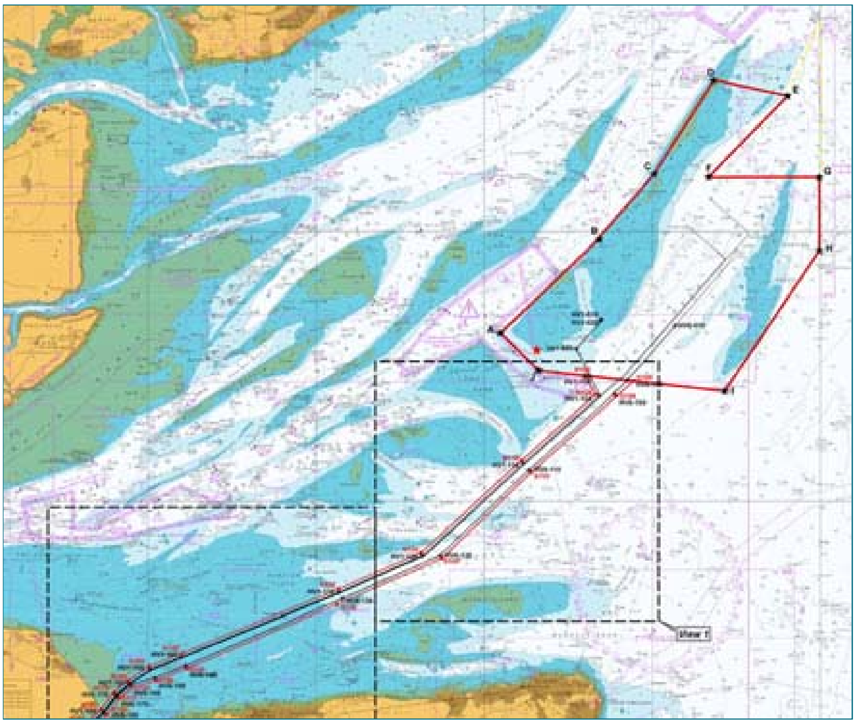
Although the period was the '16th warmest', it was still the coldest for several years. But March was very much warmer. Here is what the NCDC says about this month:

> The global surface (land and ocean surface) temperature was the 2nd warmest on record for March in the 129-year record, 1.28° F (0.71° C) above the 20th century mean of 54.9° F (12.7° C). The warmest March on record (+1.33° F/0.74° C) occurred in 2002.
>
> The global land surface temperature was the warmest on record for March, 3.3° F (1.8° C) above the 20th century mean of 40.8° F (5.0° C). Temperatures more than 8° F above average covered much of the Asian continent. Two months after the greatest January snow cover extent on record on the Eurasian continent, the unusually warm temperatures led to rapid snow melt, and March snow cover extent on the Eurasian continent was the lowest on record.

Without the continuing (but weakening) La Niña event, the global average sea and land temperature would almost certainly have been the warmest on record in March. 1998 was an extreme anomaly, with temperatures in the US over 1 degree C higher than the previous year. This was driven by a strong El Niño and there is no reason to suppose that the next El Niño event will not produce an even higher temperature.

Climate change sceptics need to get out more. April snow in southern England or in New York does not mean climate change has stopped. Any talk of 'stabilisation' is premature.

# A public share offer is the right way to fund the gap in the financing of the London Array*



Offshore location map of the London Array. Click on the image to see a more detailed map from the London Array website (opens as a PDF).

Shell backed out of its commitment to provide the financing for one third of the world's largest offshore wind farm off the Kent coast. The London Array, expected to cost about £2bn, now needs to find a new investor. What about tapping the public? The project has reasonable economics, and private individuals could benefit from 40% tax relief by putting shareholdings into pension plans. Perhaps as importantly, such a move would raise understanding of renewable energy generation among the wider community.

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The London Array is a proposed wind farm, located over 12 miles off the Kent coast in south-eastern England. Up to 340 large turbines will produce up to one gigawatt in strong winds. Actual production, taking into account periods of low winds, will average about 400 megawatts, equating to about 1% of total UK electricity needs. This is by far the largest offshore wind farm in the world.

The project has now finally succeeded in obtaining most of the consents and planning permissions necessary to build the farm and bring its electricity onshore to link to the high-voltage backbone of the grid. The remaining backers, E.ON and DONG Energy of Denmark, still face huge hurdles. Few manufacturers make turbines that can survive offshore conditions. Only a small number of vessels are available worldwide to construct the foundations of the turbines.

Nevertheless, the project should have acceptable financial returns. Much can go wrong, but a simple model shows that dividends should meet the requirements of most individual investors.

First, let's examine the financial characteristics of the wind farm:

1. Shell was due to put down one third of the money. The costs of this project have escalated substantially, but I assume that Shell's withdrawal has left a hole of about £700m, including payments to the remaining consortium members for their efforts so far. Wind farms can be partly financed by debt – perhaps in a ratio of £300m debt to £400m shareholders' investment in this case.
2. If the debt costs 7%, then servicing will be about £21m per year.
3. We cannot know accurately what the annual maintenance charges will be. A small onshore wind farm has operating and maintenance costs of about 15-20% of revenue. Expressed as a percentage of revenue, it seems unlikely that this huge project will have higher costs.
4. Projected electricity generation is about 3,200 gigawatt hours. At typical electricity prices of about £45-50 per megawatt hour, the output from the entire project will be worth about £150m a year.
5. This is less important than the money generated from Renewable Obligation Certificates. New rules mean that the farm will attract 1.5 ROCs per megawatt hour. At current ROC prices of about £50, the value of the output of the London Array will be approximately £240m.

We should be clear: neither the electricity price, nor the ROC value, is guaranteed. The price of ROCs is entirely dependent how much renewable energy is produced expressed as a fraction of the government's target which rises over the years. The London Array is so large a project that its arrival will affect this ratio and this will push down the price. Nevertheless, forecasts of renewable generation still strongly suggest that the future price of ROCs will continue to be buoyant. In other words, there is little likelihood that the percentage of all electricity derived from renewable sources is never likely to rise fast enough, even with the Array, to cause a crash in the price of ROCs.

If private investors bought a one-third share in the project, the outline finances would look approximately like this for the first year of full operation. I have not included fund raising costs:

| | |
|---|---|
| Investment | £700m |
| *Of which – debt* | *£300m* |
| *Shareholders' investment* | *£400m* |
| **Yearly sales** | |
| Electricity | £50m |
| ROCs | £80m |
| Total | £130m |
| **Costs** | |
| Maintenance | £13m |
| Other operating costs | £8m |
| Yearly operating profit | £109m |
| Interest | £21m |
| Depreciation over 25 years† | £28m |
| Money available for shareholders | £60m |
| Potential return on investment (before tax) | 15% |
| After corporation tax | 10.5% |

† This is not a cash cost, but can be used to generate a sinking fund that repays the debt and then the full investment after 25 years, with interest.

There are many questionable assumptions in this illustrative calculation; but it shows that to a private investor the returns may be acceptable. The income would be more attractive if the individual's shares were placed in a pension fund. Such an investment would allow the higher-rate taxpayer to reclaim 40% of the cost of his or her investment, raising the effective return to 17.5%.

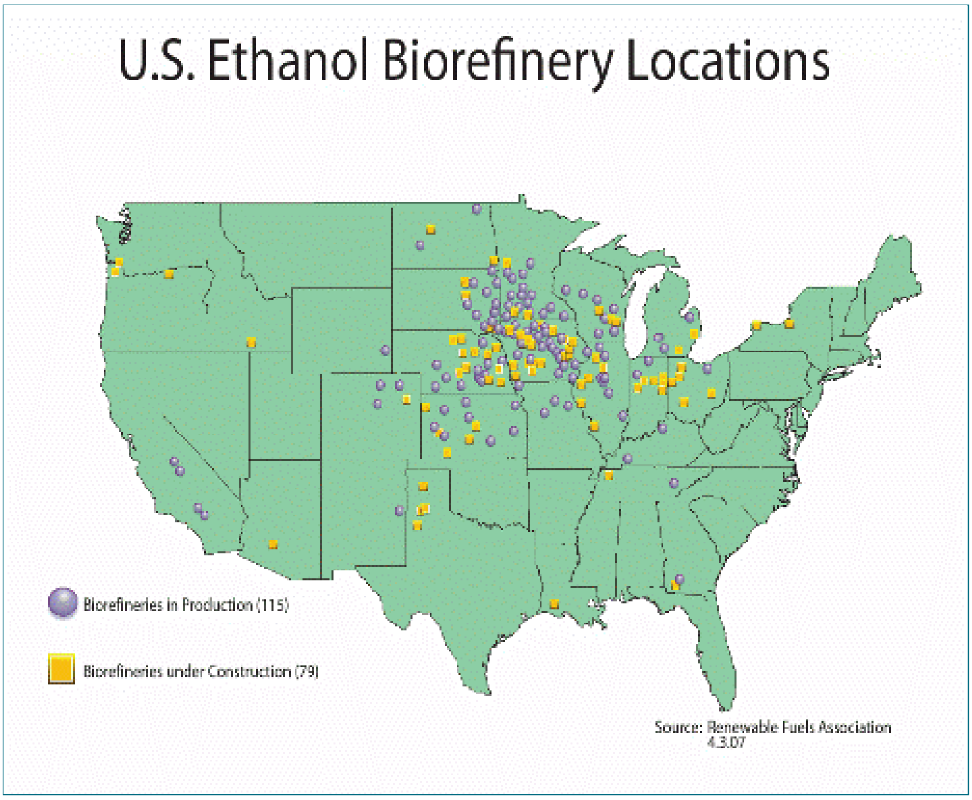
What does this mean for a 40-year-old investor putting money into the London Array for 28 years (a three-year construction period plus a twenty-five-year operating life) as part of pension planning? My very rough calculations suggest that an investment of £10,000 wrapped into a pension fund that accumulates all the payments from the Array would multiply the investment over 15 times after tax relief. I make the assumption that ROC and electricity prices stay constant and that the cash accumulating in the pension fund only earns 5% return. For the boffins reading this article, this is a real internal rate of return of well over 10% a year.

From the individual investor's point of view, these figures ought to be reasonably attractive. There are substantial risks, such as cost overruns during construction and falling ROC prices, particularly during the latter half of the project life. But they are partly matched by the possibility of the Array realising higher electricity prices, and ROC prices rising over the next few years. An investment will also act as a hedge for the individual investor against rising retail electricity prices.

This quick look at the economics of the London Array shows why Shell backed out. The returns don't match what it can hope to achieve getting oil out of the Alberta tar sands or in onshore wind projects in the US. Nevertheless, it also demonstrates that, properly packaged, the Array should be able to attract money from individual investors.

* The idea of using private investors' money to plug the gap left by Shell was proposed by Phil England, climate change journalist. I am very grateful for permission to write about his idea.

# Are biofuels responsible for the sharp spikes in food costs?




The world has decided that much of the blame for the rising cost of foods can be ascribed to the use of grains for biofuels. The case for the prosecution is simply made. About one hundred million tonnes of maize from this year's US crop will be diverted into ethanol refineries, an increase of a third on 2007's figure. The maize used for ethanol represents almost 5% of global production of all types of grain. One in twenty cereal grains produced in the world this year will end up in the petrol tank of US cars. Other countries are also pushing ethanol, but the US has moved most aggressively to increase the use of food for fuel.

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As we are all increasingly aware, world demand for cereals has recently exceeded the available supply. FAO estimates suggest that the world ran down its stocks of grains by about 50 million tonnes during the last year. The 100 million tonnes of maize to be used by US ethanol refineries in the next year is double last year's global grain shortfall. Without ethanol production, supply would exceed demand and price inflation would have been kept in check. The IMF largely agrees with this view, saying that growth in biofuels has caused 70% of the increase in maize prices over the last few years. The effect is not limited to maize. Price rises in one commodity inevitably spill over to other crops. Farmers switch out of producing wheat and other grains as the price of corn rises, reducing the supply of other cereals. Similarly, increasingly expensive corn encourages food manufacturers to switch to other grains, and livestock producers to feed their animals with other foods. Soybeans, for example, are used for cattle feed when the price of corn goes up. The IMF thinks that 40% of the inflation in soybean costs is directly down to the expansion in biofuels around the world, even though ethanol cannot be made economically from beans. Other studies also suggest strong linkages between the growth of biofuels and commodity price inflation. One witness appearing before the US Congress in early May said that increases in biofuel demand since 2000 had caused 39% of the rise in corn prices.

So can we confidently convict biofuels of the charge of causing a very large part of the spikes in food prices? Yes and no. Few will dispute that biofuels have made the problem worse, but the roots of food price inflation are far more diverse than we might think. And, if anything, these other causes should make us even more uncomfortable about the future balance of supply and demand for food.

The first counter-attack is led by the US ethanol industry. It points out that American refineries are using far less corn than is needed to meet the increasing demand from Chinese consumers for meat. One lobbying document points out that Chinese meat consumption per person has doubled in the last decade or so, rising almost to European levels. This increase has required an extra 200 million tonnes of grain to feed the animals, twice what will be used this year in American ethanol refineries. Since it takes an average of about five kilos of feed to create one kilo of meat, increasing Asian prosperity is diverting vital grain from the poorest citizens, both in Asia and elsewhere. Many independent commentators agree with the thrust of this argument. FAO data shows more grain going to feed animals in the last ten years, although the numbers are much less alarming than the US ethanol industry suggests. The total amount of grain being used for animal feed has risen by about 100 million tonnes in the last ten years, compared to an increase of only 70 million tonnes in the amount used for human food consumption.

This leads on to a second point. Underlying the food price inflation of the last few years is an even more worrying trend. Agricultural productivity is simply not growing fast enough. US government data shows yields per hectare rising 2% a year between 1970 and 1990 and then falling to 1.1% over the succeeding period. Productivity enhancements over the next ten years are expected to average less than 1% a year. Since world population growth is averaging somewhat over 1%, we are heading for global hunger, with or without biofuels. We can see this in production data from the FAO: the amount of available grain for every person in the world edged downwards last year. The world can try to compensate for faltering productivity growth by expanding the area given over to crops, but this runs the risk of increasing the rate of worldwide deforestation, already causing a fifth of global CO2 emissions.

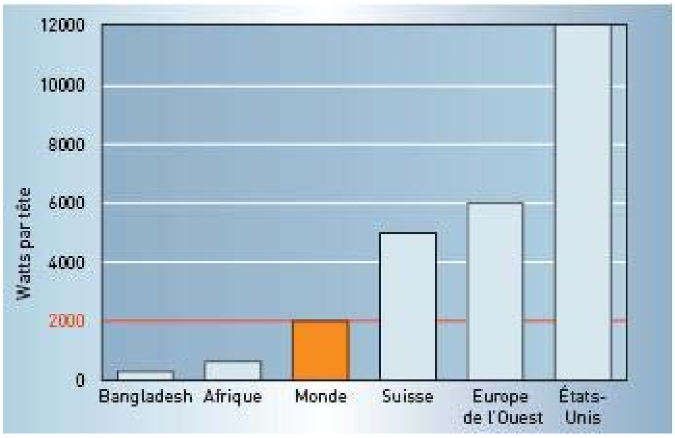
Another piece of expert testimony to the US Senate in early May should wake us to a further issue. Government legislation in the US and the European Union – as well as large amounts of subsidy – may have created the ethanol industry but the refineries can now stand on their own financial feet. With oil at $120 a barrel, it is very profitable to turn the starch in maize into motor fuel. Simply put, food is worth more as petrol than it is on the table. The only way of stopping farmers selling their grain to the refineries is to introduce an outright ban on adding ethanol to petrol. As Professor Babcock said in his testimony, 'agricultural commodity prices and gasoline prices are now inextricably linked through existing ethanol plants and the knowledge of how to convert corn into transportation fuels.' Other researchers have shown a similar linkage between increasing sugar costs and high oil prices. Like corn, sugar cane can be turned into biofuel.

At today's oil prices, the 600 million wealthy car owners in the world can comfortably afford to outbid the rest of the world's 6 billion people for the globe's food resources. Professor Babcock's estimate is that immediately reversing all forms of US government support for biofuel production would mean a fall of only a fifth in ethanol production. He says that the high level of continued demand for maize even after subsidies have been removed would mean that prices would only fall by 13%, a trivial change compared to the tripling in corn prices since 2002. If he is right, there is only one conclusion. The IMF may be correct that the push into biofuels caused much of the world's recent food price inflation. But now that we know how to make ethanol efficiently from foodstuffs, it is sky-high oil costs that are keeping up the price of agricultural commodities. For a sustained reduction in food prices, we need oil prices to fall to much lower levels, thus removing the incentive for producers to convert crops into ever more valuable fuels. Lower oil costs would also reduce fertiliser and diesel expenses, helping to restrain the upward march in agricultural prices.

The tiny number of remaining biofuels advocates around the world argue that by substituting for gasoline corn ethanol does help reduce oil consumption. Unfortunately, it is a very bad exchange. America's use of corn for ethanol absorbs 5% of the world's cereal crops but has replaced less than 1% of global oil use. The unpalatable truth is that is that it only through a long, sustained and probably painful attack on oil consumption that the world can hope to reverse the spiral in food prices.

A version of this article was published in the *Guardian* on Friday 30 May 2008.

# UK energy demand




Elizabeth Kolbert looked at the Swiss 2,000-Watt Society project in the *New Yorker* of 7 July. Her interviewees provided estimates of the energy use of the typical Swiss inhabitant. The figures added up to about 5,000 watts. To be clear, this means each person is responsible for about five kilowatts of continuous energy use. This includes home electricity and gas, personal transport, industry, and office. To keep us in the ease and comfort we have got used to we are consuming, directly and indirectly, enough energy to keep two electric kettles boiling continuously, or driving a fuel-efficient car four hours in every day.

This article looks at the composition of energy demand in the UK. The figures are then broken down by sector and by fuel. The numbers are used in the introduction to *Ten Technologies to Save the Planet* (Profile Books, November 2008), where I try to assess whether we are likely to be able to use technology to reduce fossil fuel demand substantially.

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Over a year, continuous energy use of five or six kilowatts by the typical European means a total consumption of around 50,000 kilowatt hours per person. (A kilowatt hour is power of one kilowatt maintained for one hour. There are 8,760 hours in the year.) The figures for North America are approximately double the European level. Japan is lower than Europe, and the fast-industrialising countries of Asia and elsewhere are lower still, at perhaps a quarter of the European level.

The 2,000-Watt Society project is an initiative to try to reduce European consumption down from five or six kilowatts (5,000 to 6,000 watts) down to 2,000 watts, a reduction of up to two-thirds from current levels. Even 2,000 watts is probably incompatible with stable global temperatures if the world achieved this level and still used fossil fuels. The 2,000-Watt Society project thinks that no more than a quarter, or 500 watts, can come from use of non-renewable carbon fuels.

So the engineers backing the 2,000-Watt Society think that the world needs both to use less energy and ensure that three quarters of the reduced amount of energy supplied to homes and businesses is provided by sources other than fossil fuels. Any sensible set of public policies will certainly try to find ways of reducing the total demand for energy in the modern economy as well as minimising the use of non-renewable sources of fuel. However, some societies may decide that the continuation of normal life requires large amounts of continuing energy use. What really matters is not the precise figure for total energy need but rather that we find the best ways of almost completely phasing out the use of fossil fuels.

It is not just about energy use. Global warming gases are also produced by the way we use the world's lands. In addition to decarbonising energy use, we will also be obliged to reduce the emissions of $CO_2$ from deforestation and agriculture and radically cut the production of the main other greenhouse gases, such as methane and nitrous oxide, from agriculture.

The table below gives approximate figures for the amount of continuous energy use per person in the UK. This table and the others in this article are generated from numbers contained in the compendious *Digest of United Kingdom Energy Statistics* ('DUKES') published by the UK government.

**Table 1**

| Energy source | Average continuous use per person (watts) |
|---|---|
| Electricity | 1,900 |
| Gas | 1,400 |
| Coal | 150 |
| Oil | 1,650 |
| TOTAL | 5,150 (i.e. 5.15 kilowatts) |

Of course, electricity is not itself a fossil fuel, but most power is generated from carbon-based sources, of which the most important are gas and coal. In the UK, almost 80% of coal and about a third of the gas used is employed in power stations to make electricity. I have calculated the amount of other fuels used to make electric power and then allocated these numbers to electricity. It is important to do this because much of my book, *Ten Technologies to Save the Planet*, deals with alternative, non-carbon, means of generating electric power.

Almost half of all energy use is a direct consequence of how individuals run their lives.

**Table 2**

| Energy use by sector | Average continuous use per person (watts) |
|---|---|

| | |
|---|---|
| Individuals at home and in personal travel | 2,400 |
| Offices and commercial activities | 1,050 |
| Industry | 1,700 |
| TOTAL | 5,150 (i.e. 5.15 kilowatts) |

It may be easier to replace fossil fuel sources in the home and in personal transport than in many industrial applications. For example, in my book, the chapter on electric cars shows how we should be focusing on switching to vehicles powered by batteries. Natural gas use for home heating can be replaced by renewable liquid fuels in fuel cells or by biomass-based district heating plants. Or we can use electric heaters.

Other chapters look at how fossil fuel electricity can be replaced by renewable sources such as wind and solar power. The remaining coal and gas power stations can be equipped with carbon capture plants. The figures below show approximately how the energy directly used by individuals in the UK is split between various activities.

**Table 3**

| Energy use by individuals | Average continuous use per person (watts) |
|---|---|
| Electricity in the home | 650 |
| Gas in the home | 850 |
| Car use | 550 |
| Aviation | 250 |
| Oil use | 100 |
| TOTAL | 2,400 (i.e. 2.4 kilowatts) |

Eight of the ten technologies assessed in the book will help reduce the use of fossil energy sources. Acting together, they can replace the large part of existing energy sources. A single large wind turbine in a good location can typically substitute for the total energy needs of about five hundred people. Of course the wind doesn't blow all the time, and the chapter dealing with this technology looks in some detail how we can cope with unreliable sources such as this.

Decarbonising our sources of electricity is relatively simple challenge. Renewable electricity is well understood, and we will learn how to capture carbon from power plants, although widespread adoption of the technology is at least a decade off. Combined heat and power plants, whether using renewable fuels such as cellulosic ethanol or woody biomass, will also contribute substantially.

Reducing gas demand by a large percentage is more difficult. The cheapest route will be through improved building insulation but fuel cells and district heating plants will also have a role to play. Additionally, it may make good sense to use renewable electricity and replace gas for heating of homes and other buildings.

Most oil is refined into diesel and petrol and used for transport purposes. We can replace oil with cellulosic ethanol for petrol-driven cars, and switch to electric vehicles for many forms of transport. We will not find it as easy to replace aviation fuel or diesel for heavy vehicles. Although plant-based diesel substitutes can be made from any oil-bearing seeds, biodiesel is problematic because its production generally involves the switch of either virgin forest or crop-producing land. Cutting down forests to make fuel has a substantial carbon cost and reducing the food production area in order to meet the demand for diesel has obvious detrimental effects. It may be that we will eventually be able to create bio-kerosene in huge refineries without using oil seeds as a feedstock, but the search for a sustainable source of jet fuel has made little progress as yet.

**Table 4**

| Energy source | Replacement technologies |
|---|---|
| Electricity | • Renewable electricity (wind, solar, marine)<br>• Carbon capture and storage |

| | |
|---|---|
| | • Combined heat and power (fuel cells using ethanol and district heating) |
| Gas | • Combined heat and power (fuels cells using ethanol and district heating)<br>• Building insulation technologies |
| Coal | • Most of the relatively small amount of coal not used in power generation is employed in the manufacture of metals. Switching to non-carbon sources is difficult. |
| Oil | • Cellulosic ethanol as transport fuel<br>• Electric cars<br>• Fuel cells in some commercial vehicles<br>• Possibly algae derived from carbon capture plants |

In addition to reducing the total amounts of oil, coal, and gas needed, we can expect to see a switch towards electricity and away from the 'primary' fuels extracted from the earth's crust. If our cars are eventually powered by batteries and not petrol, we will need to increase the total amount of electricity generated. Similarly, it may make good sense to heat many of our buildings using electricity, rather than gas or oil.

**Table 5**

| Energy source | Average continuous use per person (watts) | One suggestion to potential future switches between fuels |
|---|---|---|
| Electricity | 1,900 | +100 watts car travel<br>+400 watts home heating |
| Gas | 1,400 | -350 watts home heating as some gas heating is replaced by electricity |
| Coal | 150 | |
| Oil | 1,650 | -300 watts as many cars switch to batteries<br>-100 watts as homes switch from oil heating to electricity |
| TOTAL | 5,150 (i.e. 5.15 kilowatts) | -350 watts reduction to 4,800 watts |

Why does oil use fall by 300 watts as car travel is powered by batteries, but electricity use only increases by 100 watts? The reason is that cars powered by internal combustion engines are must less efficient than battery powered electric cars at transferring energy into motion. The same amount of driving requires less energy.

The impact of the technologies discussed in my book will depend on the assiduity with which they are pursued, the price of fossil fuels, and the level of any carbon tax. They could replace a large fraction of all existing carbon-based energy use. There are two main exceptions to this conclusion:

- Some liquid fuels for transport, particularly including kerosene for aviation.
- Large scale heat requirements in industry. Manufacturing processes sometimes require huge amounts of heat. Gas and oil currently provide the large majority of this energy need. Although electricity can substitute for gas and oil in some applications, industry will continue to use fossil fuels.

**Table 6**

| Estimates of how much energy use cannot be conveniently replaced by the technologies discussed in my book | Approximate continuous use per person (watts) |
| --- | --- |
| Gas and oil use in industry | 315 (50% of current figure for industrial gas and oil use) |
| Aviation | 313 |
| Shipping | 100 |
| Heavy road transport | 236 |
| Diesel use on railways | 16 |
| TOTAL | 980 (or slightly less than one fifth of today's total energy use per person) |

So even if we successfully replace fossil fuels in all home uses, we are left with a minimum of nearly 1,000 watts of energy use that is difficult to replace with non-carbon energy. To get to a net figure that corresponds to the 2,000-Watt Society's recommended level of 500 watts of fossil fuel use, we will therefore need to find ways of offsetting, or counterbalancing, the irreplaceable emissions from transport and industrial use.

We could choose to offset the remaining emissions by ensuring that the total forested area of the planet is continually increased. Reforestation will extract carbon dioxide from the air and trap it in wood. Or we could increase the levels of carbon in the world's soils. The last two chapters of my book on biochar and soil improvement demonstrate that this is relatively easy and probably not expensive although it will undoubtedly be difficult to organise on a large scale. Of equal importance to the climate change benefits, storing more carbon in the soil will probably improve the agricultural productivity of the world's land, increasing the amount of food that can be harvested.

How much extra carbon do we need to store in the soil to offset completely 1,000 watts of fossil fuel energy so that the total amount of carbon dioxide in the air remains the same? This calculation is quite simple. Much of the remaining fossil fuel consumption will be of oil (primarily for aviation and heavy road vehicles). 1,000 watts of oil consumption implies a total of 8,760 kilowatt hours a year. This amount of energy would mean using about 800 litres of oil, which would add about 2 tonnes of $CO_2$ to the atmosphere when burnt, containing somewhat less than 600 kg of carbon.

The chapters on soil improvement and biochar in *Ten Technologies to Save the Planet* suggest that we can reasonably aim to supplement soil carbon levels by 1%. We need less than 100 square metres (ten metres by ten metres) for a 1% improvement in soil carbon levels to offset completely all the emissions from 1,000 watts of a year's continuous fossil fuel use. Even the UK, which is one of the most densely populated countries in the world, could offset the emissions from 1,000 watts from every person in the country for nearly 35 years by adding 1% to the levels of soil carbon in the country's soils. In other parts of the world, the numbers would be even more striking: Australia could sequester the carbon from 1,000 watts of fossil fuel use for several thousand years just by improving soil carbon levels by 1%.

No single technology will provide us with the solution. We need to make progress across a number of fronts. I hope that the important conclusion of my book is that technological advances are making it possible for our societies to continue to have access to the ease and convenience of energy without imposing the huge costs of runaway global warming on our descendants.

# The Great Glen Energy Co-operative

Westmill Wind Farm Co-op, Watchfield, Oxfordshire. Photo credit: http://www.energy4all.co.uk.

Community-owned wind farms are a rarity in the UK, despite their popularity in other parts of northern Europe. So should we welcome an opportunity for individual investors to invest in a newly built wind project in northern Scotland? Yes and no. The prospectus promises reasonable returns. But the protections to investors are limited and the information about the mechanism by which shareholders get their returns is sadly lacking. Even enthusiasts for individual investments in wind power need to be very cautious about investing in the Great Glen Energy Co-operative.

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Buy a share in a conventional company and you normally acquire a right to participate directly in its success or failure. The Great Glen Energy Co-operative is different. It is raising up to £1.8m so that it can buy what it calls a 'Royalty Instrument'. The Great Glen prospectus says that this Instrument gives the company the right to some of the profits from a big new wind farm, owned by an unrelated third party, Millenium, a wholly-owned subsidiary of Falck Renewables. This is a financial contract that gives the holder payments dependent on the performance of the third party. In effect this is a 'derivative' arrangement.

There's nothing necessarily wrong with this scheme. If a reasonable share of the profits of the wind farm flow to Great Glen and its shareholders, no one will complain. But the Great Glen prospectus is very unusual. It states that the company is trying to raise £1.8m but it never actually says what rights the Instrument is buying with this money. You would expect that the prospectus might say that the £1.8m buys, for example, a 3% share in the profits of the Falck wind farm. But the prospectus makes no such statement. It does contain a simple financial table that provides an illustration of the returns to members, but provides very little detail on how these projected returns are calculated. At one point the prospectus implies that the backers of the Great Glen Co-op do not even know the price which Falck believes it will obtain for the electricity from the wind farm. Frankly, anyone putting money into the Great Glen Co-op is investing on trust.

The table of projected returns shows shareholders in Great Glen achieving an average yearly return of 10% on their money over the 25-year life of the wind farm. The prospectus further states that the parent company, Falck Renewables, guarantees a minimum return of 6.5% per annum, even if the wind farm itself is unable to pay its obligations under the Royalty Instrument. Based on today's wholesale power prices, I calculate that the returns to Falck from this investment are about 27%, vastly greater than the returns offered to Great Glen investors.

I have asked Great Glen and its backers for details of what the Royalty Instrument is buying and how the projections in the prospectus are calculated. I have been told that all the terms of the Instrument are confidential. Shareholders and potential investors are not entitled to know any of its contents. This means that even simple questions about the risks and returns to Great Glen shareholders cannot be answered. Here's a list of entirely reasonable queries which potential investors in Great Glen will never know the answer to:

- a) What share of the profits of the Falck wind farm is Great Glen entitled to?
- b) What assumption is made about the sale price of the electricity generated from the site?
- c) What happens to shareholder's returns if the price of electricity falls from today's historically high levels?

- d) What would be the impact of a fall or a rise in the price of Renewable Obligation Certificates, the second principal source of revenue from a wind farm?
- e) Is the return to Great Glen 'geared' in any way to the performance of the wind farm? If, for example, Falck decided to raise a substantial amount of debt secured on the wind farm's revenues, would this affect the flow of cash to Great Glen?

These are crucially important questions, vital to an understanding of the likely financial performance of Great Glen. Great Glen's backers, Energy4All, told me that one of the reasons was that the Royalty Instrument contained intellectual property that Falck wanted to keep secret. Energy4All also says that Falck insisted that the full wind speed projections for the wind farm site were confidential, although the average projected wind speed is contained in the prospectus. So outsiders cannot even check that the projected electricity generation figures for the site are reasonable.

These are serious issues, particularly since the Great Glen investment opportunity is targeted at ordinary people living close to the wind farm and not professional investors. But perhaps more important, I am concerned that the prospectus is misleading in the way it describes the investment. The prospectus implies that the offer enables investors to own a stake in the wind farm. For example, it states that:

- a) 'Great Glen Energy Co-op was established in 2008 for the specific purpose of owning a stake in a wind farm being constructed in the hills north of Invergarry in the Great Glen, Scotland'.
- b) 'Falck wished to offer a degree of local public involvement in the Project and approached Energy4All at the beginning of 2003 to explore the idea of offering partial ownership of the Wind Farm to local people'.
- c) 'The Royalty Instrument provides Great Glen Energy Co-op with the right [...] to purchase a stake in the Wind Farm'.
- d) 'The Royalty Instrument Agreement provides for a[n] interest in the Wind Farm [...]'.
- e) 'Falck approached Energy4All at the beginning of 2003 to explore the idea of offering partial ownership of their Wind Farms in the North of Scotland'.
- f) 'Community ownership of part of a wind farm is good from a social and environmental perspective'.

It seems to me that actually the Royalty Instrument does not give the Great Glen investors a stake in the wind farm. Rather, it provides for Great Glen to have certain rights over a portion the cash flow from the operation. This is very different from owning a share in the business itself. Falck remains in total control of the wind farm. In particular, as far as one can tell, it can sell the wind farm at any time and simply repay the money invested by Great Glen. It also appears to be able to raise debt secured on the wind farm without restriction, and the bankers involved could refuse to allow further payments to the Co-op. (Falck has however guaranteed the minimum return of 6.5% if this happened.)

These are very unusual terms for people who have a 'stake' in a business. I think it would be much more accurate to say that the Great Glen shareholders are, in effect, unsecured creditors of the wind farm company, ranking behind banks and other financiers. This would be acceptable if fully explained to shareholders and if Great Glen shared in the upside if the wind farm did well. But the upside appears to be limited: although Great Glen appears to benefit if electricity prices rise (though we don't know this for sure), shareholders will not benefit if the wind farm is sold at a profit.

This is an attractive deal for Falck. The Great Glen investment gives it the prospect of cheap financing (the guarantee of 6.5% is far less than it would pay for unsecured debt in today's capital markets) and it appears to have unrestricted rights to sell the wind farm or to load it with debt at any debt, much like a householder might remortgage a house. (I may be exaggerating the poor quality of the protection afforded to Great Glen, but the lack of detail in the prospectus makes it impossible to tell.)

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Energy4All has responded to these criticism by saying, inter alia, that I am wrong to focus on Falck and Great Glen. Falck is the only significant wind farm developer in the UK willing to grant any participation to community interests. It is therefore unfair to comment unfavourably on their arrangements with Great Glen. I hesitate to say this because of the admiration I have for Energy4All, but I think that this is the wrong attitude. Although the Great Glen arrangement may have been the best one Energy4All could obtain from Falck, this does not make it necessarily a good deal or one that is robust enough to present to private individuals.

# Yes, do lag your loft

For once, the government has got its climate change policies right. The idea of a windfall tax on energy suppliers has widespread support. One hundred or so Labour MPs have come out in favour. Caroline Lucas, the newly elected leader of the Greens, has advocated such a policy and many Conservatives express private approval. The trade unions were infuriated by Alistair Darling's refusal to back the proposal. Rather than backing a windfall tax, it looks like he favours plans that oblige the utilities to improve the energy efficiency of customers' homes.

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If you were prime minister and faced the need to cut UK greenhouse gas emissions by at least 80%, which policy would you support? Taxing the high profits of the energy companies or obliging them to invest a £1bn in energy-saving measures targeted at the houses with the worst insulation? Put this way, there shouldn't be much argument. If we are to reduce CO2 output, the government must focus on improving the dreadful waste of energy in British homes. Our houses are far more important emitters of greenhouse gases than our car or even our holiday flights. About 25% of UK emissions come from running our homes, most of them badly insulated and leaky. The scope for improvement is immense.

By contrast, applying an unexpected windfall tax might actually increase emissions. The current profits of the utilities are going to be partly used to make the huge investments in renewable energy that we urgently need. E.ON, for example, faces the need to find at least £500m to build its share of the 1-gigawatt London Array, the biggest offshore wind farm in Europe. A raid on its bank account by the Treasury is not going to help E.ON pay for the new turbines.

If our only interest is climate change, Darling's focus on energy efficiency is absolutely appropriate. The proposed £1bn home insulation scheme is the nucleus of a set of policies that might start reducing domestic energy use. About 8 million homes in the UK don't have cavity wall insulation. Almost all households could profitably improve their loft insulation. Full double-glazing would benefit a large percentage of UK homes.

In fact, eco-renovation is probably the most effective and cheapest way of reducing UK energy use. Simple measures will cut 30-50% from the heating bills of most homes. We should welcome Darling's proposals. In fact, we need to encourage the government to go much further, copying the German government's commitment to improve the energy performance of its entire housing stock by 3% a year. Backed by grants and soft loans, the German scheme is substantially reducing energy use in over 200,000 homes a year. Many of the most successful schemes have reduced energy use by nearly 85%. We could easily do the same in the UK. It might also pull a hundred thousand people into good jobs.

'But what about fuel poverty?' people will say. Twenty thousand more people die in the UK's winter than in summer, many because of inadequate indoor temperatures. Shouldn't the government's real priority be to increase the affordability of gas and electricity above every other objective so that people can heat their homes? No: it actually makes far more financial sense to improve the energy performance for decades to come than to temporarily reduce the price of fuel. A targeted investment of a few hundred or even a thousand pounds will typically pay for itself within three or four years in lower fuel bills. It may seem harsh, but this is far better than a short-run discount on prices.

Environmental groups led by Green Alliance have complained last week that the main political parties have begun to ignore climate change as they focus on the financial pressures faced by householders and business. Darling's policy of not subsidising fuel costs or arbitrarily penalising the energy companies is a striking counter-example. He should be congratulated for his courage, not criticised for his inhumanity or berated for his obeisance to big business.

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**Companies mentioned in this newsletter: Shell, E.ON, DONG Energy, Great Glen Energy Co-operative, Millenium, Falck Renewables, Energy4All.**