WINDFARMS – RAPE OF THE COUNTRYSIDE OR SALVATION OF THE WORLD?

This article goes to the heart of the debate about the role of wind energy in electricity generation. The question posed is the reason why groups like Greenpeace and Friends of the Earth, who passionately believe in conserving the biosphere, often find themselves at loggerheads with organisations such as National Park Authorities, the Council for the Protection of Rural England, or Friends of the Lake District, who believe no less passionately in our landscape heritage. So how has this strange dichotomy arisen when we should all be playing the same tune?

Reminders of vanishing rain forests, poisoned rivers, melting ice caps and endangered species are constantly in the media, feeding the passion we all feel about the state of the natural world. We all agree that more needs to be done to put matters aright. The disagreements arise over what needs to be done and there is a particular argument over the role wind energy can play. This article examines this last issue as it applies to the UK. It draws on data from the Department of Trade and Industry (DTI), from the British Wind Energy Association (BWEA), the National Grid plc (NGplc), British Nuclear Fuels Ltd (BNFL), the Meteorological Office, and some wind farm companies. It presents the case, using a critical analysis of the facts rather than any preconceived prejudice either for or against wind energy, against the destruction of Britain's landscape by wind turbines.

To understand the role of wind we first need information about electricity generation and consumption. Table 1 shows the sources of our electricity as a percentage of the total from 1990 and gives projections until 2020. It clearly shows the effect of the run down of coal and nuclear power stations. These provided 84% of our electricity in 1990 but will provide only about 10% by 2020.

Table 1: Britain's electricity sources in the recent past and estimates to 2020 (e = estimated)
[Based on data from the DTI web site]

ELECTRICITY SOURCE	PERCENTAGE IN THE YEAR SHOWN			
	1990	2002	2010e	2020e
Coal	64	27	12	3.5
Nuclear	20	22	15.6	6.8
Oil	8	0.5	Nil	Nil
Imported electricity	7	5.5	3.9	2.8
Renewables	1	3	9.9	11.9
Natural gas	nil	42	58.6	75.0

Expressing these figures as a percentage, however, hides a vital factor, namely that electricity consumption is steadily rising. It rose throughout the 1990s at about 1.5% each year. The DTI expects it to go on rising at this rate until 2010 and then to slow down to about 0.7%. On this basis, by 2020 we will need about 26% more electricity compared with 2000 (Figure 1). The anticipated closure of most nuclear plants also means that about 20% of our current energy supply will vanish by then, giving a total shortfall of around 46%. This understates the true figure because also during this time most of the remaining coal-fired power stations are due to close.

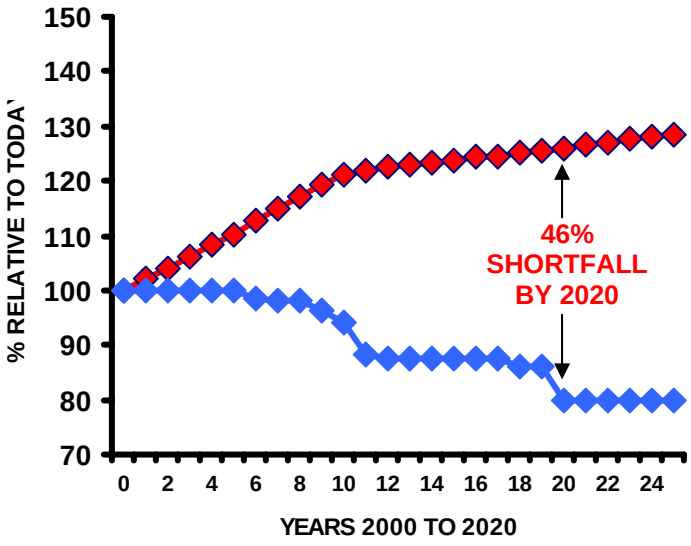

Figure 1: Projected rise in electricity demand based on DTI data (red line) and the loss of electricity due to closure of nuclear power stations based on BNFL data (blue line) from 2000 to 2020.

So the real shortfall will be closer to 65%. The Government expects this difference to be largely made up by natural gas, mostly imported through pipelines from Russia, the Ukraine and the Middle East. Many authorities believe that this over-reliance on gas which must be transported thousands of miles through pipelines exposed to terrorist and political hazards, will put Britain's whole future and security at risk and will lead to blackouts. But that is another story.

It is quite reasonable to ask whether harnessing wind can bridge this shortfall. To answer this we need to know something about current sources of electricity and how much they produce. In May 2003 we had 18 coal-fired, 29 gas-fired and 13 nuclear power stations (Table 2) each generating an average of 1,590, 681, and 927 megawatts (MW) respectively (i.e. between 681,000 and 1.59 million one-bar electric fires each). In stark contrast, there are about 69 hydroelectric schemes in Britain (excluding pumped storage) and some 84 wind farms. The former produce on average about 22 MW each and wind farms on average about 2.6 MW. Of course wind plants have a maximum possible output three times this (about 7.7 MW on average) but that could only be realised if the wind exceeded 30 mph all the time – which it clearly impossible. In fairness it should be pointed out, however, that all types of conventional power stations have shut-downs for maintenance and repairs. They rarely achieve 100% of their full capacity though 70 to 90% is quite normal.

Putting this into a local context, the turbines proposed for Whinash (which would be the largest onshore wind plant in England if built) can produce 2.5 MW each or 27 X 2.5 = 67.5 MW for the whole installation. However, that figure would only be reached if the wind blew at over 30 miles per hour all the time because it is only at wind speeds above this that the turbines are operating at maximum capacity. Above 55mph they shut down to prevent damage. Below 30 mph the amount of electricity produced drops sharply: in practice even the developer claims that Whinash will only deliver between 33 and 38% of its possible maximum output (i.e. about 25 MW).

In practice, wind companies always overstate, in their planning applications, how much electricity will be produced and how much toxic gas will be eliminated. This is clear from reports that some companies produce showing how their wind farms are performing. Take Powergen's most recent Corporate Responsibility Report and look at the figures for the Askam wind farm near Barrow-in-Furness. The planning application claimed that it would save 18,100 tons of carbon dioxide, 270 tons of sulphur dioxide and could supply 40,471 MWh of electricity. The actual figure in the company's report show that the real figures achieved for 2002 were 5,384 tons of CO_2, 47.7 tons of SO_2 (29.7% and 17.6% of the amounts claimed) and just 12,240 MWh of electricity – just 30.2% of the theoretical maximum.

Table 2: Number and average electricity generated by different types of power station in the UK (DTI figure May 2003)

TYPE OF POWER STATION	NUMBER IN UK	AVERAGE OUTPUT IN MEGAWATTS	TOTAL POWER (MW)
Coal	18	1,590	28,620
Nuclear	13	927	12,051
Gas	29	681	19,749
Hydroelectric	69	22	1,532
Wind	84	7.7	647
		TOTAL	62,599

Table excludes energy imported from France, oil, other renewables (e.g. solar and wave power), Combined Heat & Power installations that are not connected to the National Grid, pumped storage, and other burned fuels (e.g. methane gas, waste). When all these are added in, the total UK electricity capacity is about 79,600 MW.

Taking all this data together it is easy to calculate the number of wind farms the size of Whinash that would be needed to generate the same amount of electricity as one average coal-fired or one average nuclear power station, namely 64 and 37 respectively (i.e. 1,728 and 999 wind turbines).

As it is we are in danger of submerging Cumbria with wind farms – a danger that will increase further is PPS22 is adopted without revision (Figure 2). Even if we covered the whole of the northern Howgill Fells and the Mallerstang ranges (say 400 wind turbines 400 feet high) we would not have replaced the capacity of a single nuclear power station but would have destroyed a superb, and unspoiled wilderness area which was recognised as of National Park quality 50 years ago. For each wind plant would have to have back-up capacity on standby, usually gas fired that produces CO_2. According to the journal 'Power UK' every 6,000MW of wind-generated electrical energy would need 4,000MW of back-up in conventional power stations.

If wind cannot provide the solution to Britain's growing energy crisis then what can? Technologies such as wave power, tidal barrages, biofuels, gases from household waste, small hydroelectric schemes, solar panels and photovoltaic cells are often mentioned. In 2002 two experimental tidal current turbines of different design were placed in the sea – but serious amounts of electricity from such sources are still a decade or more away. Solar heating is available but is expensive and still relatively inefficient. Even with the Government now offering a 50% grant towards installations the UK is only expected to have 3,000 solar roofs by 2005 compared to 370,000 in Japan and 140,000 in Germany. Biofuels and household waste gas have a place but the amount of power is likely to be small. Tidal barrages are expensive to construct and

fraught with environmental problems of their own. Professor Ian Fells (Newcastle University), an acknowledged expert in this field and an advisor to the World Energy Council, believes that the UK needs to have a balanced portfolio of different electricity-generating methods. He advocates 30% clean coal, 30% gas, 30% nuclear and 10% renewables. The gas component is coming anyway, methods for cleaning coal to cut down on toxic emissions are actively being pursued, and the renewables target of 10% from all sources is probably realisable. At present no political party has been prepared to grasp the nuclear issue and the strong emotions attached to it. However, on a factual level, British Nuclear Fuels Ltd confirm that 10 new AP1000 nuclear reactors (replacing the aging ones on the same sites) could generate a quarter of our energy with minimal CO_2 emissions.

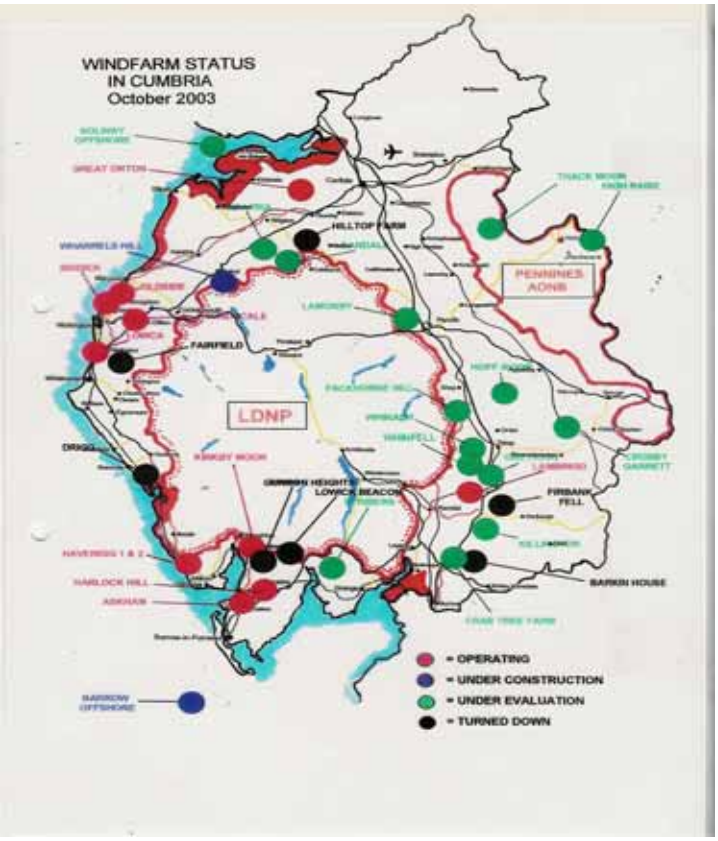

Figure 2. Figure showing how the LDNP is being ringed by wind farm applications and installations. Based on data in Planning Cumbria from CCC, known NFFO contracts, documents from wind farm developers and press reports

Improvements in energy efficiency can also make an important contribution. A report from the EU dated 26th April 2000 entitled, ***Action Plan to Improve Energy Efficiency in the European Community,*** found that efficiency savings amounting to more than 18% of current energy consumption could be achieved by 2020 using existing technology – if there was the political will to do it. This is enough to offset the closure of the UKs nuclear plants and, if applied throughout Europe would be the equivalent of saving the whole energy demand of Austria, Belgium, Denmark, Finland, Greece and The Netherlands combined. Then we may be starting to have a global impact.

The information in this article has been discussed with several specialists in this field and confirmed to be broadly accurate. Consequently, and with the Government's current approach, the numbers clearly just do not add up. Britain badly needs a more comprehensive, honest and realisable energy policy. Wind is an intermittent, ***additional*** source of a small amount of electricity, is not a serious ***alternative*** for an industrialised nation, and cannot make a significant impact at the global level. The Government has no mandate from the British people to destroy our upland heritage for virtually no gain and must be made to think again.

The author, Dr Mike Hall, is a Fellow of the Royal Society of Chemistry and a Fellow of the Institute of Biology. He is also Honourary Manager of Burns Beck Moss Nature Reserve (an SSSI owned by Cumbria Wildlife Trust) and a member of the committee of FELLS (Friends of Eden, Lakeland & Lunesdale Scenery), a voluntary organisation founded in 2000 to help local groups protect the North West landscape from unwarranted industrial development, especially wind farms. FELLS is funded entirely by membership. Details from the Secretary, Belinda Lancing, at Firbank House, Sedbergh, Cumbria, LA10 5EF. Phone: 015396-20465