Wind Chill

Why wind energy will not fill the UK's energy gap

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2008

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Acknowledgements

Support towards the research on which this report is based was given by the Institute for Policy Research.

ISBN No. 978-1-905389-76-6

Printed by 4 Print, 138 Molesey Avenue, Surrey

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SUMMARY

- Britain faces an energy gap of up 32 GW by 2015 as older coal and nuclear power stations are paid off.
- At the same time, Britain has made a binding commitment to deliver 15% of all its energy consumption from renewable energy sources by 2020.
- Government policy is based on using wind power both to help close the energy gap and to meet its renewable energy targets.
- If the Government is to meet its renewables target, **then the amount of electricity to be generated by wind farms will have to increase by more than 20 times**.

Expensive

- This will be very expensive. Electricity generated by wind turbines already enjoys huge subsidies and tax breaks through the Renewables Obligation scheme.
- The Government has now accepted that the total costs of meeting the 2020 target will be £100 billion. This is the equivalent of £4,000 for every household in the country.

- The Royal Academy of Engineering has calculated that **wind energy is two and a half times more expensive** than other forms of electricity generation in the UK.

Unreliable

- Wind generation does not provide a reliable supply of power. It must be backed up by other baseload sources.
- Greater reliance on wind power could lead to electricity supply disruptions if the wind does not blow, blows too hard or does not blow where wind farms are located.
- The experience of Denmark – often hailed for its pioneering development of wind farms – is that **wind energy is expensive, inefficient and not even particularly "green"**. There are signs that other countries are losing some of their enthusiasm for wind power.

Unpopular

- There is no evidence that people are prepared to pay for wind power. **Only 15% of people say that they are fairly or very willing to pay higher electricity bills if the extra money funds renewable power sources such as wind.** The figures for "very unwilling" and "fairly unwilling" are 37% and 24% respectively.
- This over-reliance on expensive wind energy, coupled with rising gas prices, will drive six million households into fuel poverty.

Disrupting

- Present wind farm planning applications do not take into consideration the economic viability of the project or whether the topography and meteorological conditions are suitable.
- The planning system already favours wind farm developers. But if the Government is to meet its renewable target by 2020, then current planning regulations will have to be weighted even further in favour of wind farm suppliers.
- The Ministry of Defence has recently lodged last minute objections to at least four onshore wind farms claiming the turbines will interfere with their national air defence radar.

The alternative

- **The energy gap must be filled with equivalent baseload capacity as quickly as possible.**
- The UK should therefore now develop its nuclear, clean coal (including coal gasification) and other renewable supplies of energy (particularly tidal).
- **Wind energy, in contrast, should only play a negligible role in plugging Britain's looming energy gap.**

CHAPTER ONE

INTRODUCTION

WIND ENERGY promises a clean and free source of electricity. We are told it will reduce our dependence on fossil fuels and will reduce the output of greenhouse gases and other pollution.

Many governments across the world are promoting the construction of vast wind farms, encouraging private companies with generous subsidies and regulatory support; are requiring utilities to buy from them; and are setting up markets for the trade of "green credits".

Wind energy also plays a central role in the UK's attempts to meet its targets for renewable energy. The UK has been allocated a binding target to increase renewable energy to 15% of total energy consumption, and 40% of electricity generation, by 2020 by the EU.

The following table shows how UK renewables in 2006 provide 4.6% of Britain's energy. Of this, 23% is generated by wind turbines, representing 1.1% of total UK electricity production. The rest of this renewable output is largely met from hydro electric plants, solar and biofuels. However, in order to meet the 2020 target, the increase in wind energy is immense. If the 2020 target is to be met, the Renewables

Advisory Board (RAB), which provides advice to the Government and is sponsored by the DBERR,[1] has estimated that this will have to increase to 36.5% – or 88.6% of total renewable energy generation in the UK.

Electricity generated from wind power, 2006

	GWh generated	% of renewable electricity production	% of total electricity production
On shore wind	3,574	19.7	0.9
Off shore wind	651	3.6	0.2
Total	**4,225**	**23.3**	**1.1**

Source: *Digest of UK Energy Statistics*, 2007.

RAB target for percentage of electricity generated from wind power by 2020 if 15% target to be met

	2020 target % of renewable energy production	2020 target % of total electricity production
On shore wind	37.1	15.3
Off shore wind	51.4	21.2
Total	**88.6**	**36.5**

Source: Renewables Advisory Board (RAB).

If these targets are to be met, then the amount of electricity to be generated by wind farms will have to increase from 4,225 GWh in 2006 to 87,000 GWh in 2020. This is over 20 times greater than the amount currently generated.[2]

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[1] The Department for Business Enterprise and Regulatory Reform (DBERR) is responsible for UK energy policy.

[2] Data for 2020 from author's discussions with AEA (a leading energy policy which contributed to the RAB report). AEA estimates that, in figures

Based on current projections this would necessitate around 10,000 new offshore and onshore wind turbines by 2020.[3] There are currently under 2,000 turbines in the UK. The great majority of these new turbines will have to be built onshore on grounds of cost and accessibility.

The Renewables Obligation (RO) is the Government's principal policy instrument to encourage the development of the renewable electricity sector. It is an indirect subsidy system drawing funds from consumer bills, and passing them to renewable electricity generators. This currently amounts to £1 billion a year, an amount which will have to rise significantly to fund the construction and development of these wind farms. It is already projected that by its conclusion in 2027 it will have totalled around £32 billion – a figure which could well be far too low.

OFGEM has criticised the Renewables Obligation, concluding that:[4]

> *We fully support the Government's aims of reducing carbon emissions and promoting renewable generation but we think there are cheaper and simpler ways of meeting these aims than the RO scheme which is forecast to cost business and domestic customers over £30 billion.*

Energy Minister, Malcolm Wicks, confirmed that wind was the main benefactor from the RO, "I agree that the

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rounded to the nearest thousand, onshore wind would have to contribute 32,000 GWh and offshore wind 55,000 GWh.

[3] Author's calculations based on what under 2,000 turbines produce today.

[4] OFGEM, *Renewable Obligations Annual Report 2005/6*, 2007.

Renewables Obligation could appear to be a blunt instrument and certainly seems to be favouring one technology – the wind farm."[5]

But does wind power live up to the claims made by its advocates? How benign is its impact on the environment? Will it really be able to deliver the promise of clean, cheap and reliable electricity? Or would the money spent on it be more effectively directed towards supporting new technologies which will allow us to develop more reliable and cheaper forms of baseload energy in a cleaner way?[6]

The challenges now facing Government, local planners, wind farm companies and consumers are considerable. They are only likely to grow if the Government is to reach the EU's renewable target. These challenges include:

- For central government, a substantial increase in the subsidy given to wind companies through the Renewables Obligation. This will increase electricity bills.
- For local authority planning departments, a massive rise in (and almost certainly unpopular) applications for new wind farms.
- For wind farm companies, an increase in subsidies as raw materials become more expensive and planning applications become longer and harder to approve.

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[5] Rt Hon Malcolm Wicks MP, Minister for Energy, 8 May 2006.

[6] A baseload power plant provides a steady flow of power regardless of total power demand by the grid.

- For electricity customers, an increase in their utility bills to subsidise thousands of new wind turbines across Britain. Households currently trapped in fuel poverty, half of whom are pensioners, will be the worst affected.

So, before embarking on the construction of 10,000 new wind turbines, we should surely ask, as this report does, whether wind energy really is the best, or even a sensible, way forward.

CHAPTER TWO

LESSONS FROM DENMARK

DENMARK IS Europe's most-wind intensive state. With a population of 5.4 million, it has over 6,000 turbines that in 2002 produced electricity equal to 19% of what the country used. In theory, at peak output, the Danish wind farms could account for nearly 64% of Danish peak power demand.

However, not a single conventional power plant has been closed in the period that Danish wind farms have been developed. Because of the intermittency and variability of the wind, conventional power plants have had to be kept running at full capacity to meet the actual demand for electricity and to provide back-up.[7]

Furthermore, the Danes have found that it is not practical for large baseload plants to be turned on and off as the wind dies and rises: indeed, the quick ramping up and down of those plants, such as coal, would actually increase their output of pollution and carbon dioxide (the primary greenhouse gas). Baseload stations have to keep running so

[7] A conventional power station is a baseload facility – usually either coal, gas or nuclear powered.

that they can 'shadow' wind turbines due to their intermittency. So when the wind is blowing perfectly for the turbines, the power they generate is usually a surplus and sold to other countries at an extremely discounted price; or the turbines are simply shut off. According to the Copenhagen newspaper *Politiken*, wind met only 1.7% of Denmark's total demand in 1999.[8] And in 2003, for example, 84% of western Denmark's wind-generated electricity was exported (at a revenue loss). Denmark's grid accepted only 3.3% of electricity generated by its vast wind farms.[9] This has undermined the "green" credentials of Danish wind farms. For example, the Danish grid used 50% more coal-generated electricity in 2006 than in 2005 to cover wind's failings. The increase in the demand for coal, needed to plug the gap left by underperforming wind farms, meant that Danish carbon emissions rose by 36% in 2006.[10]

There are other problems. Sometimes the Danish wind turbines produce maximum output when there is little demand. On other occasions they deliver no energy when energy demand is high. Yet wind turbines themselves require electricity to operate.[11] On days of little wind, the

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[8] *Politiken*, 26 September 2000.

[9] D J White, "Danish Wind: Too Good To Be True?", *The Utilities Journal*, 2004.

[10] *Energinet* (Danish grid operator journal), February 2007.

[11] Wind turbines need significant amounts of electricity to cool the turbines and to re-orientate the turbines and blades to face the wind and weather fronts.

wind power system reorientation requirements can exceed wind output: the wind turbines therefore consume more power from the grid than they produce. In other words, the turbines can be a net energy consumer.[12]

And wind is not cheap. Danish electricity costs for the consumer are the highest in Europe. Danish electricity consumers paid €322.03 million in subsidies for wind energy in the first half of 2007. The money was levied through the Danish Public Service Obligation (PSO) which guarantees wind generators a minimum price for their output regardless of the wholesale price of electricity. Denmark's national grid, Energinet.dk, had expected PSO fees to be half what they ended up being in the first six months of 2007.[13]

So the experience of Denmark – often hailed for its pioneering development of wind farms – is that wind energy is expensive, inefficient and not even particularly "green".

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[12] This happened for example on 16 August 2002. It is suspected to have happened often both previously and since then; but following the uproar at the time of disclosure, it is now harder to identify. See H Sharman, *Civil Engineering Magazine*, Institute of Civil Engineering, May 2005.

[13] *Utility Week*, 2 November 2007.

CAPACITY ISSUES

We're a big supporter of wind, but at the time when customers have the greatest needs, it's typically not available.

Wayne Brunetti, CEO of Xcel Energy

WIND FARMS PERFORM BRILLIANTLY if their average output reaches as much as 35% of their generating capacity. On very rare occasions, when conditions are ideal (typically a sustained wind speed of around 30 mph), wind farms can produce 100% of their generating capacity. But as the wind slows, electricity output falls off exponentially.[14] In comparison coal fired plants run at about 75% capacity and nuclear plants can operate as high as 92% capacity.

The evidence is that, throughout Europe, wind turbines have produced on average less than 20% of their theoretical (or *rated*) capacity in recent years. On-shore turbines in the UK ran at 24.1% of their capacity in 2003. The average in Germany for 1998-2003 was 14.7%. The figure in Denmark

[14] If wind speeds are too high, ironically, turbines must be stopped because they can be easily damaged. Build-up of dead bugs has also been shown to halve the maximum power generated by a wind turbine, reducing the average power generated by 25% and more. Build-up of salt on off-shore turbine blades similarly has been shown to reduce the power generated by 20%-30%. All this adds to maintenance costs.

was 16.8% in 2002 and 19% in 2003 (in February 2003, the output was just 4%).

In the US, usable output (representing wind power's contribution to consumption, according to the Energy Information Agency) in 2002 was 12.7% of capacity (using the average between the AWEA's figures for installed capacity at the end of 2001 and 2002). In California, the average is 20%. The large Searsburg wind farm in Vermont averages 21% – a high figure, but one that is declining every year.[15]

This low average capacity utilisation is important. By way of illustration if 25 Gigawatts (GW) of wind capacity were to be added to the electricity supply system, only 5GW of conventional plant capacity could be retired.[16]

It is because of this that E.ON has acknowledged that if the UK is to achieve 40% of electricity from renewables by 2020, then it will require a huge expansion in total generating capacity. E.ON calculates that the UK's total generation capacity because of the increased dependence on wind power must rise from 76GW today to 120GW by 2020.[17] This represents a Herculean task which will require unparalleled investment and a huge expansion of the grid.

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[15] *Boston Globe*, 25 August, 2007.

[16] This is because of existing security of supply standards (Loss Of Load Probability or LOLP) where in general the capacity credit is of the order of the square root of the GW of wind installed.

[17] E.ON, *Carbon, Cost and Consequences*, 3 June 2008.

THE IMPACT ON ELECTRICITY BILLS

Without the Renewable Obligation certificates, nobody would be building wind farms.

Paul Golby, the Chief Executive of E.ON UK[18]

WIND ENERGY is financially unsustainable without the Renewables Obligation, even with the currently record oil prices. This subsidy is paid to the wind farm developer and in some cases the landowner accommodating the turbines. The community does not normally gain from the development.

The subsidy is administered through the Renewables Obligation scheme, a highly complex and little understood payment mechanism. This obliges electricity suppliers to purchase a set percentage of qualifying renewably generated electricity. In 2004-05, this stood at 4.9% of qualifying electricity. This will rise to 10% by 2010. This is effectively a hidden tax on all electricity consumers; and a huge hidden subsidy, currently amounting to £1 billion a year and by the end of the scheme will have totalled some £32 billion, to providers of renewable energy. The Government has now accepted that the total bill for implementing its renewables

[18] *The Daily Telegraph*, 26 March 2005.

strategy is in the region of £100 billion – the equivalent of £4,000 for every household in the country.

The price to the consumer

The Royal Academy of Engineering has calculated that:[19]

- the cost of electricity generated by nuclear power (including the cost of decommissioning) is 2.3p per KWh;
- coal-fired electricity costs 2.5p per KWh;
- the cost of electricity generated by onshore wind is 5.4p per KWh;
- the cost of electricity generated by offshore wind is 7.2p per KWh.

In other words, the cheapest form of wind power is two and a half times the cost of nuclear or coal power, the first of which is a carbon free baseload energy source.

This significant price differential is likely to get worse, not better. The construction of wind farms in the UK, both onshore and offshore, is facing large cost increases as the raw materials required to build them become harder to obtain. Turbine costs alone have risen by about 30% in recent years. Siemens, which makes turbines, has no spare capacity.

Also, the construction of large offshore wind farms (which are often easier to secure planning permission for and which are more efficient due to their location) are also becoming

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[19] Royal Academy of Engineering, *Can we afford to keep the lights on?*, 10 March 2004.

more costly than ever envisaged.[20] Offshore wind has to contend with another problem: competing with each other and with oil and gas companies for the specialised vessels needed to install turbines and other heavy equipment at sea.[21]

Another cost factor in the development of wind farms is Britain's national grid.[22] This has not been modernised since the 1960s. This has huge cost implications for wind farm companies seeking to construct new sites both offshore and onshore. As most new conventional power stations can be constructed near to or on the sites of previous plants, they can use established grid connections and infrastructure. Wind farms, on the other hand, will need to develop the grid. This will further drive up the costs of wind for the consumer.

E.ON Netz,[23] the grid manager for about a third of Germany, has also highlighted the technical problems of connecting large numbers of wind turbines.[24] As electricity

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[20] Sea-based turbines need more robust materials to withstand corrosion and because of the difficulties in siting them, particularly in deeper water; in addition, the cost of connecting them to the electricity grid can also be substantial.

[21] 'Green goals hit by rise in offshore wind cost', *The Financial Times* 29 May 2008.

[22] The national grid is the means by which electricity is transmitted from the power station or wind farm to the consumer.

[23] E.ON Netz manages the transmission grid in Schleswig-Holstein and Lower Saxony, about a third of Germany, hosting 6,250 MW of Germany's 14,250 MW installed wind-generating capacity.

[24] E.ON Netz, *Wind Report 2004*. See www.wind-watch.org/documents/wp-content/uploads/EonWindReport2004.pdf

generation from wind fluctuates greatly, it requires additional reserves of conventional capacity to compensate. In addition, high-demand periods of cold and hot weather (when electricity demand surges) tend to correspond to periods of low wind. Thus, during the heat wave of July and August 2003 in Germany, summer electricity consumption rose to an above-average high level. Yet wind power production was at this time very low due to the lack of wind.

An analysis from Cambridge Energy Research Associates (Cera) has found that the capital cost of offshore turbines is likely to increase by a fifth in the next two to three years, from €2,300 (or £1,800) per kilowatt to €2,800 (or £2,200). This cost will be passed on to the electricity consumer through higher bills.[25]

The impact on electricity bills

The Government has set 2010 as its deadline for eradicating fuel poverty in vulnerable homes in Britain and 2016 to eradicate all fuel poverty.[26] The EU's binding renewable targets, together with the general increase in energy prices, will sadly make this target impossible to meet.

In March 2008, the cost for the UK for meeting its 2020 target has been estimated in a government-commissioned report at between £4 billion a year and £5.4 billion a year

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[25] "Green Goals hit by rise in offshire wind cost", *The Financial Times*, 29 May 2008.

[26] UK Fuel Poverty Strategy, November 2001, DTI. Fuel poverty is defined as when 10% or more of household income is spent on energy bills.

until 2020.[27] This would imply a total cost of between £47 billion and £74 billion up to 2020 (with all costs discounted to 2006). With 24.7 million households in the UK, that is the equivalent to between £1,900 and £3,000 per household.[28] By June, the Government is expected to announce that this figure will have risen to £100 billion. With wind power representing 89% of all renewable electricity in 2020, the great majority of this figure would be covering the cost of wind power.

But the final bill is likely to be even higher. The above figures do not, for example, include the costs of expanding and upgrading the national grid to cope with new energy sources. As the Pöyry report admits, its calculations omits the:[29]

> *…assessment of any missing or hidden costs. In particular, additional network investment [footnote: this analysis only includes the cost of connecting the renewable electricity facility to the main transmission grid] or reinforcement costs associated with major renewable investment programmes; infrastructure costs that may result from further penetration of renewable hat grids; and costs arising from any demand-side distortions affecting take-up.*

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[27] Pöyry PLC, *Compliance Costs for meeting the 20% renewable energy target in 2020*, March 2008.

[28] Pöyry op. cit. The costs in the Pöyry report were calculated in euros. They have been recalculated for this report at an exchange rate of £1 = €1.25.

[29] Pöyry, op. cit.

The Chief Executive of E.ON UK, Paul Golby has calculated that the costs would be at least twice as high. In June he warned that energy companies could only make the required level of investment if they passed on the cost to consumers. He estimated that homeowners will be forced to pay an extra £400 on their annual bill to meet the EU imposed green energy target.[30] That would assume (using the same methodology as the Pöyry report) a total cost of £4,700 per household up to 2020.

Such increases, alongside soaring gas prices could plunge 6 million and more households into fuel poverty by 2009, this figure having trebled in just five years.[31] It would bring the number of households in fuel poverty to a quarter of the total. Already this year, 500,000 more households entered fuel poverty when power companies put up prices by 15%.[32]

It is therefore apparent that wind energy is already more expensive than other forms of electricity generation; will become more so; does not provide value for money in terms of reducing carbon emissions; will impose great demands (and costs) on the infrastructure of the national grid; and will help drive millions of households into fuel poverty.

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[30] "Green Tax to Push Energy Bills up £400", *The Mail on Sunday*, 1 June 2008.

[31] www.uswitch.com

[32] NEA National Energy Action.

DECLINING CONFIDENCE

DESPITE BEING CITED as the shining example of what can be accomplished with wind power, the Danish Government has cancelled plans for three offshore wind farms planned for 2008. It has also scheduled the withdrawal of subsidies from some existing sites. Development of onshore wind plants in Denmark has effectively stopped. Because Danish companies dominate the European wind industry, however, the Government is under pressure to continue its support.

Other countries are also reducing their support for wind power. Germany for example reduced the tax breaks for wind power in 2004. Domestic construction drastically slowed as a result. Bloomberg News reported that "the unstable flow of wind power in their networks" has forced German utilities to buy more expensive energy, requiring them to raise prices for the consumer.[33] And a recent German Energy Agency study stated that increasing the amount of wind power would increase consumer costs 3.7 times;[34] and that the theoretical

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[33] Bloomberg News, 31 August 2004.

[34] Dena [the German Energy Agency], *Integration into the national grid of onshore and offshore wind energy generated in Germany by the year 2020*, February 2005.

reduction of greenhouse gas emissions could be achieved much more cheaply by simply installing filters on existing fossil-fuel plants and develop what has become known as supercritical clean coal technology. Carbon capture and storage technology could be retrofitted to such a station in the future when commercially developed.

Switzerland, also, is cutting subsidies as too expensive for the lack of significant benefit. The Netherlands decommissioned 90 turbines in 2004 (but to meet its EU targets, it looks set to have to erect many more turbines). Many Japanese utilities severely limit the amount of wind-generated power they buy, because of the instability they cause. For the same reason, Ireland, in December 2003, briefly halted all new wind power connections to the national grid. On 4 December 2003 the Irish Electricity Regulator had to take emergency measures to reduce the amount of wind power on the Irish grid following major concerns about, "the security and stability of the power system."[35] The Irish grid manager concluded in a study released in February 2004 that:[36]

> *The cost of CO_2 abatement arising from using large levels of wind energy penetration appears high relative to other alternatives.*

In early 2005, the Irish were considering ending state support but the EU has insisted the country meets a binding 16% renewable target by 2020, thereby guaranteeing support

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[35] *The Irish Times*, 5 December 2003.

[36] "Report Doubts Future of Wind Power", *The Guardian*, 26 February 2005.

for more large wind farms. One in 10 households in Ireland are now in fuel poverty, with figures expected to rise.[37]

Spain began withdrawing subsidies for wind power in 2002. In 2005, Spanish utilities began refusing new wind power connections and a year later the Spanish Government ended, by emergency decree, the subsidies and price supports for large wind farms. In 2004, Australia reduced the level of renewable energy that utilities are required to buy, dramatically slowing wind-project applications.

Britain's biggest wind farm application was recently dealt a fatal blow. In April 2008, the planning application for the Lewis wind farm in the Western Isles was rejected by the SNP administration at Holyrood. The Lewis farm would have involved 181 large wind turbines on the Barvas Moor. There were 11,000 letters of local opposition. The wind farm would have covered over 50 miles of open moorland and would have generated the same electricity as a medium-sized gas or coal-fired station. It was rejected on grounds that the huge rotors would have killed many rare birds.[38]

In addition, Shell recently highlighted problems in the sector when it pulled out of what was designed as the world's biggest offshore wind farm – the London Array in the Thames Estuary. London Array was to involve 341 turbines. The initial cost of the project in 2003 was estimated at £1 billion. But this had risen to £2.5 billion.

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[37] *The Irish Independent,* 18 June 2008.

[38] *The Daily Telegraph*, 22 April 2008.

partly as a result of a global surge in the price of turbine components.[39]

In California, with a population of 35 million, 14,000 turbines (about 1,800 MW capacity) produced 0.5% of its electricity in 2000.[40] Extrapolating this record to the US as a whole, and without accounting for an increase in energy demand, well over 100,000 1.5MW wind turbines (costing between $150 and $300 billion) would be necessary to meet the Department of Energy's goal of a mere 5% of the country's electricity from wind by 2010.

The US Department of Energy claims that there are 18,000 square miles of good wind sites in the US, which with current technology could produce 20% of the country's electricity. This ambitious plan, based on the US wind industry's sales lobbying, as well as on a claim of electricity use that is only three-quarters of the actual use in 2002, would require "only" 142,060 1.5MW towers. They also explain:[41]

> *If the wind resource is well matched to peak loads, wind energy can effectively contribute to system capacity.*

That is, as has been seen, a big *if*. Counting on the wind to blow exactly when demand rises, especially if you expect the wind to cover 20% (or even 5%) of that demand could be unwise. As in Denmark and Germany, grid managers have learnt from experience that the electricity from those

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[39] "Shell Pulls Out of Key Wind Power Project", *The Financial Times,* 30 April 2008.

[40] California Energy Commission www.energy.ca.gov/wind/overview.html

[41] SOURCE DETAILS PLEASE

turbines, no matter how many, would be too variable to provide the predictable supply that the grid demands. They would have no effect on established electricity generation, energy use, or continuing pollution.

Even the advocates of wind farms are now toning down the claims made for wind. For example, Christopher Dutton, the CEO of Green Mountain Power, a partner in the large Searsburg wind farm in Vermont and an advocate of alternative energy sources, has admitted that wind power cannot replace more traditional and reliable sources, and that its value is only as a supplemental source that has no impact on the baseload supply.[42] "By its very nature, it's unreliable," says Jay Morrison, senior regulatory counsel for the US National Rural Electric Co-operative Association.

As Country Guardian, a UK conservation group, puts it, wind farms constitute an *increase* in energy supply, not a replacement. They do not reduce the costs, environmental, economic, and political of other means of energy production. And if wind turbines do not reduce conventional power use, then their manufacture, transport, and construction only increases the use of dirty energy. The presence of "free and green" wind power may even give people the feeling that it is environmentally acceptable to use *more* energy.[43]

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[42] *The Montpelier Bridge*, August 2004.

[43] www.countryguardian.net/cg.htm

Are people prepared to pay for wind farms?

A poll was commissioned for this report to assess how willing people are to pay higher electricity bills.[44] The following question was asked:

How willing or unwilling would you be to pay higher electricity bills if the extra money funded renewable power sources like wind or solar power?

The response was that:

- 37% said they were very unwilling;
- 24% said they were fairly willing;
- 25% said they were neither willing or unwilling;
- 12% said they were fairly willing;
- 3% said they were very willing.

So, just as the UK is setting out to expand the number of wind farms by six times, the rest of the world, the industry itself, and the British public are all showing signs of doubt.

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[44] The poll was conducted by PoliticsHome who interviewed 1774 people from their Phi5000 panel on the 16 May 2008. They were weighted to match the demographic profile of Great Britain. PoliticsHome is the leading UK tracker of political news and opinion. The full results of the poll can be found in Appendix of this report.

CHAPTER SIX

PLANNING

PLANNING LAW, in principle, addresses the relative merits of an application and the value of the development to the proposer, against the potential disadvantages and advantages to the local community. Where a balance of advantage appears clear, it is generally accepted that applications are accepted.

But, in the case of wind applications, Government guidance on renewables targets is encouraging councils to override all other issues. Local government seems to be supporting wind farm applications irrespective of their usefulness, efficiency or practicality. The concerns of local people are often being overridden by planning officers.

Councils examining wind farm applications are not obliged to take into consideration the economic viability of the project; or whether the topography and meteorological conditions at the proposed site are suitable. It is naively presumed the presence of the application itself reflects the suitability of the site.

For example, at a planning inquiry last year into the erection of five 120m 2MW turbines near Burnham on Sea, Somerset, the Planning Inspector placed at the top of his list of issues for examination, "the contribution that the

proposal would make to achieving regional and national targets for renewable energy generation."[45] The appeal was eventually dismissed after a local campaign highlighting the environmental, health and negative economic impact of the proposed turbines on the area.

Wind companies have deep pockets (partly filled of course with income from the Renewables Obligation) with which to fight planning applications. For example, a proposal by Enertrag to build six wind turbines in countryside at Guestwick in Norfolk was opposed by the vast majority of the local community. The plan was turned down in 2005 on the recommendation of local planning officers and Norfolk County Council. This decision was appealed by Enertrag. A public inquiry was held in 2006. The planning inspector ruled that the appeal should be dismissed because of the turbines' likely impact on the local landscape. Enertrag appealed to the High Court to have the decision overturned. To the surprise of the local community the Treasury solicitor decided not to contest the application. The decision of the inspector was set aside and a second public inquiry was held in June 2007 with another inspector. Again, Enertrag's arguments were dismissed. But Enertrag is now seeking a judicial review. If it wins, it will seek a third planning inquiry. If that is unsuccessful, they are prepared to resubmit their scheme. As the local MP Keith Simpson has noted:[46]

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[45] Appeal Decision by Robin Brooks, 7 August 2007, The Planning Inspectorate.

[46] Hansard Column 409WH, 22 April 2008.

….under a subsidy system, developers can keep returning until they have worn down the inspectors and the local community. Local residents have had to fund their own legal representation.

At Guestwick, the local community raised £15,000 for the first inquiry, and £20,000 for the second. A third inquiry could cost them £25,000. And that is only the direct costs: through taxation and through their electricity bills, they are effectively funding the developers, as well as having to fund their legal representation. As local MP Richard Bacon has said:[47]

One of the most offensive aspects of this is not simply that local residents have to fund their campaigns but that, through taxes and subsidies, they are funding the potential despoliation of their landscape.

Wind farm companies are receiving subsidies from consumers' electricity bills to help construct turbines. But those same consumers are not permitted to have various items of crucial information at the planning stage. This bias in the planning system is unjustifiable.

Unaccountability

Recent ministerial correspondence has highlighted the extraordinary lack of information and accountability throughout the planning process.

Before a wind farm application is formerly presented to a local authority the wind farm company responsible erects meteorological or anemometer masts to gauge the wind conditions at the proposed site. Controversially, the results of

[47] ibid.

these tests do not have to be released to the planning committee or any inquiry or the public. This has encouraged the erection of wind farms on sites which will generate minimal capacity. They are effectively useless, but the wind farm company will still receive payment from the Renewable Obligation scheme for the completion of the project.

When the issue of mast results being made public was raised, the Energy Minister replied:[48]

> *…turning to the point regarding the disclosure of records from anemometer masts, wind farm developers are not obliged to supply wind speed records from masts when making application for a planning consent. Planning Policy Statement 22 states that 'Regional bodies and local planning authorities should not make assumptions about the technical and commercial feasibility of renewable energy projects. It is therefore up to individual developers to decide whether or not to disclose their wind speed readings to the public.*

This example of a lack of openness at planning level concerning wind farms shows how trust and confidence in the planning process can be undermined. Given this, only the wind farm company knows if it is erecting turbines which could effectively be useless.

Fast tracking the planning process?

There is a growing concern that the Government may use the Planning Bill which is currently going through Parliament to take responsibility for planning for wind

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[48] Letter from Malcolm Wicks MP to Bill Cash MP, 30 November 2007.

farms away from local communities. This was implicit in a recent report commissioned by the Department for Business, Enterprise and Regulatory reform which stated:[49]

> *All technologies must be capable of implementing a step change in build rates if the resource is to be delivered by 2020. This may require additional action to ensure any material regulatory, institutional, legal and supply chain barriers can be overcome.*

With the amount of new wind capacity added in 2007 being less than three-quarters of that built the year before,[50] the pressure on the Government to ease planning regulations for wind farms will grow. After all, if the Government is to meet its renewable target by 2020, then it will require the construction of 10,000 new turbines, or 2.5 new wind turbines every day up until then to meet binding targets. This will be extremely difficult to achieve with current planning regulations, even though they are already weighted to the advantage of the wind farm suppliers.

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[49] Pöyry, op. cit.

[50] "Setback for wind farm push", *The Financial Times*, 4 February 2008.

ENVIRONMENTAL & MILITARY OBJECTIONS

THE PRESENCE OF WIND TURBINES introduces an industrial plant to a rural area. Wind farms are generally considered to be ugly.[51] They affect birdlife, ecology and can raise health issues. And they affect house prices and can deter tourism.

Energy companies have applied to build 3,000 wind turbines over the next five years, creating fears for hundreds of acres of rural landscape.[52] The Campaign for the Protection of Rural England (CPRE) has expressed its disquiet over the large number of planning applications.

Pictures from the energy companies show slim towers rising cleanly from the landscape or hovering faintly in the distant haze, their presence modulated by soft clouds behind them. But a 200 to 400 foot tower supporting a turbine housing the size of a bus and three 100 to 150 foot rotor blades sweeping over an acre of air at more than 100

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[51] Even George Monbiot, a leading advocate of green causes, has stated: "I would also feel happier if environmentalists dropped the pretence that wind farms are beautiful. They are merely less ugly and less destructive than most alternatives." *The Guardian,* 26 April 2005.

[52] "Alarm sounds in countryside over 3,000 wind turbine plans," *The Daily Telegraph*, 9 March 2008.

mph requires, for a start, a large and solid foundation. On a 1.5-MW tower, the turbine housing, or nacelle, weighs over 56 tons, the blade assembly weighs over 36 tons, and the whole tower assembly totals over 163 tons.[53] Wind farms are industrial and commercial installations. As the Countryside Agency has said, it makes no sense to tackle one environmental problem by instead creating another.

The destruction of wildlife

The spinning turbine blades kill and maim birds and bats. Especially vulnerable are large birds of prey that tend to fly in the same sorts of places that developers like to construct wind towers. Fog is a common situation on mountainous areas and hills and this aggravates the problem for all birds.[54]

A 2002 study in Spain estimated that 11,200 birds of prey (many of them already endangered), 350,000 bats, and 3,000,000 small birds are killed each year by wind turbines and their power lines. Another analysis found that it is officially recognised that on average a single turbine tower kills 20 to 40 birds each year.

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[53] *Windblatt*, April 2005. An example of how intrusive a wind farm can be is the plan to build eight 416ft-tall wind turbines on an abandoned airfield in Cambridgeshire's Ouse Valley. Each turbine will be twice the height of Ely Cathedral.

[54] It is illegal in the US to kill migratory birds. The US Fish and Wildlife Service (FWS) has prevented the expansion of the large and numerous Altamont Pass wind plants in California, rejecting as well the claim that new solid towers would mitigate the problem.

Noise pollution

The problems with noise pollution are well documented. The EU, for example, has just financed and published the results of an investigation into wind power, finding noise complaints to be valid and that noise levels could not be predicted before developing a site.[55] The report concluded that wind turbine noise is more annoying than other industrial noises of the same magnitude and that wind turbine noise is poorly masked by background noise. The author, Dr Fits van den Berg writes, "The sound of modern wind turbines on average does not decrease at night, but rather becomes louder, whereas most other sources are less noisy at night. At the highest sound levels in this study (45 decibels or higher) there is also a higher prevalence of sleep disturbance."[56] The American Wind Energy Association acknowledges that a turbine is audible 800 feet away. The US National Wind Co-ordinating Committee (NWCC) admits that:[57]

> *Wind turbines are highly visible structures that often are located in conspicuous settings... they also generate noise that can be disturbing to nearby residents*.

The NWCC recommends that wind turbines be installed no closer than half a mile from any dwelling.

The noise of one wind plant in Ireland was measured in 2002 at 60dB one kilometre *up*wind. The low-frequency

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[55] F van den Berg, *Visual and acoustic impact of wind turbine farms on residents*, Universities of Gothenburg and Groningen, June 2008.

[56] Ibid.

[57] NWCC, Wind Energy Series, January 2002.

noise was above 70dB – the sound at which a normal conversation is held between two people standing three feet apart. A German/Dutch study in 2003 found significant noise levels one mile away from a two year-old wind farm of 17 1.8-MW turbines, especially at night. In mountainous areas the sound can echo over larger distances. This report stated that: "the turbines are audible for most of the day and night and a swishing sound is readily discernible."[58]

New turbines do have quieter bearings and gears than earlier turbines. However, the huge magnetised generators can not avoid producing a low-frequency hum, and the problem of 100 ft rotor blades chopping through the air at over 100 mph also is insurmountable.[59] Every time each rotor passes the tower, the compression of air produces a deep resonating thump. Only a "swishing" may be heard directly beneath the turbine, but farther away the resulting sound of several towers together has been described to be as loud as a motorcycle, like aircraft continually passing overhead, a "brick wrapped in a towel turning in a tumble drier," "as if someone was mixing cement in the sky," "like a train that never arrives." It is a relentless rumble like unceasing thunder from an approaching storm.[60]

The penetrating low-frequency aspect to the noise, a thudding vibration, much like the throbbing bass of a

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[58] G P van den Berg, 'Effects of the wind profile at night on wind turbine sound', *Journal of Sound and Vibration*, September 2003.

[59] A 35-meter blade turning at 15 revolutions per minute (rpm) is travelling at 123 mph at the tip; at 20 rpm, the speed at the tip is 164 mph.

[60] See www.aweo.org/ProblemWithWind.html

neighbouring night-club, travels much farther than the usually measured "audible" noise. It may be why horses which are calm around traffic and heavy construction are known to become distressed when they approach wind turbines. Many people have complained that it causes anxiety and nausea. 'Flicker' is another health issue. It occurs when low sun is behind wind turbines near sunrise and sunset; the blades cast shadows which may cause serious irritation and in some sensitive individuals, physiological responses. In hilly areas with large arrays of machine, some buildings may be exposed to 'flicker' for substantial parts of the day.

This also has huge implications for local house prices. A valuer in mid Wales has suggested a probable 25% reduction in house values caused by a proposed wind farm; estate agents estimated that proposals for three 100m wind turbines in Devon reduced the value of one particular property by a third. The home owner commented:[61]

> *We couldn't live here with those things towering over us. The turbines would be west of us so we would get shadowing from the sun and a stroking effect when the blades rotated. And we have no background traffic hum here to drown out the sound of the turbines. We went to see some smaller ones in Cornwall and heard them before we saw them.*

Military objections

Military objections are a relatively recent but increasingly important factor. In February 2008, the Ministry of Defence

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[61] "My Property Nightmare: Wind Farm", *The Sunday Telegraph*, 26 January 2005.

(MoD) announced that wind turbines were jeopardising national defence as the turbines interfere with radar. The MoD has lodged last minute objections to at least four onshore wind farms in the line of sight of its radar stations on the east coast of England because they make it impossible to spot incoming aircraft. The same objections are likely to apply to recently proposed offshore wind farms in the North Sea which would be directly in line with the three principle radar defence stations, Brizlee Wood, Saxton Wold and Trimingham on the Northumberland, Yorkshire and Norfolk Coasts. Giving evidence to a planning inquiry in October 2007 Squadron Leader Chris Breedon explained that the turbines create a hole in radar coverage so that aircraft flying overhead are not detected:[62]

> *This obscuration occurs regardless of the height of the aircraft, of the radar and of the turbine.*

Wind turbines are now reaching 500ft above ground level. This is not high compared to the normal flying height of most aircraft but for specialised pilots they are a serious hazard. For example, the Station Commander of RAF Shawbury[63] has officially complained that proposals for a wind farm in the North Shropshire countryside pose a significant danger to the lives of his trainees.[64]

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[62] "Wind farms a threat to national security", *The Times*, 4 February 2008.

[63] RAF Shawbury is home to the Defence Helicopter Flying School where helicopter pilots for the RAF, Army and Fleet Air Arm are trained. It sustains 1500 jobs and puts £20 million into the local economy.

[64] Letter from Owen Paterson MP to Rt Hon Des Browne MP, Secretary of State for Defence, 19 July 2007.

CONCLUSION

BRITAIN ENJOYS THE BENEFITS of many indigenous energy sources. Yet today we face a looming energy crisis.

Today, our electricity comes from a mix of power stations – the more recently built are mostly gas, the older mostly coal-fired and nuclear. Over the next six to eight years, 40% of this ageing fleet will be shut down on environmental, efficiency and safety grounds. But replacement baseload capacity is not being built. Despite three Energy White Papers since 1997, new build has stalled.

Coal still provides 37% of our electricity, but now faces the challenge of cutting its carbon emissions. As a baseload supplier of electricity it can have a bright future if clean coal technology is developed. Coal is comparatively cheap and coal plants can be activated quickly to meets peaks in demand and to help stabilise electricity prices. New supercritical coal plants, which are able to be retrofitted with carbon capture and storage facilities when the technology is commercially available, are long overdue.

Electricity from gas-fired power stations has, until recently, also provided relatively cheap supplies for the consumer. Gas supplies 37% of our electricity. But Britain's

reserves of indigenous gas are in decline and we have become a net importer of gas for the first time. Gas prices are tied to the high oil price and this shows little sign of falling: electricity from gas-fired power stations is increasingly expensive and the country risks becoming over-dependent on gas for the generation of electricity. And it should not be forgotten that gas often has to be imported from geo-politically turbulent regions.

Nuclear power is virtually carbon-free. Nuclear power stations operate at exceptionally high load factors and represent the most efficient source of baseload carbon-free energy. The price of electricity produced by nuclear stations is also competitive when compared against other baseload suppliers like coal and gas.

Over the last decade the Government has let our nuclear stations run down without any replacement plants. It will now be difficult to rapidly increase nuclear power in the UK. Teams and expertise have to be built up again. Nuclear engineering know-how has dwindled while public fears, and misunderstanding, on issues such as the handling of nuclear waste have not been countered.

So it is true that the UK must now develop its nuclear, clean coal (including coal gasification) and renewable supplies of energy. Yet this does not mean that wind is the only, or even a preferable option. For wind energy is proving to be an unreliable, costly, uncompetitive and unpopular horse in the great energy race. Over-dependence on wind energy and the resultant costs to electricity consumers risks plummeting more and more families into the fuel poverty trap.

Britain's coastline is over 11,000 miles long and has some of the highest tidal ranges in the world. Tidal energy provides a far higher level of load consistency than wind and can be housed and installed away from the population thereby negating the problems, cost and time taken up with lengthy planning applications so associated with wind. Compared with wind energy, the costs and environmental impact of tidal energy are substantially lower. David Cameron was right to herald tidal power in his speech unveiling the Blue Green Charter.[65]

Wind energy, in contrast, can only play a negligible role in plugging Britain's looming energy gap. It is time to call a halt to new wind farms, and to expand aggressively our nuclear, clean coal and tidal resources.

[65] 'The Blue Green Charter', Speech by David Cameron MP, 16 June 2008.

SURVEY RESULTS

POLITICSHOME interviewed 1,774 people from their Phi5000 panel on the 16 May 2008. The responses were weighted to match the demographic profile of Great Britain.

How willing or unwilling would you be to pay higher electricity bills if the extra money funded renewable power sources like wind or solar power?

Political allegiance

	Total	Lab	Con	Lib Dem	Other	None	Don't Know
Very unwilling	**37**	35	45	26	47	37	24
Fairly unwilling	**24**	26	24	24	19	21	20
Neither willing nor unwilling	**25**	26	22	17	17	31	48
Fairly willing	**12**	10	8	28	15	10	8
Very willing	**3**	3	1	5	3	2	0

Gender and Age

	Total	Male	Female	18 to 34	35 to 54	55+
Very unwilling	**37**	41	34	25	39	44
Fairly unwilling	**24**	20	27	27	21	24
Neither willing nor unwilling	**25**	26	25	28	27	22
Fairly willing	**12**	10	12	17	10	9
Very willing	**3**	3	2	3	3	2

Social Grade

	Total	ABC1	C2DE
Very unwilling	**37**	37	36
Fairly unwilling	**24**	24	24
Neither willing nor unwilling	**25**	22	29
Fairly willing	**12**	14	9
Very willing	**3**	3	1

Region

	Total	London	Rest of South	Midlands/ Wales	North	Scotland
Very unwilling	**37**	34	36	36	39	41
Fairly unwilling	**24**	25	23	21	26	22
Neither willing nor unwilling	**25**	23	24	29	25	25
Fairly willing	**12**	18	13	10	9	9
Very willing	**3**	1	3	4	1	4

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