The Author of this document wishes to remain anonymous(purely for health reasons) and has asked me to relay any questions to him which he will be more than happy to answer. My 'e'mail address is bobgraham@onetel.net.uk or telephone 01343 880345

THE RENEWABLE ENERGY DEBATE AND WIND POWER

Apart from researching into the pros and cons of wind power, I am currently involved in a Community Renewable Energy Initiative involving hydro-power. So I have researched deeply into all forms of renewable energy, and the pile of official and semi-official reports and documents now stands over a foot high!

I write from a totally apolitical viewpoint, but with a healthy scepticism of most politicians of whatever party. After ten years in the Royal Navy I have been actively involved in farming, fish farming and several aspects of tourism, and thus have a broad range of practical experience.

Clearly I am influenced by the proposal to site 22 turbines on the ridge between Lochavich and Loch Awe, right opposite and at closest 1 kilometre from my house. However, were I convinced that windfarms are effective both economically and environmentally, then I would accept them in the common good. Nothing I have read in a mass of reports over the last year has convinced me otherwise.

Like most other people I was vaguely pro-wind energy on the basis that it was 'green'. However, a great deal of research has shown that onshore wind turbines are a politically driven 'quick-fix' which has not been fully reasoned through.
They are:

- **Ineffective as to overall emission savings.**
- **Unreliable, inefficient and unpredictable as to power generation, requiring costly and inefficient standby power plants**
- **Uneconomic without subsidy.**
- **Damaging to the greater environment, to tourism, and to the health and safety of local residents.**

By concentrating on windpower, research and engineering effort is being diverted from other, less environmentally damaging and more reliable renewable energy sources. For the power companies windpower is a quick, proven and relatively simple route to government subsidies – in other words they are in it for the money!

In the following pages I have tried to give a balanced view, but it is often difficult to determine between truth and half-truth when both sides 'spin' their arguments!

I have added the source of almost every quotation largely because I have read so many references that I tend to forget where each one comes from; and also so that anyone interested can follow them up. This digest is somewhat lengthy as I have avoided selective quotations but reported the facts verbatim. In the very few instances where I have shortened quotations I have done so accurately to the main gist.

Of major concern to us all should be the lobbying by wind farm developers of Government. Because the planning regulations protect the interests of us all, developers are seeking a fast-track route through the planning laws in the interests of economics and themselves, but certainly not to concerned individuals and groups.

I make no apology for being termed a NIMBY. If we who know and love the area make no effort to protect our backyards then what will be left for future generations? The Bishop of Hereford recently compared the spoilation of the Welsh hills by turbines as equally culpable to the destruction of Buddhist statues by the Taliban. I tend to agree.

If I can provide any more information I shall be glad to do so, but the following should give food for thought.

DTI - Department of Trade and Industry.
BWEA – British Wind Energy Association.
IPCC - Intercontinental Panel on Climate Change.
CCGT - Combined Cycle Gas Turbine.
CHP - Combined Heat and Power.

1. Back to basics:

: No one can query the need for more of our electricity supplies to be generated from renewable sources – over time. However, Government has drawn out of a hat the catchy phrase '10% from renewables by 2010, 20% by 2020' without considering whether this is practically achievable, economically feasible or scientifically necessary.

Whilst the targets are well-intentioned, they are unrealistic to the point of naivety. They vastly underestimate the capacity of Britain's engineering base to build tens of thousands of wind turbines and connect them to the National Grid, which itself is not designed to receive embedded generation (e.g. wind turbines). As Ian Fells (Professor of Energy Conversion at the University of 0Newcastle) commented: 'People don't realise you can't just build thousands and thousands of wind turbines and put them into the North Sea – there are severe engineering constraints. We have only three construction barges large enough. I'm staggered by the naivety of it'. [*The Times*, 30 August 2002].

: When politicians from the Prime Minister downwards consistently distort the truth to support their political aims one has to go back to scientific facts. For instance, the IPCC (Intercontinental Panel on Climate Change) suggested a possible rise of between 1.6 degrees C and 5.8 degrees C by the end of this century. Mr Blair then said "scientists tell us that the temperature is likely to rise by as much as 6 degrees by the end of the century." Not true – the IPCC said it was highly unlikely.
Mr Blair also forgot to mention that even if all the Kyoto agreements were fully implemented by every country, the rise in global warming would only be delayed six years in a century.

: "The quickest and most cost-effective way to reduce carbon dioxide and other destructive emissions is by increasing energy efficiency, improving energy management, and improving insulation." [Neil Kinnock quoting government policy]. But that of course doesn't generate any form of instant profit or glamorise the Government's programme – it's not something you can go to Rio and boast about!

: 'The projections of temperature rise to 2100 are uncertain because they depend on model simulations and are subject to the acknowledged limitations of those models. In

addition, predictions depend upon projections of greenhouse gas and aerosol (particle) emissions to 2100, which in turn depend upon assumptions about changes in global population, income, energy efficiency and sources of energy into the 21st century. The levels of these parameters in 2100 are not only unknown, but are unknowable within ranges that are relevant for policy making.' [The European Science and Environment Forum 2001].

: The journal *Global and Planetary Change* published the results of research carried out by C J van der Veen in an article entitled *'Polar ice sheet and global sea level: how well can we predict the future?'* He concluded that 'considerable improvements are needed before accurate assessments of future sea-level change can be made'.

One eminent editorial commented on the research:

'Hence, even for the *worst* of the global warming projections – which could well be way off base itself, as we personally believe it is – there could be little to no change in mean global sea level due to the ongoing rise in the air's CO2 content.

'Clearly the results of van der Veen's eye-opening study should be trumpeted in the ears of the public at large, as well as those of all world leaders'. [The Center for the Study of Carbon Dioxide and Global Change, 24 July 2002].

2. So is Kyoto flawed?

Probably on the basis of global warming; definitely on the cost/benefit analysis. I am very rarely pro-American, and was initially angered when Bush refused to ratify the Kyoto Protocol. But I am beginning to agree that they – and many other countries - have mustered strong and valid arguments for not ratifying.

: Not only may Kyoto be flawed, but evidence from internal Enron memos shows that 'the vocal global warming movements and its 1997 Kyoto Protocol were fruit of a stealthy and extensive lobbying campaign. The ringleader? Enron (surprise!). The memos disclosed that 'green' groups were courted, funded and even created to spread the gospel that man is killing the planet by burning fossil fuels, a malady Enron offered to mitigate through its natural gas, windmill and solar ventures'.

One memo headed 'Making sure there is a treaty' detailed high-level meetings with Clinton administration officials. Oval Office meetings followed soon thereafter. [W*ashington Post,* 25 April 2002].

Clearly, Enron no longer has the influence it once had, but the global warming scare it helped create lives on in public and political minds, clouding the true picture.

: To achieve 20% of electricity supplies from renewables by 2020 would roughly double the retail cost of electricity in the USA. [Energy Administration Information statistics]. This in turn would throw the world's largest economy into even deeper recession, causing untold misery throughout developing nations.

: The USA currently generates 8% of its total power from renewables, but most of that is from hydro and biomass, mainly wood. Despite being one of the top three wind power producers in the world (along with Germany and Denmark) the USA produces just 1% of all its renewable energy from wind i.e. 1% of 8%. 'Given time, market forces, with perhaps a little push from government-funded research, will almost certainly replace fossil fuels with renewables. If solar costs fall by 3% per annum we will be completely solar-driven on the planet by 2100.' [James K Glassman, US Embassy Rome, 11 June 2002].

In addition, too little is known of world climate change, and many eminent scientists think global warming is merely a cycle within a much larger pattern.

: Twenty-five years ago the newspapers ran headlines warning of the "continued rapid cooling of the Earth" [*Global Ecology,* 1971]; that we prepare for the next ice age" [*Science Digest*, February 1973]; and of "the approach of a full-blown 10,000 year ice age" [*Science*, March 1975]. Now the in-thing is global warming, and the politicians have happily climbed onto the band-wagon for their own ends.
The current belief in global warming reflects the power of political myth which evolved in the late 1980's to fulfil a political need, initially by both right and left. The right needed to promote nuclear power, and the left badly needed a legitimising science to control the car, globalisation and population growth – a whole raft of 'Green' agendas that had been elaborated during the 1960s and 1970s. [Professor Emeritus Philip Stott].

: 'If the global warming scare has little foundation in fact, the ice-age scare is only too solidly founded. For the last two million years, but not before, the Northern Hemisphere has gone through a regular cycle of ice ages; 90,000 years with ice; 10,000 years without. The last ice age ended 10,000 years ago. Our time is up. The next ice age is due. What causes ice ages? We do not know. It is probably something to do with the shape and arrangement of northern land masses and the path of the Gulf Stream, but we do not know. However, a new ice age, unlike global warming, would be a certain calamity.' [Andrew Kenny, *The Spectator,* 22 June 2002. www.spectator.co.uk].

: Philip Stott is Emeritus Professor of Biogeography at the University of London [www.ecotrop.org/]:
'Climate will continue to change catastrophically, gradually and unpredictably, whatever happens at the Kyoto Conference. We fool ourselves by thinking we can halt climate change by fiddling with one or two politically selected variables.'

: 'Earth's atmosphere has gotten about one-tenth of a degree Celsius warmer in the past twenty years, with most of the warming concentrated in the Northern Hemisphere. .. satellite data, from 1979 to 1997 [shows] there is no global climate trend at all – either up or down.' [Dr John

Christy, Associate Professor of Atmospheric Science, University of Alabama in Huntsville. 18 January 1999].

: Nor is carbon dioxide the major culprit it is so conveniently held up to be; 95% of the greenhouse layer is composed of water vapour, and CO2 makes up just 3%. Of this, less than 3% comes from using fossil fuels. *Science* magazine last year stated: 'The rate of CO2 accumulation in the atmosphere over the past two decades has stayed the same or even decreased slightly, in spite of the fact that emissions of CO2 from the use of fossil fuels have increased about 40% over the same time period.'

: 'In general terms the Kyoto Protocol is conservatively estimated to cost .. a mean of $350 billion. This amount of money could pay off the public debt of the 49 poorest countries in the world and provide clean drinking water for all. Imagine the comparative medical advantages of that course of action.' [Professor Philip Stott, *The Lancet*, 15 June 2002].

3. Are we about to run out of fossil fuel?

: 'Current known reserves—to-production ratios range from about 50 years for oil and gas to over 200 years for coal'. [The Director General of the UK Petroleum Industry: *The Times*, late 1999].

: New clean-coal technologies are in use throughout Europe and the USA, and can rival the overall environmental emissions of gas-fired stations.

: The House of Commons Trade and Industry Committee stated: 'We see no grounds for major concern over the very diverse countries of origin of supplies of gas, nor the prospect of prices being driven unnaturally high by cartel.. There are no reasons either on grounds of security of supply or of confidence in long term availability to resist the growing use of gas'. [*Energy Policy* June 1998].

I am hardly an advocate of nuclear energy, but the pragmatist in me argues that as 25% of UK electricity generation comes from ageing nuclear plants it is inconceivable that with increasing consumption renewable sources can replace nuclear generated supplies. [22% from UK plants, 3% from France].

: 'We need to make an enormous effort to convince the public about the benefit of nuclear energy. We have to choose. If we give up nuclear energy we will not comply with Kyoto.' [My underlining. Loyola de Palacio, EU Energy and Transport Commissioner, 28 April 2002].

: 'Replacing the whole of the current UK nuclear capacity would add only around 10% to the existing volumes of [nuclear] waste over the 40-year lifetimes of the reactors'. [News release 30 August 2002 by the Royal Academy of Engineering. www.raeng.org.uk/]

: That is not to say we should ignore renewable sources, but we need to be convinced that onshore windpower is not just a quick solution to ill-founded political decisions.

4. What are the alternatives to fossil fuels?

: Present power production is as follows:

- **Natural gas 37%**
- **Coal 33%**
- **Nuclear 25% (UK 22%, France 3%)**
- **Renewables 3% (mainly biomass)**
- **Oil 1%**
- **Hydro 1%** **[*The Times,* 30 August 2002].**

: We should make every effort to reduce pollution and energy use, coupled with an increase in energy efficiency. Which of us has not sweltered in some shop or office, when reducing the temperature by a few degrees would result in massive energy savings and a healthier workplace. Energy conservation should be top of all our priorities, but here Government is sadly failing to take the lead.

: Much more research needs to be done rapidly into wave & tidal power; geothermal energy; energy from waste management & methane from old coal mines; and especially biomass crops, for they convert as much CO2 as is released in their burning. Energy from Landfill gas is now considered 'one of the most successful technologies' and 'a mature technology', with an installed capacity potential of 850MW. [DTI *New Review* May 2002].

: All generators and suppliers should be obliged to adequately resource other developments when the social, ecological and environmental impact of windfarms is so great. Comparable studies should be done between the impact of windfarms as opposed to all other sources of renewable energy.

: Compressed methane in the form of hydrates on the ocean floor would provide sufficient energy for a millennium. There are problems associated with its recovery, but so there were with drilling deep oil wells offshore, and there is ample time before oil and gas stocks are depleted to resolve these problems.

: Geothermal energy has the potential to supply all our electricity demands, but needs government and commercial finance to back research.

For instance, in the mid 1990's Iceland offered to install - at their expense - a low-voltage sub-sea cable

and supply Scotland with electricity from totally non-polluting geothermal energy. Not surprisingly, the power companies blocked the project.

: 'Biomass is another promising power source for the future but it needs more research to make it practical – the whole of Kent would have to be covered in coppiced willow to replace the output of Dungeness B power station'. [News release 30 August 2002 by the Royal Academy of Engineering. www.raeng.org.uk/]

: At present the National Grid is designed to accept large amounts of electricity from a relatively few power stations. Massive amounts of money will have to be spent on the Grid to enable it to accept embedded generation e.g. windpower, CHP, micro-hydro etc. from a disparate number of sources.

: Not everyone agrees with the ability of renewables to meet the needs of a modern, industrial society. High up-front capital costs are one of the major barriers to the adoption of renewable technologies – about 3-15 times those of conventional fossil-fuel power plant technologies.

'Criticise innovation, renewable energy or the vision thing and you are in deep trouble. It explains why so much time and money gets wasted chasing the impractical. And why solar, wind and wave schemes have promised environmental salvation only to deliver tiny, erratic amounts of heavily subsidised electricity.

'Improvements in fuel use and emission reductions should be encouraged. Not in hope, faith or charitable green dogma, but in practicality. Get the money into domestic CHP (Combined Heat and Power), one huge tidal barrage scheme or, dare we say it, integrally safe nuclear power. Engineers, be practical.' [Bill Evett, Managing Editor of *Electrical Review*, 21 May 2002].

: Nuclear power has associated risks of radiation, accident and storage problems from spent fuel. But not one nuclear station would shut however many windfarms were installed, for wind is unreliable and needs 100% backup (more on that score later).

Even allowing for the world's two worst disasters at nuclear power stations (Chernobyl and Three Mile Island) the chance of you dying from a nuclear accident are about the same as being hit by a meteorite. Is not the answer to build a new generation of nuclear power stations providing

electricity over the next 40 years, at the same time researching heavily into reliable, environmentally friendly renewable energy systems?
'Replacing the whole of the current UK nuclear capacity would add only around 10% to the existing volumes of [nuclear] waste over the 40-year lifetimes of the reactors'.

: On 22 November 2002 Brian Wilson – Minister for Energy – announced three major areas for offshore windfarms. Coupled by a new sub-sea Grid they are close to centres of power demand and have the potential to supply all the UK's electricity needs. Offshore wind turbines are 20% more efficient than onshore due to more consistent windflow and the ability to build much larger turbines.
Surely large-scale offshore windfarms make sense, and the economies of scale will drive down cost, coupled with enormous opportunities for British manufacturing industry. The alternative of hundreds of small, isolated onshore windfarms in our most scenic areas with their minimal and highly variable output is obviously uneconomic and no longer arguable.

: Yet even offshore there are problems:
'The governments energy policy is hopelessly unrealistic, expecting far too much from renewable energy sources and ignoring serious concerns about reliable gas supplies..'
'.. grid stability can be adversely affected when the penetration of intermittent renewables reaches 15%.'
'The Energy Review places great faith in wind energy and proposes installing 22,000 MW of turbine capacity by 2020. However, Met Office data shows that the country's wind record is not dependable – the mot likely power output in real life is less than 7,000 MW. To ensure the supply it would have to be backed up by 16-19,000 MW of conventional generation plant, adding an extra £1 billion to the cost'.
[Royal Academy of Engineering, 30 August 2002 www.raeng.org.uk/]

: Load factor is the proportion of actual output of wind turbines compared to installed capacity. In 1999 these were:

Best	**– Spain at 27.8%**
Worst	**– Finland 14.8%**
European average	**– 19.5%**

UK load factors were:
1995 – 21.5%

1996 – 21.9%
1997 – 23.9%
1998 – 28.6% Four year average - 24%

Since 1998 the Government have declared load factors as 'confidential'. One can only wonder why they wish to conceal them, and in the absence of factual data one should use the above average of 24% - rounded up to 25% - when calculating load factors, rather than the 30% used by the wind industry. [Source of figures: DTI].

5. Will renewables give cheaper electricity?

Afraid not. Renewables have high up-front capital costs - from 3-15 times as much as conventional fossil fuels – and this is exactly why renewables have not been used worldwide to any great extent. Whether we should continue to expect cheap electricity at the cost of ever-diminishing supplies of fossil fuels is another question altogether.

: To achieve 20% of electricity supplies from renewables by 2020 would roughly double the retail cost of electricity in the USA [Energy Administration Information statistics].

: Denmark produces 15% of its electricity from wind power, and their cost is twice the price per unit of the UK's.

: Ofgem calculates that Scottish consumers will pay a 2-2.5% levy on their electricity bills within two years.

: Ross Finnie MSP (Minister for the Environment & Rural Affairs), when hard-pressed by the Rural Affairs Committee in June 2002, said in evidence that the increase in renewable energy for Scotland from the current 3% to 10% by 2010 will cost 5% on electricity bills.

: The Scottish Renewables Obligation [SRO] levy is used to compensate our two power companies – Scottish Power and Scottish & Southern Energy – for being obliged to buy more expensive renewable electricity. The SRO is expected to cost £15 million to the year ending 31st March 2002. [*Electrical Review* May 2002].

: The Scottish National party want 50% generated from renewables – that would mean a 30% increase in electricity bills for domestic & industry consumers alike.

: For every unit of electricity produced from the renewables target (10% by 2010) the generator will receive exemption from the Climate Change Levy – worth 0.43p/unit. The funds raised from the levy on Industry will be distributed amongst the renewable generators as a subsidy.
Those generators with a surplus of renewable energy will be able to trade it as Renewable Obligation Certificates, currently trading at 4.7p/unit.
And who says renewables are not subsidised?

: The Vestas wind turbine factory in Campbeltown received public subsidies of £9 million to create 140 jobs.

6. Why the dash for wind?

The UK government is committed to the Kyoto Protocol, although I have argued earlier that the Protocol is ill-founded, seriously flawed and the cost/benefit analysis does not add up.

For Government, wind turbines have two major advantages:

1. **They are largely privately funded at installation.**
2. **The subsidies for production are paid for by the consumer.**

They are a highly visible display of commitment to renewables. A more cost-effective saving on energy could be achieved by fully insulating Britain's housing stock, but that, of course, is not visible.

: 'The government's energy policy is hopelessly unrealistic, expecting far too much from renewable energy sources and ignoring serious concerns about reliable gas supplies..' [News release 30 August 2002 by the Royal Academy of Engineering. www.raeng.org.uk/]

: Electricity generators are obligated by Government to provide 10% of their supplies from renewable sources by 2010 (18% in Scotland, set by the Scottish Executive) and 20% by 2010. If they fail to meet this target they face penalties of about 4.7p per unit; windpower is the simplest and quickest way to avoid this penalty. These penalties will then be distributed as subsidies to the power companies.

: 'An average [cost] for a new [onshore] wind farm in a good location is 2.88 pence per unit. .. electricity from smaller windfarms can be more expensive.' (up to twice the cost – ADFD) [BWEA www.bwea.com].

The forward contract price for electricity in March 2002 was 1.2 pence per unit – half the cost of production from a new 'good location' windfarm.

Without government subsidies and penalties the incentive to produce electricity from onshore windfarms would be non-existent. Wind turbines throughout the world are always subsidised in one form or another, thus giving a false view of their economic benefit.

: Offshore windfarms have the potential to supply one-third of Britain's energy needs, and are up to 20% more efficient with the steadier, stronger airflows offshore. [DTI figures]. However, only about 10% of renewables can be integrated into the National Grid [BWEA figures] and no one seems to be proposing a solution, let alone costing it. At present the cost of installing offshore windfarms is about 30% more than onshore, although this is expected to fall sharply as technology drives down costs. [DTI figures]. In May 2002 subsidies of £74 million were set aside by the DTI for the development of offshore windfarms, but the Department admitted that was about half what was needed, and that they were swamped with applications. [*Electrical Review*, quoting the DTI].

: Windfarms certainly produce electricity without the associated pollutants from other sources - CO2, SO2 & Nitrogen Oxides from coal and gas powered stations, possible radiation from nuclear. Like other power sources they do however release CO2 during their manufacture and construction, but at a relatively low rate – 9-12g per unit of electricity generated, compared to 987g for coal, 446g for gas (CCGT) and 7g for nuclear.

: The BWEA advocates some 2,500 onshore turbines in the next decade, 80% of them targeted for Scotland. Others calculate that to meet renewable energy targets from windfarms would require 23,000 turbines. Who is one to believe?

Even these would only contribute about 1% to reductions in UK CO2 emissions – and less than .001% of the world's. The total amount of energy currently produced by UK windfarms is less than 0.5% of our total supplies.

: Wind power is unreliable and largely unpredictable; no wind, no power – too much wind and the turbines are shut down to prevent damage. However, all wind farm developers quote installed capacity as opposed to load factor – i.e. the proportion of actual output compared to installed capacity. In 1999 these were:

Best	**– Spain at 27.8%**
Worst	**– Finland 14.8%**
European average	**– 19.5%**

UK load factors were:

1995 – 21.5%
1996 – 21.9%
1997 – 23.9%

1998 – 28.6% Four year average - 24%

Since 1998 the Government have declared load factors as 'confidential'. One can only wonder why they wish to conceal them, and in the absence of factual data one should use the above average of 24% - rounded up to 25% - when calculating load factors, rather than the 30% used by the wind industry. [Source of figures: DTI].

: Because of the unreliability of wind power, other power stations have to be kept on standby to meet demand, known as 'spinning reserve'.

Coal-fired power stations are designed to run at optimum efficiency, and it can take two days to shut them down. When run on reduced output they perform less efficiently, and hence pollute considerably more.

Modern CCGT (Combined Cycle Gas Turbine) power stations can be run up from spinning reserve to full power in a few minutes. But 80% of our gas will have to be imported by 2020. [DTI]. Yet with the rise in price of gas this year, modern, efficient CCGT power stations are being mothballed, and output from cheaper coal stations increased – with resulting increased pollution.

Nuclear power stations, of course, cannot be shut down at short notice, and thus regularly provide 25% of the nations electricity demand.

: 'The Energy Review places great faith in wind energy and proposes installing 22,000 MW of turbine capacity by 2020. However, Met Office data shows that the country's wind record is not dependable – the mot likely power output in real life is less than 7,000 MW. To ensure the supply it would have to be backed up by 16-19,000 MW of conventional generation plant, adding an extra £1 billion to the cost'. [News release 30 August 2002 by the Royal Academy of Engineering. www.raeng.org.uk/]

: 'I have had some involvement in introducing cleaner and more efficient power stations in China, and it pleases me that these technologies are providing their expected benefits.

'Wind farms are a different matter altogether. These environmentally damaging money-wasters exist on hill-tops as very visible advertisements that politicians are 'green'. However, their large scale use would INCREASE power demand and fossil fuel (or nuclear power) usage because thermal plants would need to (wastefully) operate

on standby to provide backup for when the wind dropped or when it is blowing too hard.

'The New Age dream of a world operated by windfarms will remain a dream because the laws of physics do not allow it unless we return to a pre-industrial society; if wind power were economic then oil-tankers would be sailing ships.' [Richard Courtney, BA, ABSW, FRSA, ESEF. Expert Peer Reviewer for the UN Intergovernmental Panel on Climate Change (IPCC)].

7. Experience of wind turbines from other countries.

: Denmark is often held up as 'the' windfarm country, but has amongst the most expensive electricity in Europe, and the new government has placed a moratorium on further developments whilst it re-assesses their worth. Their industry minister, Bent Bendsen, is deeply concerned with the social and industrial consequences of building more turbines. 'We have far exceeded the limits for unsteady energy supplies' he said. [*The Scotsman*, 30 January 2002]. [And see http://www.naboertilvindmoller.dk/]

: 'Experience on the Continent, especially in Denmark, has shown that grid stability can be adversely affected when the penetration of intermittent renewables reaches 15%.' [News release 30 August 2002 by the Royal Academy of Engineering. www.raeng.org.uk/]

: Norway concluded: 'serious environmental effects, insufficient production and high production cost'.

: Over 100 leading academics in Germany concluded: 'The negative effects of wind energy is as much underestimated as its contribution to the statistics is overestimated. Falling property values reflect the perceived deterioration in quality of life – not just in areas close to turbines, but even all over Schleswig-Holstein.
Wind energy is therefore of no significance whatever either in the statistics for energy or for those of pollution and greenhouse gases'. [*The Darmstadt Manifesto*: A Paper on Wind Energy by the German Professors Initiative Group].

: France concluded that 'To use wind turbines along with other conventional energy producing systems to cover for he lack of wind periods is a particularly wasteful way of trying to reduce gas emissions'. [*The Scotsman*, 30 January 2002, quoting the French Parliamentary Office for the evaluation of scientific and technological choices].

: United Kingdom. 'The environmental impacts of wind power projects have become increasingly apparent during the 1990s.'
[House of Commons Trade and Industry Committee, 1998].

: 'My long-established view is that wind-generated power is an expensive form of energy. It can only provide a very small fraction of the output required to meet total energy needs and it unavoidably makes an unacceptable intrusion into the landscape'. [Neil Kinnock, EU Commissioner].

: 'Wind energy is not as clean as its proponents would have us believe. It is an industrial development and as such causes degradation of the environments where the turbines are sited. The proposed environmental benefits of windfarming .. will only come from the very large-scale use of turbines. One environmental problem will simply be replaced by another'. [Dr John Hedger at the Institute of Biological Sciences at the University of Wales Aberystwyth].

: To achieve 10% of the UK supply from windpower would require – by some estimates - 23,000 turbines. Not <u>one</u> power station would be shut down as a result, for the wind is intermittent and unpredictable, requiring alternative power stations to be on standby to meet demand.

8. Health, Safety, Tourism & the Environment.

HEALTH RISKS

The British Wind Energy Association states 'Wind turbines are not noisy.' [www.bwea.com – Frequently asked questions]. Many other reports disagree, particularly those living close to them.

: 'More and more people are describing their lives as unbearable when they are directly exposed to the acoustical and optical effects of windfarms. There are reports of people being signed off sick and unfit for work, there is a growing number of complaints about symptoms such as pulse irregularities and states of anxiety, which are known from the effects of infrasound (sound of frequencies below the normal audible limit).' [The Darmstadt Manifesto: A Paper on Wind Energy by the German Professors Initiative Group].

: 'Because of the low rotational rates of the turbine blades, the peak acoustic energy radiated by large wind turbines is in the infrasonic range with a peak in the 8-12Hz range.. [and] it would appear that wind energy does carry health risks.
'Typically, except very near the source, people out of doors cannot detect the presence of low-frequency noise from a wind turbine. They can, however, if the noise has an impulsive characteristic, 'hear' it within homes in nearby communities, again under the right set of circumstances. Because of the impulsive nature of the acoustic low-frequency energy being emitted, there is an interaction between the incident acoustic impulses and the resonance of the homes which serve to amplify the stimulus, creating vibrations as well as redistributing the energy higher into the audible frequency region. Thus the annoyance is often connected with the periodic nature of the emitted sounds rather than the frequency of the acoustic energy'.
[Neil Kelley, US National Renewable Energy Laboratory].

: 'Standing 1000 metres downwind of the turbines is enough for most people to realise that they would not like to live within this distance of a turbine. The sound is invasive enough to penetrate the walls and double glazing of a house of modern construction and still be clearly audible

inside'. [Residents of Marton, Ireleth and Askam, south Cumbria. www.windfarm.fsnet.co.uk].

: The BWEA also state: 'When it is very windy, the noise of the wind masks the noise made by wind turbines.' Yet *The Assessment & Rating of Noise from Windfarms* [DTI ETSU-R-97] clearly says: 'The assumption that background noise increases with wind speed is not necessarily true in hillier regions'.

SAFETY

: As with any large rotating structure – and some turbines are 400 feet tall – there is a risk to passers-by from structural failure e.g. lightning strike and storm damage. In winter ice shards forming on the blades when static can be thrown up to a quarter of a mile when the blades begin rotation. If we are indeed due for another ice-age, this will produce formidable safety concerns for windfarms close to footpaths & bridleways – but hardly a problem in the Highlands.

TOURISM

: A National Tourist Survey showed that 90% of British holidaymakers who go to the countryside do so to enjoy it for its own sake and seek no further attractions like theme parks. [Country Guardian, 'The Case Against Windfarms'].

: Evidence from Europe shows that visitor numbers have dropped by up to 40% where windfarms proliferate.

: VisitScotland (Scottish Tourist Board) commissioned an extremely detailed survey of tourist attitudes to windfarms, published November 2002. [www.scotexchange.com]. 56% of those interviewed said windfarms spoilt the landscape; 28% said they would stay away from windfarm areas.
Tourism is Scotland's main industry, generating £4.5 billion/annum and supporting 200,000 jobs. In Argyll it generates £330 million and 20,000 jobs at peak. [Argyll, the Isles, Loch Lomond and Trossachs Tourist Board]. If 28% of tourists avoided Argyll – with 21 windfarms proposed they almost certainly would – that would mean a loss of £92 million a year and 5,600 jobs. Economic disaster for a highly rural area, as farming, fishing & forestry are all struggling to survive. Directly or indirectly we all depend on tourism, and there is no viable alternative.

: In April 2002 we surveyed the last 100 bookings from our self-catering cottages, and 76% of past tenants said they would definitely/probably not visit the area if a windfarm was built in the glen – as is proposed. If windfarms proliferated in Scotland, 68% said they would definitely/ probably not visit again – a frighteningly high proportion.

: VisitScotland markets the country on the people, the history, and the landscape – justifiably so. If we destroy that landscape with windfarms so that tourists go elsewhere to unspoilt areas, where will that leave our economy, and especially the rural areas? Even a 10% drop in tourism would be economic disaster.

: The Welsh and Cumbrian Tourist Boards are already backing objections to windfarms, and the Welsh Tourist Board has revised its policy on wind farms and specifically endorsed the following.

: The Board opposes the introduction of commercial wind turbines and wind turbine power stations in both the primary designated areas (National Parks, Heritage Coast, National Marine Nature Reserves and Areas of Outstanding Natural Beauty) and on natural sites that are clearly visible from the primary designated areas. We consider that elsewhere proposals should demonstrate that there will be no detrimental effect on tourism.

: That the Board oppose the development of offshore windfarms adjoining the coastline, which is either within a National Park, designated Heritage Coast, Areas of Outstanding Natural Beauty or National Marine Nature Reserves. Elsewhere, in assessing the suitability of locations for offshore windfarms in the proximity of traditional coastal resorts the effects on tourism should be a material consideration in the determination of applications for such developments.

: That the Board recommends that the National Assembly for Wales provides clear land use policy guidance on the provision of wind farms and that the scope for less intrusive forms of renewable energy be investigated. (My underlining).

[Wales Tourist Board. Statement of Policy on Windfarm Development, 22 September 2000].

THE ENVIRONMENT

: The Countryside Act 1968 states:

'In the exercise of their functions relating to land under any enactment every minister, government department and

public body shall have regard to the desirability of conserving the natural beauty and amenity of the countryside'.

: Yet the visual, aural and physical damage windfarms impose on the landscape is all too apparent. Given the number and height of turbines the risk of bird-strike is considerable, especially in poor visibility. The wind turbines in Altamont Pass in California have on average killed 2-300 Redtail Hawks and 40-60 Golden Eagles each year. [California Energy Commission].

The RSPB (Royal Society for the Protection of Birds) receives regular funding from the power company Scottish & Southern. How then can we be assured of their impartiality when assessing Environmental Impact Reports?

: Two European Directives have been transposed into UK law by Regulations 48, 49 & 54 of the Conservation (Natural Habitats &c) Regulations 1994. They apply to proposed developments which are likely to have a significant effect on designated habitat and breeding sites.

: I accept that the actual footprint of each turbine is small, and that agriculture can be carried on right up to the base. But the visual impact is felt for many miles around, especially when sited on prominent hilltops.

: 'For people living close to a windfarm life can quite literally be hell. Noise, flicker and visual domination are all a constant source of concern and anxiety'. [www.windfarm.fsnet.co.uk].

: On narrow country roads wind turbines are a constant distraction, especially to visitors.

: With the collapse of major power companies like Enron and British Energy, bonds must be taken by Councils to cover the costs of decommissioning wind turbines. Scottish Power, for instance, have debts of £6 billion, equivalent to their total turnover. What guarantee do we have that they will be around in 25 years time to decommission any turbines installed?

9. Conclusion ("Thank Heavens for that," says you!]

: I fully endorse government policy of increased supplies from renewable energy, but strongly disagree with the emphasis on wind power. This emphasis on one 'flavour of the moment' results in far less research and development into other potential energy sources, some of which will be considerably less environmentally polluting. For instance, wavepower has been identified by the Scottish Executive as having potential to supply all our energy needs.

: For the power companies, faced with levies if they do not meet government targets, wind turbines are a proven, quick and cheap way both to avoid those levies and gain subsidies - subsidies to private companies paid for by every electricity consumer. Thus the race is on by the power companies to secure the best sites and cash in on the subsidies.

: Certainly there are some areas where onshore windfarms can make a contribution - albeit limited. For instance, brownfield sites close to centres of demand, where transmission losses and the unreliability of wind energy can be minimised. But major scenic areas like the Highlands – heavily dependent on tourism - must be preserved from the economical and environmental damage that such industrial scale projects would bring.

: Modern, clean gas-fired stations are being mothballed as:
: power prices in the UK are below the cost of production of less efficient generators.
: the UK power market is substantially over supplied.
: demand growth is likely to be non-existent.
: capacity withdrawal is needed to restore the supply/demand balance.
[Warburg's UK Wholesale Electricity Markets March 2002].

: In addition, the New Electricity Trading Arrangements (NETA) have seriously undermined the potential for unreliable, unpredictable sources like wind power.
'Analysts say the market's design encourages generators to use their power stations less efficiently, causing a jump in emissions of carbon dioxide, equivalent to all the savings from Britain's windfarms'.

‘ Emissions have risen over the last couple of years as generators switched to coal generation after a steep rise in natural gas prices, reversing a downwards trend in the 1990’s when utilities switched to less polluting gas’. [Reuters, 15 July 2002].

: The answer to renewable energy lies not in the cheap and quick solution of windfarms, but in the conservation of energy across the board. Up to 60% of energy is wasted in domestic homes, yet Vat on insulation and double-glazing is at 17.5%, whereas on electricity it is 5%. Subsidising house insulation is fifty times more cost-effective than subsidising windpower. [Source: Pilkington Insulation].

: If each UK household replaced the conventional electric bulb most used with a low energy bulb, the energy saved would equal the entire output of all existing and proposed [onshore] windfarms. [Professor John Etherington, former Lecturer in Ecology, University of Wales].

: The cost of saving energy is less than one half the cost of producing it. [BWEA].

: Scotland is a net exporter of electricity to both Northern Ireland and England, and we currently produce 12% of our supplies from renewable energy. However, the interconnector to England is close to capacity; why then are we being urged to produce a surplus of environmentally damaging, unreliable electricity which we cannot sell?

It makes little economic or environmental sense to produce electricity far from centres of demand. Rather, we ‘should be developing resources closer to the load centres’. [Report from consultants PB Power, 2001].

: Hard political decisions need to be made over the greatest pollutants – road and air travel. ‘The Academy is also very concerned about the Government’s lack of attention to transport issues – 42% of UK energy consumption goes on transport. Major support for research to develop the hydrogen economy is urgently needed’. [Royal Academy of Engineering, 30 August 2002].

I deeply regret that Government seems unlikely to make the necessary, if difficult, political decisions so desperately needed for a rational, sustainable and reliable energy policy. That is no reason for the ruination of our

landscapes for short-term profit and increased risk to the environment and the tourist industry so vital to Argyll.