

Ofgem Project Discovery - Options for delivering secure and sustainable energy supplies

I confess to having little faith that what I say will honestly be taken into full account, but at least I am not succumbing to passivity and failure to engage because of cynicism about this critical exercise. In view of the relevance of this contribution, if I receive only a stock acknowledgement, I'll know not to waste my time in future.

The consumer is between a rock and a hard place. Busy people, worried about employment prospects and making ends meet, have to trust that their interests are being protected - but ever increasingly misgivings are surfacing. Every time there is an article on AGW and/or the flawed wind turbine 'solution', it is usual for 90% or more of reader comments to be highly critical of the 'orthodox' position. If Ofgem isn't championing the consumer, who will?

Affordable, dependable energy is the lifeblood of our economy and way of life. The subject could hardly be more important. Yet there is no proper debate allowing conflicting evidence and points of view to be reconciled. Ed Miliband for one is guilty of reviling those raising legitimate concerns as antisocial. The term 'denier' is too often bandied about by those choosing not to acknowledge they have a political, ideological, or financial conflict of interest. The situation is a mess.

Let us be clear about claimed Co2 driven AGW - it is NOT settled science. There is no consensus. Climate is changing, it always has and always will. Suitably qualified scientists state that there has been cooling these last 10 or more years. We are apparently overdue a mini ice age. Co2 is a minor greenhouse gas – however, the increase has had a significantly beneficial effect on crop production. Atmospheric water vapour (the effects of which are not well understood) is said to be of much greater importance. Co2 levels have been rising, so where is the rising temperature correlation? In the past, Co2 levels have reportedly been between 10 and 20 times higher than at present without catastrophe. Medieval Warm Period temperatures were significantly higher than those at the end of the last century when present day temperatures peaked, again without catastrophe.

The IPCC has much to answer for. It is led by a man the media calls "leading climate scientist" but so far as can be discovered, he has no pertinent qualifications and has innumerable carbon trading conflicts of interest. Temperature data is drawn from monitoring stations the majority of which have been swallowed up by urbanisation. So we now have the absurd situation where former green field monitoring is contaminated with jet aircraft exhaust, air conditioning heat, passing traffic, tarmac, and all the other factors that lead to urban 'warm spots'. Many remote stations have been abandoned. Russia has recently complained that its data has been distorted and is unsafe.

Very much more could be written on this subject but information challenging the current commercial and establishment position is easy enough to find by those who care to look. Computer modelled assumptions using questionable data are not scientific evidence. It is speculation being made now by people who have funding and a reputation to protect. The UEA CRU investigations are headed by men aligned with the AGW hypothesis. Accordingly, cynics/realists anticipate a result that suits 'established' thinking.

This springs to mind: *Some people have a "conflict of interest" – this means their judgment is unduly influenced by money. "It's difficult to get a man to understand*

something when his salary depends upon his not understanding it,” as Upton Sinclair wryly observed.

In order to provide a concise, independent overview, attached is a chapter from a book by Dr John Etherington, former University of Wales Reader in Ecology, entitled “Climate change and Kyoto – Is it all necessary?” It is from *The Wind Farm Scam*, published by Stacey International ISBN 978-1-905299-83-6. The book sold out in the first two months and has now been reprinted twice in six months since publication. So the ‘vociferous minority’ assertion may well be well wide of the mark. It was published before the more recent UAE CRU revelations and growing critical media attention. I urge Ofgem decision makers to read Dr Etherington’s balanced, authoritative and thoroughly researched book. He was raised in a family of electrical engineers so is well placed to make sense of the environmental and power demand positions.

In addition, please study the following:

Memorandum submitted by Dr Sonja Boehmer-Christiansen (CRU 26) which details the wholly improper politicisation of science.
www.publications.parliament.uk/pa/cm200910/cmselect/cmsctech/memo/climatedata/uc2602.htm

Politics and the Greenhouse Effect – “Basic scientific principles demonstrate that the overall GE phenomenon is not a result of human emissions of “greenhouse gases”.”
www.tech-know.eu/NISubmission/pdf/Politics_and_the_Greenhouse_Effect.pdf

Wind Power Points

Setting aside landscape, amenity, and health implications of wind turbines, this focus is on the cost/benefit relationship for consumers. High infrastructure costs are a further factor.

The long, bitterly cold winter saw demand at its height. There are some 2700 heavily subsidised turbines – how did they perform? The National Grid’s NETA site has a ‘Generation By Fuel Type (table)’ at http://www.bmreports.com/bsp/bsp_home.htm. It offers real time data and gives percentage output against overall demand for the previous 24 hours. For much of the months of low temperatures, the wind contribution was either too low to register or was within the range 0.1% to 0.5%. It is obvious that wind is intermittent, unpredictable, and incapable of baseload generation. So what conclusions should be drawn?

Conventional fossil fuelled power duplication to back up wind is essential. E.on reckons 90%. Wind or no wind, the provision of this is urgent because of the looming 40% black hole as old power stations are obliged to close. So we have the farcical proposition that in order to reduce fossil fuel Co2 emissions, we turn to a technology that depends on fossil fuel generation to back it up most of the time. Further, the thermal backup cannot generate optimally because it is tracking wind – any electrical engineer will confirm this increases emissions, and that overall this is highly likely to increase Co2 instead of achieving the reduction objective. The burning question is “why bother with wind at all” as it cannot measurably reduce Co2; it will contribute significantly to fuel poverty; it involves uncertain and complicated ‘carbon trading’ fixes which constitute stealth taxes.

This report “Wind Turbines in Europe Do Nothing for Emissions-Reduction Goals” is pertinent <http://www.spiegel.de/international/business/0,1518,606763,00.html>

This article neatly and concisely exposes wind spin.
www.pressandjournal.co.uk/Article.aspx/1661284?UserKey=

Then there is future demand. Prof David Mackay's '*Sustainable Energy – without the hot air*' provides pointers. Commitment to electric transport means even greater demand than at present. That adds more pressure on availability of affordable and dependable electricity.

The position for onshore wind is untenable, but the offshore programme is beyond reason. Even if the targets were achievable (leading electrical engineer Prof Ian Fells and others give practical reasons why it is not) similarly low performance problems as onshore, and even higher costs are indefensible.

Further references:

Climate Money by Joanna Nova

http://scienceandpublicpolicy.org/images/stories/papers/originals/climate_money.pdf

Wind Turbine Syndrome by Dr Nina Pierpont – the recently published book has been peer reviewed by a number of experts including Professor Robert Lord May of Oxford, OM AC FRS, formerly President of The Royal Society, Chief Scientific Adviser to the UK Government and Head of the UK Office of Science and Technology, member of the UK Government's Climate Change Committee, Non-Executive Director of the UK Defence Science & Technology Laboratories. He, and the other peer reviewers, contributed to the book making it a distillation of considerable expert knowledge.

www.kselected.com/?page_id=6560

The Skeptic's Handbook by Joanna Nova

http://jonova.s3.amazonaws.com/sh1/the_skeptics_handbook_2-3_lq.pdf

Short and to the point:

Letters, Daily Telegraph, 4 September 2007

Sir, There is an old saying: "No one ever built a windmill if he could build a watermill." The wind is an unreliable source of power. It seldom blows steadily and sometimes not at all.

The power generated by the wind varies with the cube of the wind speed. That means that if the wind speed drops from 40mph to 20mph, the power output does not drop by 50 per cent: it drops by 87.5 per cent. At 10mph, the wind produces only 1.56 per cent of the power generated by a 40mph wind.

The wind can never become a major source of power.

Norman Plastow, Hon Curator, Wimbledon Windmill Museum , London SW19.

Sincerely,

Brian Gallagher

Climate change and Kyoto – Is it all necessary?

There is no opinion, however absurd, which men will not readily embrace as soon as they can be brought to the conviction that it is generally adopted. Arthur Schopenhauer

Whether the post-Kyoto control of carbon dioxide and other greenhouse gases is necessary to “tackle climate change” is still a matter of considerable dissent – despite political projection of consensus that “the debate is over”. Whatever the outcome of the controversy, it is quite obvious from the foregoing chapters that wind power could make little or no contribution in any circumstances. Even if one were to accept the tenets of a simple, one-factor CO₂-driven model of climatic warming it can be shown that wind power is not able to provide a significant or cost effective means of displacing CO₂ emission, or limiting fossil fuel consumption sufficiently to alter climate.

British “windmills” cannot significantly affect global warming so why write about it in a book on wind power? The decision is forced upon me by the repeated governmental support for wind power in the name of controlling the weather. Ed Miliband, the Minister for Climate Change, for example said:
It is socially unacceptable to be against wind turbines . . .
(Press statement on viewing The Age of Stupid)

There is no dispute that climate has changed on the scale of centuries, mostly long before man had any influence, and it will continue to do so, driven by natural processes, though within surprisingly narrow limits. It is also not disputed that man-made “climate change” may be caused by accidental alteration of atmospheric composition and its natural “greenhouse effect”. What is in dispute is the amount of warming which can be caused by a specified increase in a greenhouse gas.

The natural greenhouse effect occurs because the atmosphere is largely transparent to solar radiation, which warms the earth, but is partly opaque to the loss of infrared radiation which keeps earth cool. It may be visualised as a one-way door for heat, resulting in a warmer earth. The natural greenhouse maintains a temperature high enough for life to exist but it is also suggested that the manmade contribution to greenhouse activity may recently be causing it to become too hot for comfort.

Before we can understand the control and maintenance of earth’s temperature in the narrow limits which supports life we need to ask “What is ‘global warming?’” (or as it has been renamed for strategic reasons, “climate change”, a catch-all if there ever was!). It is often implicitly “man-made” and a threat to life, even though the historical past has seen relatively enormous climatic shifts such as the Roman Warm Period and the Medieval Warm Period and, a little later the Little Ice Age, long before man measurably influenced the atmosphere with fossil fuel CO₂ and other greenhouse gases (GHGs).

A simplistic answer requires a little bit of physics which I will attempt to explain without too many numbers. For simplicity, let’s

assume the earth is a globe with a very thin “skin” of atmosphere at the top of which is an imaginary “transparent ceiling” through which no heat can travel by convection or conduction. This barrier approximately models reality as the only significant energy exchanges between sun, earth and the cosmos are radiation at wavelengths ranging from long-wave infrared, through the visible down into the ultraviolet and short-wave X-ray and gamma-ray wavelengths. There is some transfer of energy by gravitation, causing tidal friction heating, but so small in quantity that it can be neglected in relation to global temperature. Below the “ceiling”, convection of heat and water plays the major part in creating “weather” and its long term average, “climate”. Evaporation of water and its precipitation transport huge amounts of energy vertically into the troposphere (lower atmosphere) and horizontally from low to high latitudes.

Energy from the sun reaches us as short-wave radiation (a mixture of visible light, ultraviolet and infrared). The atmosphere and earth’s surface absorb much of this radiation, the balance being reflected back to the cosmos mostly from cloud tops.

This absorption of radiant energy by the sunward hemisphere warms earth’s surface and atmosphere, and without a balancing process earth would rapidly heat up to a lethal temperature. The balance is provided by loss of long-wave infrared radiation (radiant heat). All bodies warmer than absolute zero (zero Kelvin or minus 273°C) radiate energy – visible light or shortwave infrared if they are very hot like the sun, or long-wave thermal infrared from cooler bodies such as the planets. There is in fact a continuum of decreasing wavelength of emission as temperature of the emitting body falls and it is also the case that a very hot body radiates enormously more energy per unit of surface area, than a cool one. Furthermore, all bodies exposed to radiant energy of any wavelength, absorb a part and reflect the remainder.

Earth’s average temperature (if there is such a thing on so diverse a planet!) is defined by just three energy exchanges through that imaginary “transparent lid” to the atmosphere.

a. “Downward” solar short-wave visible and invisible “sunlight” passing freely through the lid. Global average 342 watt per m² (W/m²).

b. “Upward” reflection of part of that income back to “space”, largely by cloud cover and some by reflection from the surface. Global average 107 W/m².

c. “Upward” loss of long-wave infrared radiation from surface and atmosphere to space. Global average 235 W/m².

If solar income (a) is constant, which it effectively is as an annual average, and if cloud cover and surface reflectivity (albedo) remained constant, so upward reflection of short-wave energy (b) will be constant. To balance the budget the net upward loss of longwave (c) must equal the difference between income and reflection of the short-wave solar energy (a - b) thus (342 - 107) - 235 = 0

(American Meteorological Society estimates). The zero of this balanced budget implies that earth is at a constant temperature – there being no residual energy to warm it or loss of energy to cool it. In the real world each of the three radiant components may change and alter the equilibrium temperature, as we shall see. It is a matter of geological history that these three processes have kept surface temperature in the very narrow range to preserve the molecular structure of life for over 3.5 billion years. At present it averages about 15°C. Living processes cannot continue much below 0°C and above about 60°C to 70°C almost all organisms die because their proteins and nucleic acids are destroyed. That I am here to write this, and you are reading it at this moment in geological time, is of great significance to the controversy about regulation of earth's surface temperature and the “global warming” debate. It implies that whatever has happened in the past has not been able to trigger run-away warming or cooling, otherwise all our shared inheritance of genetic material would have been snuffed out long before it had legs!

How does the “greenhouse effect” and consequent global warming relate to the atmosphere and its composition beneath that imaginary transparent ceiling? If the constituents of the atmosphere allow short-wave solar radiation in, this will cause warming of the surface and lower atmosphere. The warmed molecules will consequently emit long-wave infrared radiation. If the atmosphere absorbs this radiation it will prevent loss of energy to the cosmos and earth and lower atmosphere would grow warmer. This process was historically named the “greenhouse effect”, and gases in the atmosphere which are transparent to short wave but blanket long wave radiation are “greenhouse gases”. We have no space here to explore the argument about the appropriateness of the “greenhouse” simile – suffice to say it is a simplification which is at least 200 years old¹ and serves well in an elementary explanation. That's what simplifications are for.

Speculation on the warming effect of CO₂ on global climate dates back to the nineteenth century but it was only in the 1950s that systematic attempts to monitor air CO₂ concentration began. C.D. Keeling's continuous measurements of carbon dioxide in the atmosphere started in 1958 and quickly established that it was rising fast². The time-course is often now referred to as the “Keeling Curve”³. Other researchers soon took an interest in how the level of CO₂ had changed in the past and how it was influenced by chemical and biological forces. Initially this seemed of no practical significance, and unlikely to receive research funding. However through the '70s and '80s a few workers vociferously claimed that the gas plays a crucial role in climate change, and that the rising level could seriously affect our future.

These claims led to the establishment of the Intergovernmental Panel on Climate Change (IPCC) in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations. The IPCC does not carry out research, nor does it monitor climate but publishes special reports relevant to the implementation of the UN Framework Convention on Climate Change, adoption of which led eventually to the Kyoto Protocol.

By the time of the 1995 Second Assessment Report the IPCC confidently claimed, “The balance of evidence suggests a discernible human influence on global climate”.

The United Nations Conference on Environment and Development, commonly known as the Rio Summit, which was held in June 1992 had its foundation partly in the IPCC’s work. More than 100 national leaders signed the Convention on Climate Change and adopted Agenda 21, a plan for achieving sustainable development in the twenty-first century. This was a further step toward the Kyoto Protocol on global warming which was adopted in 1997, came into force in 2005 and now in 2009 has 183 ratifying signatories.

The agreement was intended to reduce global emissions of carbon dioxide and other minor GHGs to 1990 levels or below during the period 2008-2012. Crucially, the protocol was based on the assumption that carbon dioxide was the main factor in driving “global warming” and indeed the only quantitative annex to the summary of actions taken in 1997, was a list of countries, their CO₂ emissions and percentage contribution to emission of the gas⁴. However, the atmospheric concentration of CO₂ continued to rise at about the same rate it did before Kyoto, at a steady 1-2 parts per million by volume (ppmv) per year and until the 2000s, global average temperature rose with it, albeit not so steadily. “Global warming” became a household word and vested interests targeted governments and academia with demands to “do something”.

Up to this point, contributors to the “warming” debate on either side would not be likely to argue too much with this account. It is a matter of fact that air concentration of CO₂ has been increasing at one to two ppmv per year at least from the 1950s and carbon isotope studies suggest that much of the increment has come from fossil fuel. All physicists would accept that long wave absorption by this extra CO₂ will cause some warming of the troposphere and surface, but the magnitude of radiative forcing and consequent temperature rise is in dispute. It is also correct that a generalised warming has continued sporadically since the late 1800s – before man could have had much influence. It accounts for much of the total recent warming and is usually interpreted as emergence from the cold of the Little Ice Age. There is controversy about the impact of man-made CO₂ in the later years of the twentieth century and to what extent it has driven additional warming, in particular because warming has now slowed or even reversed for a decade.

These recent events can be seen in the global temperature record, compiled by the UK Meteorological Office’s Hadley Centre
CLIMATE CHANGE AND KYOTO – IS IT ALL NECESSARY?
173

for Climate Prediction and Research, which starts in 1850. This presents the temperature change as an anomaly – expressed as difference from the average of 1961-905.

During the period 1850-1900 the anomaly oscillated between minus 0.4°C up to minus 0.2°C. Shortly after the turn of the century a steady increase took the anomaly to + 0.1°C by 1940.

The temperature then dropped sharply back to an average anomaly of about minus 0.2°C, maintained until the late 1970s when the “modern warming” began as a continuous uniform increase lasting for some 30 years and taking the anomaly to about +0.5°C, reaching a record high in 1998. This 1998 record coincided with and was amplified by an El Niño event and even now ten years later has never been exceeded.

If, and only if, a starting point is chosen at the commencement of one of these two 30 to 40 year warmings, for example 1970-2000, the cumulative temperature rise is highly correlated with the CO₂ concentration. However an alternative choice such as 1940-1980 shows virtually zero correlation between CO₂ and temperature (assuming CO₂ concentration can be extrapolated into the past as the IPCC does).

After the 1998 record high, global temperature-change dropped back in line with its pre-El Niño course but from 2002 the evidence suggests that the 30-year “modern warming” has stopped and latterly has become a four-year cooling. It is far too soon to draw conclusions about climate change but is of huge significance that since 1998 there has been no correlation between the inexorably rising CO₂ concentration and global temperature. The protagonists of global warming explain this recent cessation of temperature-rise but continuing CO₂ increase by claiming that other natural processes have masked the ongoing warming. This may be so, but it also suggests that the earlier warming may have been part of a natural oscillation. As the IPCC’s and other computer models of climate failed to predict this cessation of warming it means that at least one unknown parameter is missing from the modelling. What is it? and what else is missing? It is not credible that the virtual-world output of the models can be reliably used to make policy decisions.

Neither is this the only failure of prediction by the models.

Their projections suggested that the troposphere should show more warming than the surface but in fact its temperature has been virtually unchanged since 1979 if El Niños and volcanic eruptions are taken into account⁶. The inability of models to retrospectively explain events in the more distant past compounds doubts whether huge financial commitments should be gambled on their future output.

Temperature in the past

It is not only in recent history that CO₂ appears to have no effect as a warming gas. The geological past has seen great changes in atmospheric CO₂ concentration, global temperature, cloud cover and sea level. In the distant past CO₂ has been enormously higher than the present level – it was over ten times the modern concentration in the early Palaeozoic era, including glacial periods during the Ordovician period (490 to 443 Ma). Prior to this, with even higher CO₂ our planet had experienced several major glacial periods (600-700 Ma) when the entire Earth was icecovered for long periods⁷. The coexistence of high CO₂ concentration and glaciation, not to mention spontaneous recovery from what could have become run-away

freezing, suggests that CO₂ alone simply cannot be the sole driver of climatic temperature change.

During the present Quaternary Period, covering the past 2 million or so years, there has been a cyclic repetition of 30 to 40 warm and cold events – the coldest becoming full glaciations. We know from ice-core sampling in Antarctica and Greenland that CO₂ and methane (CH₄) rose and fell in concentration, correlated with the temperature changes but lagging a few hundred years after them⁸. There could of course have been no man-made effect on CO₂ concentration during any of these cyclic oscillations or the changes of temperature in deeper geological time.

We live in a late-interglacial period and because of cyclic recurrence, almost for certain the cycle will repeat itself. The temperatures at our latitude became sub-tropical in the last interglacial and the sea rose to several metres above the present level. For the future of mankind, it is important that we recognise that this will happen and as it is unlikely that human intervention could safely deflect the process, we need to conserve resources to adapt to these changes as they develop. “The Age of Stupid” will almost certainly prove to be the time when we threw away essential resources in symbolic acts akin to those Bronze Age sacrificial offerings intended to ensure that the sun would continue to rise.

The warming process during the current interglacial is already well documented. Temperature has been rising in sporadic fashion since the maximum of the last glaciation (c.18,000 years ago), faster during the final de-glaciation (ended c.10,000 years ago) but it has continued sporadically ever since though more slowly in the past 2,000-3,000 years. At the height of the last glaciations about 18,000 BP [Before Present], sea level was about 100 m below the present level consequent on land-locking of ice and thermal contraction of ocean water, aided and abetted by alterations of land level caused by the weight of ice.

During the post-glacial warming there have been “hiccups” – the sudden re-freezing of the Younger Dryas was the most prominent and plunged earth back into cold from 15,000 BP to 13,000 BP with dramatic cooling and then a warming of several °C within a century or less, all without the carbon footprint of man. Several smaller changes are evidenced by many paleoclimatic proxies or are historically recorded; thus we have the Bronze Age and Roman Warm Periods, the Medieval Warm Period and the Little Ice Age, the harsh winters of which to this day give us our Dickensian Christmas card visions of snows and cosy cottage lamps.

None of these great changes in the past can be attributed to man-made CO₂. It is possible that the present human contribution to CO₂ increase may speed the warming process but before embarking on hugely expensive policy decisions, the proponents of warming must explain how CO₂ and CH₄ increased previously without human intervention and of course why they followed rather than preceded temperature change (see below). More crucially, how did rising or falling CO₂ concentration switch as the

climate cooled or warmed into the succeeding glacial and interglacial periods? What physical process switches between warming and cooling in the absence of human interference? We do not know – and what is fast becoming the world’s biggest ever commercial enterprise will be based upon total ignorance, indeed the true age of the stupid.

Consensus is crumbling

As a former peer reviewer and editor of an international journal, I am shocked by the discussion-stopper from politicians and journalists (even the occasional inexplicable scientist) that “debate on climate-change is over” – that there is “consensus”. This is simply not true nor how science works. It is certainly not how the incredibly complex science of climatology works as IPCC itself recorded – probably now to its own embarrassment.

We are dealing with a coupled non-linear chaotic system, and therefore the prediction of a specific future climate state is not possible.⁹

The future projections of the IPCC are essentially based on mathematical modelling and it is significant that the IPCC calls the models and outputs “storylines” each of which belong to scenario families. The climate models calculate the consequences of increasing atmospheric GHG concentrations and an illustrative “scenario” was chosen for each of six scenario groups which were refined down from 40 original groups. The 2002 Special Emissions report notes that no judgment is offered as to preference for any of the scenarios:

[The scenarios] are not assigned probabilities of occurrence, neither must they be interpreted as policy recommendations.¹⁰

Politicians and the media have deliberately disregarded this warning against misuse and inevitably represent the worst-case scenarios of greatest change. As a result of this disregard, the world is now committed to the greatest expenditures it is likely to make, but with no guarantee that any specific outcome will be achieved. The computer generated “futures” are a virtual reality and, lacking numbers and sometimes signs for important parameters such as reflection of energy income by clouds, cannot be relied on to be more accurate than tomorrow’s weather forecast.

The impression which has been projected to the media and the public by the IPCC is very simple: that CO₂-emission is increasing at an exponential rate, that atmospheric concentration will follow that increase and because it is a greenhouse gas global temperature will rise. Lo and behold, if we start in 1970 and stop in 2000 as we saw above – we have demonstrable “global warming” and thus hysteria has erupted.

However if we move forward into the last decade or backward in history by say 1,000 years or further through geological time, there is no evidence for CO₂ -driven warming (or cooling for that matter). During the past decade CO₂ has risen uniformly but there has been no overall temperature rise. Likewise in the period 1940 to 1970 there was no correlation between increasing CO₂ and

temperature.

Looking further back the most remarkable failure of CO₂ warming theory is derived from the late Quaternary ice core record of temperature, CO₂ and methane, especially those from the Vostok Antarctic base where there is a continuous record covering 420,000 years and several glacial-inter glacial cycles¹¹. In his film, *An Inconvenient Truth*, Mr Gore triumphantly said that when CO₂ goes up and down, so does temperature. Unfortunately for this “proof” that CO₂ is the driver, higher resolution analyses of the cores revealed that it is temperature change which precedes the dissolved gases by between 200 and 1,000 years for the last three deglaciations. Thus the assumption that CO₂ controls climatic warmth appears to be a good story spoiled by ugly facts. That temperature moves first is falsification of the CO₂ driver hypothesis – CO₂ patently cannot be the initial driver of temperature change. It is most likely that temperature is driving evolution of CO₂ by the warming of seawater, which reduces the solubility of the gas.

CO₂ concentration is increasing a lot; how can it not cause warming?

One answer lies in feedback. A refrigerator does not get too cold or too warm because it has a thermostat which senses temperature and imposes a negative feedback. When too warm it cools and when too cold it switches off and warms slightly. Many natural systems, physical or biological, have feedback mechanisms. Negative ones maintain stability whilst positive ones promote runaway change. By far the most important natural GHG is water vapour which can also change to liquid water (cloud) in the atmosphere with effect on both incoming solar radiation which it reflects, and upward long-wave radiation, which it absorbs. As a global average, water vapour and cloud contribute more than three-quarters of the natural “greenhouse” which makes earth habitable rather than a frozen “snowball”. The reflection of short-wave income by cloud reduces average solar energy input by about 20% but both vapour and cloud also reduce cooling by blanketing long wave infrared loss.

Warm air can contain much more water vapour than cold air so any warming process will cause evaporation of water into the lower atmosphere then, as it is transported by atmospheric convective processes, it may condense as cloud. Low level cloud in particular imposes a negative feedback on warming by reflecting solar income, whilst high altitude cirrus cloud may add more blanketing and act as a positive feedback to warming.

Long before I encountered the problems of wind power discussed in this book, I taught undergraduate biologists elementary environmental physics which included outlines of earth’s energy balance and the radiant energy budget of ecological systems as it relates to the water cycle and carbon fixation by photosynthesis. At that time (1975) I wrote:

[The] energy budget of the earth’s surface may be altered by the ‘greenhouse effect’; the trapping of long wave blackbody re-radiation of energy, from the earth’s surface, into space. This effect is due to the transparency of CO₂ to the

shortwave income from the sun and its opacity to the much longer wave, low temperature re-radiation. The obvious consequence would be an increase in atmospheric temperature but further alterations such as an increase in global cloud cover might also be expected to have a homeostatic effect.”¹²

Looking back over 34 years this seems a bit naive, but one thing which remains true is that alterations to the water cycle and cloud cover could impose a negative feedback, so providing selfregulation (homeostasis) of temperature. This would prevent CO₂ or other greenhouse gases from driving temperature inexorably upward or downward as they change in concentration. The UN’s Intergovernmental Panel on Climate Change (IPCC) has recognised this possibility. For example the 2001 3rd Assessment Report listed amongst “Key Uncertainties”:

Factors associated with model projections, in particular . . . climate forcing, and feedback processes especially those involving water vapor, clouds, and aerosols.¹³

The 2007 4th Assessment Report remained remarkably vague about water despite the fact that no mathematical model can give a useful predictive simulation if any key parameter cannot be quantified. It said:

Cloud feedbacks remain the largest source of uncertainty.¹⁴

An earlier IPCC report had expressed not only doubt about the magnitude of the feedback from the water cycle but also admitted its sign was not known. Whether water provides a positive or a negative signal is crucial to predictive modelling and if the value is simply guessed at, the output of the model is equivalently guesswork – “garbage in – garbage out” in the words of wise modellers. As I said above – we do not know.

In addition to the low-level cloud reflective feedback it is now apparent that infrared blanketing by high altitude cirrus cloud may vary in response to surface temperature. In 2001 Lindzen *et al.* suggested that high cirrus cloud over the tropical Pacific dissipated as the sea surface warmed, thus opening an “iris” for escape of long wave infrared¹⁵. Further support has come from Spencer’s recent work at the University of Alabama. If this mechanism is widespread, and operates on global warming, “it would reduce estimates of future warming by over 75 per cent”.¹⁶

A second reason why increasing CO₂ may not drive substantial warming is that the “blanketing” effect is logarithmically related to concentration – sequential equal increments of CO₂ give progressively less warming. If we look at the escape of long wave radiation through the atmospheric “lid”, it is as if there are a number of windows to the cosmos (corresponding to wavelengths of radiant absorption by CO₂). If there were no CO₂, some of the windows would still be “curtained” as water vapour and cloud has already blocked them. The first increment of CO₂ pulls a thin curtain over the remaining windows so less energy spills out and the planet warms. The next thin curtain has less effect, and very soon, extra curtains make no significant difference to blocking radiant energy.

The net effect of doubling CO₂ concentration can be expressed as the imbalance of radiant energy passing the “lid” – often referred to as a “forcing factor” expressed in W/m². If a net downward energy flux results, this is a positive forcing factor and, via the Stefan-Boltzmann relationship, can also be converted to a predicted surface warming and new higher equilibrium temperature.

In increasing from perhaps 280 ppmv (parts per million by volume) in pre-industrial times to 380 ppmv now, carbon dioxide has already produced 75 per cent of the theoretical warming that would be caused by a doubling from pre-industrial 280 to 560 ppmv. As we move from 380 to 560 ppm, at most a few tenths of a degree of warming remain in the system. Claims of greater warming rely for example on assumptions that all feedbacks are positive – statistically unlikely, probably untrue for low cloud formation, and counter to the circumstantial evidence of life having survived several billion years. However empiricism now tells us that there has been no warming for ten years during which CO₂ has risen steadily from 368 to 386 ppmv¹⁷ – there is an almost irrefutable suspicion that CO₂ cannot be the principle driver.

An inconvenient untruth

We saw in Chapter 10 that the industrial and political determination to deploy wind power at all costs has encouraged a great deal of misrepresentation. Much the same can be said of “climate change” and just one example is recounted here as an indictment of this corruption of science.

In 1990, the IPCC’s 1st Assessment Report¹⁸ included a graph of the global temperature history from AD 1000 to 1990. Between 1000 and about 1400 the Medieval Warm Period (MWP) was depicted with a highest temperature much exceeding that of the modern warm period. It also showed temperature plunging to a similar degree below the present warmth to give us the Little Ice Age which terminated not long before the twentieth century. This diagram was derived from the work of distinguished climatologist, Hubert Lamb, the founder of the UEA Climate Research Unit.

In 2006 Dr David Deming of the University of Oklahoma gave testimony to the US Senate Committee on Environment & Public Works¹⁹ that, after he had published a paper on borehole temperature historical data in *Science*, he received an email from a major researcher in the area of climate change which said, “We have to get rid of the Medieval Warm Period”.

And indeed someone did. In 1999, Michael Mann and his colleagues published a reconstruction of past temperature from AD 1000 to the present, in which the MWP simply vanished. This unique estimate became known as the “hockey stick,” because of the shape of the temperature graph. The long straight shaft represented unchanging temperature from 1000 to the beginning of the modern warming, taking-off into the future as the sharp upward angle of the “blade”. By the time of the IPCC’s 3rd Assessment Report in 2001²⁰ the hockey-stick and the very similar graph of CO₂ during the same period had become the trademark of global warming, featuring in hundreds of presentations and press reports as scientifically illiterate “proof” that CO₂ was warming the earth. The diagrams were included several times in the main 3rd

Assessment Report and also as large illustrations in the *Summary for Policymakers*.

There is not space here to explain what happened next but careful investigation revealed that the hockey-stick had been created by a statistical manipulation which, by over-weighting parts of the data set could create the hockey-stick shape from any – even a random data set. Amidst protestations of outrage and innocence the diagrams have quietly disappeared from prominence and no longer feature in the IPCC's 4th Assessment Report SPM21 nor as “convincing” slides in presentations. With the loss of the hockey stick, the MWP has been recreated and there is no doubt from the historical record and proxy data that it was at least as warm as the present day despite our “unprecedentedly high CO₂”. Similarly the Little Ice Age is even better documented as colder than the present and recovery from it was certainly the beginning of recent warming triggered by what? Certainly not man-made CO₂.

Carbon dioxide may or may not play an important role in controlling global temperature but other factors must be involved and are the more likely cause of the sudden warming and cooling events which we have seen on a small scale in modern times and through prehistory as the cyclic oscillation of glacial and interglacial periods. Cyclic changes in solar radiant flux have long been recognised as driving the glacial resurgences but as to the shorter term events like the temperature hiatus of 1940 to 1970 or now in the last decade, we do not as yet know and claims that mathematical models can tell us the answers are simply untrue and as we have just seen, encourage intellectual recklessness or was it dishonesty?

References and notes

1. Jean Baptiste Joseph, Baron de Fourier, in 1807, suggested that the earth's atmosphere acts like the glass of a hothouse. *Theorie Analytique de la Chaleur*. The concept may be even older.
2. Beck, E.-G. (2007) 180 Years of Atmospheric CO₂ Gas Analysis by Chemical Methods. *Energy & Environment* Volume 18 No. 2. Beck reexamined a large number of early volumetric and titrimetric analyses of CO₂, concluding that concentrations have not been so stable with time as other modern workers have assumed.
3. R.F. Keeling et al. Atmospheric Carbon Dioxide Record from Mauna Loa 1958-2007 <http://cdiac.ornl.gov/trends/co2/sio-mlo.html>
4. Report of the Conference of the Parties on its Third Session, Held at Kyoto From 1 To 11 December 1997. Addendum Part Two: Action Taken by the Conference of the Parties at its Third Session.
5. Hadley Centre for Climate Prediction and Research (Meteorological Office) <http://www.cru.uea.ac.uk/cru/data/temperature/hadcrut3gl.txt>
6. Gray, V. (2006) Temperature trends in the lower atmosphere. *Energy & Environment* 17, 707-714
7. International Geoscience Programme (IGCP) Project 512: Neoproterozoic Ice Ages <http://www.igcp512.org/>.
8. Monnin et al. (2001) Atmospheric CO₂ Concentrations over the Last Glacial Termination. *Science*, vol.291, p.112. Shows a time lag of 800 years.
9. IPCC (2000) Draft WG1 Third Assessment Report Chapter 14. The quotation which is obviously crucial and just as true today was in a

section on chaos in climatology and omitted from the *Summary for Policymakers*.

10. IPCC (2002) *Special Report on Emission Scenarios* (SRES).

11. Fischer, H et al. (1999) Ice Core Records of Atmospheric CO₂ Around the Last Three Glacial Terminations. *Science*, 283, 1712 – 1714.

12. Etherington J. R. (1975) *Environment and Plant Ecology* 1st edn John Wiley.

13. IPCC (2001) *Third Assessment Report. Summary for Policymakers*. The IPCC's future "scenarios" (its word) for projected climate are largely based on mathematical models which effectively deliver century-long weather forecasts.

14. IPCC (2007) *4th Assessment Report. Summary for Policymakers*.

15. Lindzen et al. (2001) Does the Earth have an Adaptive Infrared Iris? *Bull. American Meteorological Society* 82 417-32.

16. Spencer, R. (2007) Cirrus disappearance: Warming might thin heattrapping clouds. University of Alabama, Huntsville. Earth System Science Center press release.

17. Mauna Loa CO₂ record. Scripps Institution of Oceanography, National Oceanic and Atmospheric Administration.

ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_mm_mlo.txt

18. IPCC (2007) *1st Assessment Report*.

19. U.S. Senate Committee on Environment & Public Works Hearing Statements (12/06/2006). Statement of Dr David Deming, University of Oklahoma http://epw.senate.gov/hearing_statements.cfm?id=266543

20. See 13.

21. See 14.