

ecolonomics

Paul Mobbs' newsletter of thoughts, ideas and observations on energy, economics and human ecology

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Thoughts stirred by an afternoon on Garreg Hir... and wind turbines

Does the present debate about energy, and especially climate change and wind power, mask a more troubling and pressing debate that mainstream society just doesn't want to have?

Saturday 15th August, 2009 – Clatter, mid-Wales

For a map of the Garreg Hir area, [click here](#)

Perhaps my day of rest and relaxation didn't quite turn out as intended – an afternoon walking in the hills of mid-Wales, inspiring thoughts on the problems with the debate about energy. The difficulty in considering the issue of wind power and the countryside is that people are not talking about the real “energy problem”, but instead engage in a totemic debate that creates the pretence of action whilst ignoring the more unwelcome truths about how we consume in our “modern society”.

Right now I'm sat behind a large rock on top of a sixteen hundred foot mountain, scribbling hieroglyphs (a.k.a my handwriting) ***furiously in a small notebook as I dictate the structure of this essay.*** This is a good location to draft ideas, but not to write them out in detail: The wind is blowing at twenty to twenty-five miles per hour, and probably gusting to well over thirty; although the weather report might be for nineteen degrees Celsius today, its two degrees less at this altitude due to the lapse rate, and the wind chill knocks a further three or four degrees; waves of drizzle lash across the landscape and the clouds roll across the panorama of the rooftop of mid-Wales that lies all around me; the rough weather means that although this is an easily accessible mountain top, and it's the middle of the holiday season, I seem to be the only human in view in this post-glacial landscape, listening to the exasperated tweets of the birds and the mournful bleats of the ewes recently separated from their lambs; the hard climb has depleted my water reserves, and I've just finished the second of my two apples, so I'm going to have to ration my consumption in order to get back to base again; in other words, it's a very

nice day!

I set out from Carno just after one in the afternoon. Stopping to pick a stone from the bed of the River Carno as I left the village, I walk the back roads to the foot of Garreg Hir, just to the north of the small hamlet of Clatter on the A470. A nice gentle walk, few cars on the road, lush hedgerows, warm breezes, and the odd ripe blackberry to boost the blood sugar. Then things got difficult.

The map describes a bridleway rising from Parc-y-rhiw, about six hundred and twenty feet in about a quarter of a mile – but it didn't show the enthusiastic farm dog (it's lick likely worse than its bite), the barbed wire fence where the gate should be, and most importantly the chest-high bracken covering the whole ascent. About a hundred feet into the ascent, sweat running down my arms and legs, I wondered if this was such a good idea. I could see dark clouds on the horizon and the wind was rising – *but damn the effort, this is such fun!*

The path to the summit, on the map at least for no path exists in front of me, is over a couple of bracken-covered breaks on the slope which obscure the route to the first of three long ridges that crown the mountain. Walking through bracken requires thought rather than brute effort – you can burn a lot of energy forcing your way through or you can listen to what the vegetation tells you to do and take what is often more circuitous but easier route. The sheep have done some of the work; when walking through dense bracken look for the cleavage lines in the green sward, created by the passage of sheep and other animals beneath the surface layer, and zig-zag up the hill along these lines to reduce the effort of wading through the woven foliage. The difficulty here

is that I need to keep close on the track to avoid the boggy ground, and so I'm navigating on the compass – sighting points on the skyline, and zig-zagging towards them up the steep (30 degree or so) slope, eventually I arrive about fifteen or twenty feet off-course from the gate that gets me through the fence and on towards the top of the hill. It's been more than a year since I've had a good walk like this but at least I still retain the knack of walking a bearing in the mountains.

I reach the first ridge, at about 1,440 feet, and just sit and look at the view for a while – I'm not really bothered about the time, and in general I prefer to walk without a timepiece so that I travel at the pace of the landscape and my energy levels rather than having to return by a specific time. Experience tells me that this walk will take four or five hours, and that's all I need to consider in planning the route – worrying about your progress along the route just detracts from enjoying it, and hurrying to keep an arbitrary time schedule depletes your energy and makes you have accidents.

Garreg Hir (in English, “the long rocks”) is a series of fractured stone ridges, created by alternating layers of hard and soft rocks that have been uplifted to an angle of 45 degrees. In the last ice age a glacier shaved off the top of the landscape, hollowing out the softer rocks to leave a mountain that looks like a line of odd-sized books that have fallen over sideways on a shelf. Between each successively higher ridge the weathering of the rocks and the slow, high-altitude growth and decay of bog grasses and sphagnum moss has created a rich black peaty soil that in recent centuries has been cleared and fenced for sheep – although with the demise of Welsh hill farming the bracken and gorse are slowly reclaiming the land. On the south west flank of the mountain the land surface of a field has been scraped clear and presumably re-seeded to try and halt the advance of the creeping green invaders, but all this appears to have done is create a scar of water-eroded soil down the steep hillside and into the valley below. When traversing boggy land like this you can get rather damp and messy, but trust the sheep! They know this landscape a lot better than you, or the map-makers, and sheep won't willingly walk into the mire – follow the sheep tracks and you can usually pass without getting stuck.

As well as the enthralling structure of the mountain that I see written around me in the living rock, on a larger scale this area tells the story of its creation in the topography of the hills and valleys. The steep slope I have just climbed marks the boundary between the Wenlock and Llandovery groups, Silurian rocks about four-hundred and twenty-five million years old¹ – the construction material for which, as sedimentary rocks, would have been eroded from land created perhaps half a billion or more years before that. The difference in hardness between the

two rock groups provided a weakness for ice and water to carve the land surface that you see today, and this contact line roughly defines the long valley along which the River Carno flows, and which rises to where the railway line cuts the wall of the valley on the far side of Talerddig to enter the Twymyn valley beyond.

As I climb higher the mid-Wales landscape opens around me like a vast amphitheatre. Rather than heading straight for the highest point I'm traversing along each ridge before crossing to the next – further to walk, more to climb, but far more enjoyable as I see the shapes of the landscape change with the shifting light, cloud and my own viewpoint (even with the [flaws in the legal definitions of “Access Land”](#)², if it's there you might as well use it). After undulating down, up and along for a while, and circumnavigating the boggy patches between each rocky crag, I finally make my way to the crest of the mountain, 1,590 feet at the trig point. With each ridge the wind had grown stronger and more oppressive, but in the shelter of each rocky crag it's a comfortably warm day.

On reaching the summit I drop the stone I had carried-up from the river below onto the top of the cairn – it's an tradition amongst hill walkers, and to me a symbolic reversal of the entropic geological processes of rock weathering. Then I stand full stretch, weary limbs a testament to the effort required to get here, and take in the full panorama of the rooftop of mid-Wales: From here the scene is dominated by the imposing figure of Plynlimon, to the south west, it's top buried in a blanket of dark cloud; to the south, the bumpy plateau of the Cambrian Mountains; to the east, the buff-coloured slopes of Clun Forest and beyond that the darker outline of the Long Mynd; to the north west, the massive form of Cadair Idris which is, like Plynlimon, buried in dark but more angry looking clouds (perhaps created by Idris himself); and to the right of Cadair Idris, the Arans are also partially clad in cloud too; in the north, buried in mist, the land rises to the top of the Berwyns; to the north east I can see the Long Mountain near Welshpool, the radio masts on Beacon Ring where many years ago I stopped whilst walking Offa's Dyke, and beyond that the thumbs of rocks that make up Moel y Gofa and Breidden Hill; to the south east the long ridges rise and fall, with the peaks of Radnor Forest rising dimly in the distance; *and, of course, wind turbines* – marching like animatronic eco-warriors across the landscape, readied for battle in some sci-fi, post-apocalyptic modern [Mabinogion](#)³.

I knew I'd see a lot of wind turbines today, but since I last walked the hills in this area they've become more pervasive: Nearest to me is the wind farm at Mynydd Clogau – according to the British Wind Energy Association's (BWEA) [table of UK wind farms](#)⁴ it comprises seventeen 850 kilowatt machines; across the valley I see the Trannon or

Carno A and B wind farms (fifty-six 600 kilowatt machines), and to the right the more recent Carno 2 wind farm (twelve 1,300 kilowatt machines); off to the south east, spreading along the rim of the Severn Valley, is Llandinam (one hundred and three 300 kilowatt machines); and further away, phasing in and out of the shifting mists, is Cemmaes (eighteen 850 kilowatt machines). In total then: four wind farms; together comprising 206 wind turbines, that on a day like today can produce almost 110 megawatts; and which between them represent (on the BWEA's figures) 8.0% of the UK's installed wind turbines and 2.9% of the wind generating capacity. Surely, this place must be the 'ground zero' of British wind energy! As I contemplate this idea I find my mind wandering back to inordinately long debates on the subject of "cumulative visual impact" in some of the public inquiries I've fought in the past.

I don't "mind" wind turbines; I look at them for what they are, not what I want them to be. My first profession was engineering, and latterly I've been an environmental consultant. I understand how wind turbines work, and how the power distribution system to which they attach operates; the trends that define the development of renewable energy in Britain, and the way that we consume electricity in Britain; the significance of power generation to energy and carbon emissions overall, and the relative significance of each fuel source; and also the scale of impact that the power produced by the machines that I see all around me has on this system of mass energy consumption. In reality, that's not a lot; for example, in the USA there's a Google data centre (one of forty or so around the globe) that takes half the renewable energy output from the local 1,500 megawatt hydro-power dam – arguably all the wind turbines in the UK couldn't even power the our Internet⁵ use.

As an engineering system I can appreciate the elegance of wind turbines, and in fact I think that comparatively the most significant scar in the landscape from this viewpoint is not the wind turbines, but the new tourist holiday home development in the valley below. The difficulty is that in Britain the common concept of "the natural Landscape", beloved of Wordsworth and David Bellamy, is a complete myth – and a politically biased (to the right) myth at that. Over the many years that I've roamed the countryside around Britain, from the Hebrides to Northumberland and down to the tip of Cornwall, every part of the landscape has been influence by either agriculture, urbanisation, or the infrastructure that supports these activities. As Edward Abbey said⁶, "beating swords into ploughshares"⁷ is no solution since the plough has done far more damage to the natural environment than weapons of war have wrought on human society. In Britain there are very few places in which you can escape the over-dominant intervention of man – in England I can't really think of anywhere, in Wales I'd recommend the Carnedd, and

in Scotland the west coast beyond Lochinver up to Cape Wrath – but the idea that wind turbines are something alien in the natural environment makes as much sense as saying that the pattern of hedgerows, or stately homes and parkland, or any of the other features of modern agriculture and urbanism that have developed in the last four hundred years are a "natural" feature of the landscape. Those engaged in this debate need to accept that it's as much as a political as an aesthetic viewpoint which dictates that wind turbines are either good or bad, just like fox hunting or organic agriculture.

What offends me as I look around the hills is not the rotating arrays of machinery but the rationale for their development, and the hostility of the groups, both for and against the turbines, to looking at the fundamental root of the problem – the mass consumption of materials and energy by modern society and it's ecological impacts. I was once told by a campaigner that "the problem is not important, only the solution" – the inference being that we have more to learn by building our way out of the problem rather than working out precisely what sequence of actions got us here to begin with; and along similar lines, I was told after one of my presentations that I should, "always give people a positive thing to do even when there was nothing people can to solve the problem" (you know, some days I'm tempted believe that consumerism has atrophied many people's will for change!). I also find that both the pro- and anti-wind groups are intolerant to anyone who wants to have an evidential argument because the points they make are not based on a wide evaluation of the available information on energy and human ecology, but rather their own narrow, selective, and often delusional view (e.g., "the natural landscape" as mentioned above) of how their needs are met by modern society. As Buffalo Springfield said, "[nobody's right if everybody's wrong](#)"⁸.

The way industrial-scale, grid-connected wind farms are being planned, built and operated in the UK makes absolutely no sense; not so much because they don't work, but because the justifications raised by their supporters don't stand up to close examination. If we look at the main point in this debate it's clear that, within a movement that has chosen to ignore the more significant role of material consumption and consumerism on the [British ecological footprint](#)⁹, and which instead holds aloft the iconic but wholly tokenistic wind turbine as its principal solution to the ills of our nation (have you seen *The Age of Stupid?*), environmentalists have abjectly failed to demonstrate an evidential argument in their promotion of renewable energy as a means to control carbon emissions.

In turn, politicians usually talk of renewable energy within inefficacious terms, often conflating the values of targets and consumption (usually "electricity con-

sumption” with “total energy consumption”) to satisfy the media agenda created by the campaign groups. Again, both the politician's confabulation and the media's failure to present a coherent evaluation of present policy statements can happen unchallenged because campaign groups (on both sides) seek to appeal to people's feelings rather than arguing on the available evidence.

The [statistics on energy use in the UK](#)¹⁰ provide a far more objective picture of what's happening than any Greenpeace, Friends of the Earth or Department for Energy and Climate Change “talking-head” would care to outline in public: From 1990 until 2008, fossil fuel consumption has increased in three out of every five years – in a very real sense, given the cyclical nature of economic growth, [energy use in Britain takes three steps forward and two steps back](#)¹¹; over that same period the production of what the government classes as “renewable energy”, used to create electricity and heat, has [grown by a factor of five](#)¹² – and though that might sound impressive the total value of that energy increase, about 170 peta-Joules, represents just 40% of the increase in fossil fuels, about 411 peta-Joules, over the same period.

Unfortunately, due to the evolution of the renewable energy policy from a framework devised to support the waste management industry, much of what the Government classes as “renewable” can, objectively, not be described as such; and on a life-cycle basis some of these sources require more energy to create the source material than is produced from the energy extraction process. Almost a half of what the government describes as “renewable” is, quite literally, *pure rubbish* – landfill gas and waste incineration only produce a fraction of the energy that was used in producing the rubbish in the first place, and arguably recycling that rubbish would save more energy than these processes produce. The types of “iconic” renewable energy that we see in the media (wind turbines, solar panels, geothermal heat and hydro-electricity) only make up about a fifth of the renewable energy produced annually – in fact, whilst wind power production might have increased by a factor of five in the last five years (until 2008), it still only makes up 10% of what the government classes as “renewable”.

If we sum up these differing trends comparatively, over the last 18 years of official data: For every 1 unit increase in the Government's definition of “renewable” energy fossil fuel consumption has increased by a factor of two; if we exclude landfill and waste incineration then for every one unit increase in renewable sources fossil fuel use went up by a factor of three; and if we just include the “iconic” renewable sources (wind turbines, solar panels, geothermal heat and hydro-electricity) then for each one unit increase of renewable energy fossil fuel use increased by a factor of nine.

Although we must quite rightly state that the devel-

opment of renewable energy systems off-sets some demand for fossil fuels, *it's also clear that the development of renewable energy, averaged over the last 18 years of the official data, has never reduced the use of fossil fuels – not just in Britain, but in other “greener” states such as Germany.* I believe that this is what the politicians and civil servants privately know to be true, though they dare not say it due to the questions it would raise about energy policy; I also think that leading environmentalists know this too, although again they dare not speak it because it would question their approach to lobbying for change; it seems the only group in society who are not aware of the trends that dictate the way the energy system works, and what this portends for our economic future, are the public – and in many ways both the government, the energy industry and the mainstream environmental groups use the public's ignorance of these trends in order to promote their own 'political' (with a small 'p') viewpoint on the energy economy to attract the public's economic or electoral support.

In practice, both in Government policy and in the actions of the large energy companies, renewable energy does not feature as a prominent energy source because it cannot deliver the scale of energy required to secure the continued growth of the economy – and the pursuit of economic growth, above all else, is the policy that is the cause of our present problems, but curiously it is also the issue that the media, politicians and the mainstream environmental movement refuse to overtly tackle.

I ponder these ideas for a while and then I sit down, using a large boulder as a wind break. I eat an apple and take a drink, and pulling my travelling notebook from my pocket I begin to scribble down a few of the shapes that this landscape of ideas whispers into my mind.

The really revolutionary issue that the groups who debate renewable energy fail to engage with is the role of economic growth, the growth-induced imbalances within the British economy, and how energy plays a part in that process. As noted above, if “solutions” are more important than problems then consider this: In 2008 the economic slow-down created by the credit crunch knocked over 50 peta-Joules off UK fossil fuel consumption; that's twice as much energy as the record-breaking level of UK wind power production in 2008; high fuel prices, not wind turbines, also cause one of the most significant year-on-year drops in [traffic congestion](#)¹³ since the 1990s. Of course most mainstream environmentalists don't like to associate recessions with improvement in environmental performance because it doesn't make good press. In reality, the problems of the credit crunch might seem relatively minor compared to the problems that the British economy will suffer as [our indigenous energy production falls over the next decade or so](#)¹⁴ – and if the environmental movement

could stop their carbon fixation for a moment and look at these trends then perhaps they could see the potential this offers to lobby for positive changes to the British economy. We will move from being, in the late 90s, an energy exporter to being, by 2025, one of the most energy import dependent developed nations. Unfortunately the structure of our economy means that there is no way we can pay for that position in the world rankings. Keep an eye out for the phrase, "[sovereign debt crisis](#)"¹⁵, because unless we avert these trends through fundamentally changing the way we live and work the British economy will collapse as debt and a lack of foreign earnings make us unable to pay the bill to import much of our food, a significant proportion of our consumer goods, and ultimately much of our energy supply.

I get up from behind the rock and finish-off the last drops from my two water bottles, surveying the ever-changing forms of light, cloud, rock and shadow that stretch to the horizon. As I look at Carno wind farm a white mist envelopes it and it disappears from view; *I'm going to get wet.* With a twenty-five miles an hour wind that squall is moving at about two-and-a-half miles a minute; the wind farm is about five miles away; I pull my cagoule from my belt-bag in a leisurely fashion and, about two minutes later, just as I'm adjusting the hood cord a hail of watery bullets slam noisily into my waterproof plastic skin. Before the production of the polyethylene and polyester polymers that my cagoule is made from I might have worn waxed cotton, or further back still soft leather cured in tallow (smelly, but effectively waterproof). The reason that I wear plastic is that it's cheap, lightweight and effective for this application. In many ways the economics of renewable energy are much the same. The reason that fossil fuels are so dominant in the modern economy is that their physical "quality" allows them to deliver the largest amount of energy with the least amount of engineering. But as we look at other technologies then we find that, although they produce energy, their [energy return](#)¹⁶ becomes progressively lower as either the physical quality of the energy source diminishes or the scale of engineering required to produce a given amount of energy increases.

This trend is not a technological problem, it's a fundamental principle that arises from the physics of energy and thermodynamics. That's also why, until the peak in production of oil, coal and gas send their prices soaring the levels that will not be economic at any level, the economics of energy will always favour fossil fuels. No amount of "market intervention", through tariffs or trading, will solve that problem either since it is the cheap and plentiful supply of fossil fuels that has created both our technological society, and the global food system that today is beginning to creak under the demands of over six and a half billion people, many of whom insist on eating excessive quantities of meat (but that's another

essay in itself). Any form of "market correction" that works to rebalance fossil fuels with renewable energy sources, directly or indirectly through mechanisms like carbon trading, will make energy overall more expensive, and that in turn will reduce growth – and I've yet to find any leading British politician prepared to sign-up for that policy.

I wander down towards the lakes that make up the Bwlch y Garreg (read literally, "the gap in the rock") nature reserve. The fall in my blood sugar following the hard climb to the top of the mountain, that finished more than an hour or so before, has slowly triggered a cascade of metabolic reactions that's beginning to make me hungry. The difference engine in my head assesses the competing variables of thirst, hunger, aching knee joints, a family who get worried when I disappear into the hills taking a very minimal level of equipment, and my overall level of blissful satisfaction, and arrives at an unwelcome conclusion... *it's time to wander back.* Before I arrive at the lakes I turn north west and walk on until I reach the footpath that leads westward off the top of the mountain.

After a steep descent I finally arrive at a metalled road – "civilisation". Walking down through a wooded narrow valley it's very quiet; whilst it was blowing a gale on top of the mountain here, amongst the scented pine plantations with their diverse blooms of highly toxic fungi, and the ash and oak copses alive with birds calling frantically as the day draws to an end, a gentle breeze blows the damp, dank smells of the wet upland Summer over my face. Whilst the summit of a 1,600 foot Welsh mountain is rather bleak the wonderfully sheltered micro-climate of this small valley, even at 800 feet, means that I can nibble blackberries, wild raspberries, a few immature hazelnuts dropped by squirrels, and chew yarrow for it's pithy but refreshing juice, to lift my spirits.

If Britain is in a decaying orbit around the black hole of economic meltdown then that's an issue here as much as it is for the City of London: If we have to produce food rather than import it then upland farming might once again become viable; if people need to be producers, and as an essential part of this more people need to produce food either commercially or to support more of their own needs, then areas such as this might see a reversal in the slow depopulation trend that has taken place since the beginning of the Industrial Revolution; and if we do produce more of our own food then the creep of the bracken and gorse will have to be reversed once more to enlarge the productive area – preferably without the powerful earth moving machines I saw evidence of above, and which has resulted in the scars of eroded soil that I now see running down the gully in front of me.

Of course such a process will have an impact on the landscape, just as such economic transitions have had in the past (e.g., [inclosure](#)¹⁷), and just as

the wind farm on the hill in front of me has an impact today. But arguably this change is likely to mark a far more profound change to human ecology than the development of the Carno wind farms: Wind farms reinforce the economic processes that enable the present mass consumption system, and which is causing the damage that these developments seek to reverse – they're not really a *change in* economic strategy but rather a cosmetic *change within* the existing strategy; in contrast a large-scale economic contraction and re-localisation, induced by the post-peak (both UK and global) energy crisis, will by necessity enforce a lower level of consumption and carbon emissions; and ultimately it is a refocussing on the most important aspects of life, such as food and social networks rather than material affluence, that will be required to negotiate the economic transition to the low energy system that the global peak of

fossil fuel production represents. In my view the economic volatility initiated by the global peak in oil production, and then perhaps a decade later the peak in natural gas production, will do more to contract the fossil fuel consumption and carbon emission than any amount of wind farms built in the UK; but on the other side of that process it is renewable energy – including wind, and of course the most important but most often ignored form of renewable energy, **food**¹⁸ – that will allow us to move beyond this change in economic paradigm.

Eventually I reach the road that takes me back toward Carno where, with my aching knees and quadriceps lubricated by the inspirational landscape and a liberal dose of my body's endorphins, I return in time for dinner. Perhaps, as a small token of transition, I pick some chickweed on the way in to serve as our salad dish.

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5. A 'back of the envelope' calculation based on the relative impact of digital telecommunications globally as a proportion of carbon emissions, and the relative value of wind power to Britain's energy emissions. For an articles see –
 - [Web providers must limit Internet's carbon footprint, say experts](#), The Guardian, 4th May 2009; and
 - [Google's power-hungry data centres](#), The Guardian, 4th May 2009.
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7. "They shall beat their swords into plowshares, and their spears into pruning-hooks: nation shall not lift up sword against nation, neither shall they learn war any more", Isaiah 2:4.
8. Words from the song *What It's Worth*, Buffalo Springfield, 1967.
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