

From: [Stephen Kneale](#)
To: [NDE](#)
Subject: Response to the "Welsh Government Draft National Development Framework (NDF) Consultation"
Date: 15 November 2019 21:01:57
Attachments: [NDF Response by Mairede Thomas 7th November 2019 Final.pdf](#)

Dear Sir

This 'National Development Framework' identifies vast swathes of rural Wales that will be industrialised by solar farms and wind turbines up to 250 metres high. All Anglesey will be affected, particularly central Anglesey, which has been identified as 'Priority Area 1'. The Welsh Government's proposals are tantamount to the destruction of Anglesey's beautiful countryside, its crucial tourism economy, thousands of jobs and the wellbeing of its people and wildlife. Turbines 250 metres high will be visible from most of the Areas Of Natural Beauty (AONB's) along the Anglesey Coast.

The Welsh Government is seeking to justify this on the basis that wind and solar farms will reduce our greenhouse gas emissions and help stop 'global warming'. They are wrong, the facts and data that have accumulated over the last 30 years tell us we must conserve our countryside if we want to mitigate climate change. And using these renewables will make only an insignificant dent in the total volume of GHG emissions.

It is proposed that all projects over 10MW will be approved by the Welsh Government & that Communities will have no say. These proposals are wrong & undemocratic. The people of Anglesey who would have to live with these monstrosities should be consulted over such major changes to the Anglesey landscape, & about how these changes could affect tourism on the island.

As a retired National Grid Engineer, who has some knowledge of Electricity Generation, I can tell you that It does not matter how many wind-turbines are connected to the Grid System, they will never replace a single Power Station (see appendix 1). This is because there are long periods in every year when there is no significant wind blowing anywhere in the UK. To cover these periods, exactly the same number of Power Stations need to be available for connection to the Grid System. The many thousands of wind turbines which have been installed are useless during these periods. Also connecting this many wind turbines reduces Grid System stability, reduces efficiency & increases costs of the electricity produced by the Power Stations. Similarly, Solar Panels only produce power during daylight hours.

There is a huge amount of relevant information in the attached compilation (produced by Mairede Thomas) which should be considered.

Yours faithfully

Stephen Kneale

Appendix 1 - The Grid System works by generating electricity to exactly meet demand at all times. Power Stations need to be both reliable & their output needs to be controllable to exactly meet demand. Wind turbines & Solar panels are neither reliable or controllable so can never replace a single Power Station, which needs to be built &

available anyway. It would be better to replace existing fossil fuel Power Stations with Nuclear Power Stations which are both reliable, controllable & have very low carbon emissions.

Welsh Government's draft National Development Framework (NDF)

The NDF represents the latest iteration of more than 10 years work by the Welsh Government designed to weaken the legal protections that previous administrations have afforded to the Welsh countryside and its designated landscapes.

The result is an NDF, which identifies vast swathes of rural Wales that will be industrialised by solar farms and wind turbines up to 250 metres high. All projects over 10MW will be approved by the Welsh Government who has told us we must accept these changes to the landscape. Communities will have no say. All Anglesey will be affected, particularly central Anglesey, which has been identified as 'Priority Area 1'.

The Welsh Government's proposals, specifically Policies 10, 11, 12 and 13, are tantamount to the destruction of Anglesey's beautiful countryside; crucial tourism economy; thousands of jobs and the wellbeing of its people and wildlife.

The Welsh Government is seeking to justify this wanton act of vandalism on the basis that wind and solar farms will reduce our greenhouse gas (GHG) emissions and help stop 'global warming'.

They are wrong, **the facts and data that have accumulated over the last 30 years tell us we must conserve our countryside if we want to mitigate climate change. And using these renewables will make only an insignificant dent in the total volume of GHG emissions.**

Renewables won't stop Global Warming

Bloomberg research states that "the world has almost doubled its energy consumption since 1980, much of that demand has come from the use of fossil fuels. Half of all carbon emissions from fossil fuel operations in modern history have come in the last three decades."

China is now the biggest user of energy having overtaken the USA a decade ago.

Each year the International Energy Agency (IEA) informs us how global energy use is rising as countries around the world develop their economies and lift their citizens out of poverty. Despite strong growth in renewables across all continents, fossil fuels today provide 81% of global energy, a percentage that has hardly varied in 30 years. The gigawatts (GW) of power produced by newly built coal power plants are currently outgrowing the number of GWs produced by renewables. So GHG emissions from energy use have risen sharply, while renewables are trailing behind unable even to keep pace with the growing demand for energy.

In 2018 Global energy demand rose by 2.3%. In the report Global Trends – Energy Transition Outlook; July 2019, by Wood MacKenzie, it states "**unprecedented efforts to install renewable power capacity have only translated into meeting 2 per cent of global energy demand**, meaning the world's overwhelming reliance on fossil fuels shows no sign of abating". The report forecasts that coal, oil and gas will still contribute about 85 per cent of primary energy supply by 2040. By

2040 the forecast is for at least a 25% increase in energy demand, “led by swelling populations in emerging economies in Asia and Africa”.

The concentration of CO₂ in the atmosphere has continued to rise every single year since 1990 despite 30 years of low emissions targets in the West. And all the major forecasts say carbon emissions will continue to rise.

Recently China has built huge wind and solar farms, but it continues to build coal plants, burning half the world’s coal output. China’s reach for new natural resources go far beyond its own borders into the South China Sea and globally on the deep seabed. The Chinese are also building nuclear-powered icebreakers, something the U.S. has not even contemplated. At more than 30,000 tons, the Chinese ships will outpace any other nation’s capability to explore the Arctic, where there is an enormous trove of hydrocarbons that will be uncovered as the ice melts. Some estimates approach 2 trillion cubic feet of natural gas and nearly 100 billion barrels of oil. Icebreakers open the logistics paths for placement of the necessary oil and gas rigs. Additionally, the melting Arctic ice will create shipping routes that could be geopolitically central for China’s One Belt, One Road global development strategy, which many political thinkers see as China’s route to a global hegemony in China’s image.

India and other developing economies in Asia and Africa are also burning more coal. Prime Minister Modi’s Government has said “despite the growth rate in thermal capacity outpacing electricity consumption in the last few years, more coal-fired plants will still be needed in the future to meet growth”.

His Minister, Pralhad Joshi says, *“If we have to meet demand and address the intermittencies we have with solar and wind, we have no choice but to keep depending on coal-based generation in the near future.”*

80% of future energy infrastructure will be built in the developing world.

Schalk Cloete’s research into these markets finds that utility scale onshore wind and solar PV can’t compete on price with gas and coal, *“even without including the integration costs of wind and solar. These integration costs also increase strongly over the plant lifetime as more capacity is installed”*. Cloete concludes *“thermal power generation (especially coal) easily out-competes clean energy in the developing world on economics alone.”*

Cloete is creating his own 5-part independent Global Energy Forecast to 2050, to compare with the next IEA World Energy Outlook, due in November. To make his predictions he has created simulations of cost-optimal technology mixes and made his own assumptions over the drivers that will affect them: policy, technology, demand growth and behavioural change are all included. Cloete reminds us that fossil fuels did not reach their dominant position by chance. They are cheap and practical – easy to store, transport and deploy. So, with carbon emission targets in mind, stiffening climate policies and pollution controls will be used to increase their price, favouring clean alternatives particularly in power generation. **His modelling points at nuclear as the only way to displace almost all fossil fuels from the power system in a cost-optimal way.** But even then fossil fuels will be hard to displace from key categories like transport, industry and heating. And Asia’s growing energy demand and the essential need for poverty alleviation will see their widespread use continue to 2050. Overall he predicts that the primary energy consumption of oil and coal will eventually decline, but gas usage will rise:-

<https://energypost.eu/an-independent-global-energy-forecast-to-2050-part-3-of-5-fossil-fuels/>

The IEA's current figures show that *"The growth of coal power in developing regions is overtaking the reductions in wealthier countries."*

However Germany and Poland are still opening coal mines and burning lignite coal the dirtiest fuel of all. And both countries depend on Russian gas. It's little wonder that **despite Germany's Energiewende and attempted transition to a nuclear-free economy, its GHG emissions are rising.**

Germany still generates just 35% of its electricity from renewables. And if biomass burning, often dirtier than coal, is excluded, wind, water and solar power in Germany accounted for just 27% of electricity generation in 2018.

Wind & Solar Renewables trigger blackouts and jeopardise safety

Even at this level Germany's grid is becoming increasingly insecure due to its heavy reliance on intermittent solar and wind. For three days in June 2019, the electricity grid came close to blackouts.

"Only short-term imports from neighbouring countries were able to stabilize the grid," says the consultancy firm McKinsey. As a result of Germany's energy supply shortage, the highest observed unit cost of short-term 'balancing energy' skyrocketed from €64 in 2017 to €37,856 in 2019. *"It can be assumed that security of supply will continue to worsen in the future."*

German utilities are warning that a more insecure supply is looming. *"By 2023 at the latest, we will be running with eyes wide open into a shortfall in secure capacity,"* a managing director for the Germany energy industry association BDEW said.

"The ongoing phase-out of nuclear power by the end of 2022 and the planned coal withdrawal will successively shut down further secured capacity," explained McKinsey. *"In particular, the industrial regions in western and southern Germany are affected, in which many capacities go off the grid at the same time".*

The growing insecurity of German energy supply is made worse by the fact that its neighbours Belgium and Netherlands may shut down baseload capacity: coal plants in the Netherlands and nuclear plants in Belgium.

And McKinsey says that Germany may not be able to meet demand with imports. *"In the medium term, there is a risk that there will not be enough supply capacity in the entire European network."*

To stabilize the electricity grid and avoid becoming too dependent on imported natural gas, Germany is expanding coal mining to the Hambach forest, where environmental activists were arrested last September.

Meanwhile, local communities and environmentalists have successfully blocked the building of transmission lines from the windy north to the industrial south.

"By the first quarter of 2019, just 1,087 kilometers of the planned 3,600 kilometers of power lines were completed." At that rate, McKinsey notes, *"the 2020 target will not be reached until 2037."*

German consumers have paid dearly for the energy transition. German electricity prices are 45% above the European average and green taxes account for 54% of household electricity prices, McKinsey reports. To keep its industry competitive German has put the burden of its 'green' taxes onto domestic bills.

"Electricity prices will continue to rise through 2030", McKinsey predicts, "despite promises in recent years by renewable energy advocates and German politicians that they would go down".

And higher prices will threaten German industry's competitiveness. *"Even a modest increase of a few euros per megawatt-hour could jeopardize the competitiveness of energy-intensive industries in Germany."* McKinsey says *"What is required is a fundamental turn in energy policy."*

UK's Grid is already destabilised due to renewables

At one point on 9th August 2019, just before the infamous Grid failure, wind energy was producing 13.8 gigawatts (GW), which was nearly half the UK's electricity demand at that time. However that only made matters worse when there was a lightning strike and a 'trip' on the system because the Hornsey offshore wind farm could not cope and neither could the onshore wind turbines. When the gas power station at Little Barford went off line the wind generators were unable to compensate for the *"rapid fall in frequency"*. The result was one of the biggest ever blackouts on the transmission network, with many very nasty consequences.

<https://www.nationalgrideso.com/information-about-great-britains-energy-system-and-electricity-system-operator-eso>

I have screen saved a copy of the Grid's output for the Hornsey windfarm and Barford gas station on 9th August. Ofgem has subsequently said that the network was operating normally - well that may be how it operates these days - but when you superimpose the graphs on top of one another you see that the windfarm output was fluctuating wildly i.e. from full to almost nil, all day but reducing over the course of the day until its output fell off the bottom of the graph presumably when it tripped. Barford's output was the inverse of these wild swings - presumably as it ramped up and down to compensate for Hornsey, then its output fell off the bottom of the graph too. It's not surprising to me that the gas powered station developed a fault operating in that way. And this is precisely the issue of balancing the network that engineers are worried about with regard to wind power on the network.

National Grid at first tried to play down the role of wind energy in the blackout. *"Wind generation, solar and interconnectors are different to the conventional electricity generation sources,"* they said. National Grid put the blame for the blackout on a lightning strike taking down Hornsey wind farm as Barford natural gas plant also went off the grid.

However this explanation is disingenuous as in April National Grid had published a report based on a £6.8 million research project, where it admitted that renewables increased the *"unpredictability and volatility" of the power supply which "could lead to faults on the electricity network"*.

If frequency on the network drops or rises above 50Hz equipment can be damaged, and wind and solar power make it exceptionally difficult to maintain that level frequency of output on the network. Changes in frequency can damage the power networks equipment and if uncontrolled it can damage electricity consumers' equipment and potentially cause fires.

John Constable: Global Warming Policy Foundation (GWPF) Energy Editor has compiled details of the event and what we know, so far, about its causes. I draw attention to the following paragraphs in his report:-

“There are now three separate inquiries into the event, by National Grid, by the regulator, Ofgem, and also by the Department of Business, Energy and Industrial Strategy (BEIS), which has activated its Energy Emergencies Executive Committee (E3C) to undertake a review, which will report within twelve weeks.”

“Since much of the relevant data is held only by National Grid, it has been extremely difficult for external analysts to get a firm purchase on the matter; and this has allowed the interested parties, such as National Grid, the opportunity to control the discussion: an opportunity which they have exploited to maximum advantage, generally by dribbling information out, with the result that its impact has been diffused, and specifically by leading the public to conclude that the event was the result of highly unlikely coincidences, and thus by implication that there is nothing fundamentally or systematically at fault with the UK electricity network. The evidence suggests that neither of these is true.”

“But even with the meagre public data available from the Balancing Mechanism it was clear to some that National Grid’s Electricity System Operator’s (ESO) version of the events was not entirely persuasive. Readers of the Operational Forum reports, for example, would have been aware that the system has been experiencing what are known within the industry as “difficult days”, and Friday the 9th looked suspiciously like a difficult day that didn’t end happily. The system frequency trace, in particular, did not seem to be quite consistent with the narrative that the company was implying, a narrative that was in significant part driven by the clear desire to excuse wind power in general and the Hornsea Offshore wind farm in particular, from any significant blame in the event.”

“National Grid encouraged the view that the blackouts were the result of a simultaneous and highly unlikely fault at two power stations, Hornsea for one, and the other a Combined Cycle Gas Turbine (CCGT) at Little Barford on the border between Cambridge and Bedfordshire.”

*“Doubts about the corporate story began to become public when the Guardian reported, on the 12th, that there had been **“three blackout ‘near-misses’ in as many months before Friday’s major outage”**.*

“The Daily Telegraph reported ‘that on the night of Saturday and Sunday after the blackout there had been another system disturbance, with frequency dropping to just below the operational limits observed by National Grid, and that in response to this problem the Control Room had constrained Hornsea Offshore wind to reduce output, paying it £100,000 to do so, while at the same time requiring conventional generation to increase output. Far from being a one off, the problems appeared to be persisting, and it seemed likely that Hornsea was part of that problem, otherwise they would not have been paid handsomely to reduce output’.”

“The Financial Times report on the 17th headlined, ‘National Grid electricity blackout report points to failure at wind farm’, was explicitly based on a National Grid briefing and confirmed the lightning strike and added the additional information that a considerable quantity of embedded generation, that is to say generation connected to the low voltage distribution network and thus invisible to the Control Room, had tripped as a result of the lightning. The report also observed that the blackout was ‘caused by the world’s largest offshore wind farm accidentally going offline’.”

“On Sunday it was reported, again in the Telegraph, that Colin Gibson, a former Power Networks Director at National Grid, a main board position at that time with personal responsibility for keeping the lights on, had, with his former colleague Dr Capell Aris, raised concerns that National Grid had permitted hazardous decline in system inertia resulting from high levels of asynchronous generation, and pointed to this as the underlying cause of the weaknesses leading to the blackout (‘Former National Grid director says ministers

should impose limits to new wind and solar farms to help avoid power cuts’). Gibson and Aris added that government would need to call a halt to further installation of both wind and solar. Both are well known in the power networks field.”

“On Monday the 19th, the Times published a piece if anything still more awkward than Gibson and Aris’ criticism. This article reported that National Grid was actively limiting the utilisation of interconnectors with the continental networks in order to reduce the amount of asynchronous input and maintain inertia: ‘Blackout fears over National Grid cables from the Continent Company limiting use to guard against failure’.”

“The information in this article was attributed to a senior National Grid source, but may not have been part of the corporate public relations approach since it clearly tended to confirm the Gibson/Aris diagnosis of problematically low system inertia, and put into a more robust context the fact of constraint payments to Hornsea on the night of the 10th and morning of the 11th, as well as the ‘near misses’ reported by the Guardian.”

Constable published his assessment after I had made my own observations of the output graphs for Hornsey and Barford and he confirms my assessment, and also confirms that conventional thermal power stations produce ‘synchronous’ power input to the grid, but wind farms produce ‘asynchronous’ or ‘non-synchronous’ input which is the cause of these problems.

Constable concludes:-

*** The blackout was the result of a single phenomenon, not a rare coincidence of uncorrelated problems, as National Grid had intimated throughout the week. The single phenomenon consisted of a lightning strike on a grid line, which affected voltage and caused 500 MW of embedded generation (i.e. renewables connected to the distribution network) and the Hornsea Offshore wind farm to trip because they could not ride through the fault. Little Barford CCGT subsequently tripped, probably as a result of the combined effects of the preceding events.”**

And added:- **“There can be no doubt now that the UK’s electricity system is increasingly fragile. Will the consumer accept the extremely high costs of addressing renewable energy problems in order to secure this fragile electricity system? Or would they prefer a major policy rethink?”**

Here is John Constables full report https://www.thegwpf.com/telling-the-story-of-a-blackout/?utm_source=CCNet+Newsletter&utm_campaign=0a3d2ddb68-EMAIL_CAMPAIGN_2019_08_23_12_36&utm_medium=email&utm_term=0_fe4b2f45ef-0a3d2ddb68-36457565

The latest Interim report on 4 October 2019 has been released by BEIS, it does indeed find that unreliable renewables caused system wide problems leading to one of the largest blackouts ever in the UK. It prefaces its findings by saying “The *electricity* industry is experiencing significant growth in the connection of *embedded generation* (EG), in particular from renewable *energy* sources. *Embedded* or distributed *generation* is any form of *generation* which is connected to (or *embedded* in) an electrical distribution network”.

<https://www.gov.uk/government/publications/great-britain-power-system-disruption-review>

The BEIS E3C Committee identify the following emerging areas for scrutiny in their interim report:-

- communication policies and protocols across the ESO, DNOs, Transmission Operators, generators, government, Ofgem, the Energy Networks Association (ENA) and Energy-UK

should be reviewed to understand whether these support timely and effective communication for future events

- given the loss of generation, they suggest that more work needs to be done on the compliance process, most notably for embedded generation
- they recommend that there should be a review into the reserve and response holding policy of the ESO and whether it is fit for purpose going forward
- a review into the performance of the LFDD scheme is required to ensure lessons are learnt

The final report will be submitted to the Secretary of State at the beginning of November.

Note: the ESO is the Electricity System Operator i.e. National Grid; DNOs are the distribution networks and embedded generators are in the main renewables.

The problem of renewables causing instability and blackouts on the grid is not confined to countries in Europe - in Australia recently electricity regulators sued four wind farm operators for contributing to a huge blackout in 2016. And California's increasingly perilous electricity grid may put pressure on California Governor Gavin Newsom to keep the state's last nuclear plant running.

<https://www.forbes.com/sites/michaelshellenberger/2019/09/03/why-california-may-go-nuclear/>

It's the physics and maths that count

Over the course of the last 30 years the UK's energy consumption, excluding embodied energy in imports, has fallen to around 1.4% of global energy use in 2018. In part this is because energy intensive industries have moved abroad but it is also because of the steep rise in global energy use. Both of these trends are continuing.

Air travel alone accounts for between three and five percent of global CO2 emissions and those emissions are growing fast. Dieter Helm, the author of a UK Government cost-of-energy review points out *"that even a relatively small country such as Denmark, with a population of 5.8 million, has increased its carbon consumption. **The increase in the carbon intensity of its imports has far outweighed the reduction in emissions it made through uptake of renewable energy**"*.

The UK is responsible for less than 2% of global GHG emissions, Helm says that "even if we spend a trillion pounds", and sacrifice all of our natural landscapes and environment, "getting our net emissions to zero it won't make any difference" to this global picture.

It is a matter of fact that renewables are not reducing the rising level of global GHG emissions.

The reasons are obvious and manifold - economic, political, geopolitical, geographic and of course simple physics. Renewables are diffuse energy sources. Furthermore capturing, storing and distributing renewable power is an expensive business, requiring extraordinarily large amounts of infrastructure and equivalent amounts of fossil fuelled generating capacity which are burning fuel while they are running on 'spinning reserve' just so they are ready to fire up immediately there is a drop in wind or solar power. Wind power is proportional to the cube of its speed. If your wind "farm" is delivering 900 MW from a wind speed of 9 m/s (metres per second) and that drops in half

an hour to 6 m/s, the power does not become 600 MW, it drops to less than 300 MW, actually about 267 MW.

Wind farm developers don't mention any of this when they say they produce 'clean' energy. And In addition to short term fluctuations in the power that these weather dependent renewables produce, even more backup power generators are required in the form of batteries for overnight power when the sun isn't shining, or more usually, conventional power stations are required to cover this and the even longer gaps such as long periods of no wind across the whole of the UK, when for example there is a static 'winter high' weather pattern. All of this requires expensive additions to the network and equally expensive and complex balancing strategies to cope with renewables' intermittency.

Throughout recent human history we have progressively sought materials of higher 'energy density' than renewables to radically transform and develop our economies and lift people out of poverty. The energy density of oil is nearly double that of coal and three times that of wood. Windmills worked in pre-industrial times, but per square metre wind and solar deliver a tiny fraction of the energy available from coal and frequently nothing at all.

Since the industrial revolution our success with harnessing energy dense fuels has rapidly driven our economies forward.

In the 20th Century we discovered how to use 'nuclear fuels'. These have the highest energy densities of all. An inch long fuel pellet delivers as much energy as a ton of coal, yet nuclear power contributes few CO2 emissions.

Politicians chasing votes; and ideology

However after 20 years of Labour controlling the Welsh Government, the party and its Luddite ideas have ossified. While it wins elections in the urban areas, which are more populous and have a younger demographic, it sees no reason to change. A simplistic 'climate emergency' rhetoric appeals to young impressionable voters and those who are less knowledgeable, and the party has little to gain from listening to public opinion in rural Wales. Welsh Ministers have thus overruled decisions taken by County Councils and Planning Inspectors. They have, as in the case of Hendy wind farm demonstrated that they will brook no resistance to the imposition of their regressive ideas and abhorrent plans to build more and more ever larger solar farms and wind turbines in the countryside.

Unfortunately many politicians, in seeking to attract Labours' urban voters or who have fallen prey to sophisticated lobbyists, have become equally complicit with the lie that 'renewables' are the answer to 'global warming'.

Plaid Cymru has been captured by 'green' politicians. So much so that in 2016 it appointed Gareth Clubb, who was Friends of the Earth, Cymru's Chief Executive, to become Plaid Cymru CEO. As Director of FOE he gave evidence to the Welsh Affairs Committee in April 2016 saying *"The costs of nuclear are gargantuan and increasing daily. In contrast, nuclear's competition for the new energy market - renewables - are plummeting in cost. Nuclear is quite simply an uneconomic, busted flush. Our extensive research into this issue leads us to conclude that there is no future for nuclear in Wales"*. His brother David Clubb was until recently Director of RenewableUK Cymru. On leaving

RenewableUK he claimed onshore wind was a technology supported by the vast majority of citizens with opposition in Wales being down to the *“extreme politicisation of the topic by Conservative politicians like MP Glyn Davies and AM Russell George”..... “which led to the famous protest outside the Senedd in 2011”*.

However Plaid Cymru in north Wales have to face both ways when talking to its local electorate, because it knows that in Anglesey during 2012 there had been a door-to-door petition which clearly showed that more than 90% of residents objected to commercial wind turbines within 1 mile of homes and didn't want any in the AONB. The local party subsequently won the largest number of seats of any political party in the May 2013 County Council elections, having made a promise to the electorate that it would not to support wind turbines taller than 12 metres. And during the August 2013 Ynys Mon by-election campaign Rhun ap Iorwerth said he would support Anglesey's Plaid Cymru Councillors' stance on wind turbines in the Senedd, and that he supported Wylfa Newydd.

There are some groups however such as People Against Wylfa B (PAWB) who do support wind farms simply because they reject nuclear power. However listening to people on the doorsteps in 2012, I found many residents voluntarily expressed strong support for Wylfa Newydd, even though I was merely collecting signatures for an anti-turbine petition and was not canvassing opinions about nuclear power.

Plaid Cymru recognises the fact there is a great deal of support in Gwynedd and Anglesey for new nuclear power developments. Both these constituencies have benefitted economically from Trawsfynydd and Wylfa power stations. And many well paid highly skilled workers want to remain in the area and working in the nuclear power industry. Both Gwynedd and Anglesey Councils are currently run by Plaid Cymru and they have supported the Hitachi development at Wylfa and the prospect of Trawsfynydd becoming a licensed site for a new generation of nuclear power. However the party has not supported the idea of nuclear power developments being located elsewhere.

The Labour Welsh Government and Plaid Cymru have long since accepted wholesale landscape change in Wales in the name of wind turbines. And over the last few years Plaid Cymru's AMs have acquiesced with Welsh Labour's plan for the roll out of renewable developments across Wales. Simon Thomas; Llyr Gruffydd and Leanne Wood have argued for moving to 100% renewable energy. They have not argued for the protection of Welsh landscapes.

The Conservatives have tried to “conserve” the Welsh landscape, including during the Welsh Government's ‘Review of Designated Landscapes’. The review commenced in 2014 and in November 2015, the [**Independent Review of Designated Landscapes in Wales**](#) was presented to the Welsh Government by Professor Terry Marsden, Chair of the advisory panel and Director of the Sustainable Places Research Institute at Cardiff University. The independent review made *“69 recommendations covering a raft of proposals and observations on purposes, principles, vision, governance models, planning, and funding”*.

<https://www.cardiff.ac.uk/news/view/154044-final-report-of-review-of-designated-landscapes-in-wales-published>

However the Welsh Government was less interested in the 69 recommendations made by the ‘Marsden’ review and was more interested in seeking to remove the long-standing ‘Sandford Principle’, which establishes in law the purposes and protections given to Areas of Outstanding Natural Beauty and National Parks.

In May 2017 the Welsh Government published ‘Future Landscapes: Delivering for Wales, which was to be the Welsh Government policy statement on the outcome of ‘The Review of Areas of Outstanding Natural Beauty and National Parks in Wales’.

Produced under the auspices of Dafydd Elis-Thomas it was an excuse for disregarding or watering down many of the recommendations made in the Marsden Report. Crucially it removes the concept of conservation, and so the purpose of designation is fundamentally altered. The concept of protection and considered stewardship of our natural and cultural heritage is changed to one that will more easily facilitate change and development.

As ever language is crucial to our understanding of our environment and to delete concepts of protection, preservation and conservation, whilst merely replacing them with the concept of “sustainable development” begs the question who and what generation decides what is sustainable?

The report does recognise the UNESCO Global Geoparks, but does not offer a way of ensuring their statutory protection in upcoming Welsh legislation. The report is so vague as the basis for legislation that it gives the Government of the day huge freedom to determine what is important to keep and what is not and certainly does “*open the door*”, as Environment Minister, Lesley Griffiths said to new policy, and takes Wales onto a pathway for losing our great landscapes and wondrous places.

The vision for landscapes neglects the intrinsic qualities of designated landscapes by avoiding the words ‘natural’ and ‘beauty’:-

“Our Vision

Wales as a nation values its landscapes for what they provide for the people of Wales and elsewhere. The designated landscapes of Wales deliver both within and beyond their boundaries to enhance their social, economic, environmental and cultural resources; delivering the maximum well-being benefits for present and future generations whilst enhancing the very qualities that make them both distinctive and cherished.” [quote from Elis-Thomas report].

And because it ignored so much of Marsden, the approach set out in the Elis-Thomas report fails to protect our inspirational landscapes for the artists, poets and enquiring minds of future generations.

Fortunately a concerted effort by many conservation bodies, including the Campaign for the Protection of Rural Wales (CPRW) and its Anglesey Branch, of which I was Chair at the time, persuaded the Welsh Government to leave well alone. And a new Minister, Hannah Blythyn announced in the Senedd that the AONB and National Park designations would be unaltered and the Sandford principle retained.

However the critical moment in the destruction of our beautiful land came when the Welsh Labour Government introduced its Environment Bill which became the Environment (Wales) Act, 2016. Plaid Cymru supported the Labour Minister Carl Sergeant when he refused to accept Conservative amendments to the Bill. The Conservatives wanted changes that would make landscape protection a core and central purpose of the Act. You would think the Senedd would cherish the landscapes of

Wales and would use the opportunity of Wales' first ever Environment Act to ensure that the protection of Wales' landscapes was central to such legislation. However Minister Sergeant was clear that he would not accept the Conservative amendments because that would curtail the Welsh Government's plans to have wind farms. Here is the link to the webcast of the Senedd committee meeting when every attempt to include the concept of landscapes as being one the greatest assets Wales has, was voted down by Labour and Plaid:-

<http://www.senedd.tv/Meeting/Archive/f587cc31-564c-4fa7-9dbf-b9b2ef3982d7?autostart=True>

Here's the full record:-

<http://www.senedd.assembly.wales/ielIssueDetails.aspx?IId=12572&Opt=3>

As can be seen the amendments to the Bill were brought forward in Committee by Russell George and they were supported in Committee by Conservative, Janet Haworth and Liberal Democrat William Powell. But the composition of the Senedd Committees must reflect the political numbers in the Senedd Chamber, so the majority of AMs in Committees comprise Labour and Plaid AMs, in this case Alun Ffred Jones; Llyr Gruffydd; Joyce Watson; Mick Antoniw; Julie Morgan; Jeff Cuthbert and Jenny Rathbone, and all these Plaid Cymru and Labour politicians voted the amendments down.

I am not aware of any occasions when Plaid Cymru has not given its support to the Welsh Government's plans and targets for renewable energy developments, despite it being absolutely obvious that these targets will be destructive of good farmland, wildlife habitat and public amenity, to say nothing of the ruination of beautiful scenery.

Plaid Cymru's May 2017 General Election Manifesto pledged to make "Wales self-sufficient in electricity from renewables". It said it wanted to electrify road and rail transport and encourage more electric domestic heating. The party was setting out its stall as moving towards 100% renewable energy in Wales. Quite how that squared with its support of new nuclear power stations was not explained.

Welsh Government crushes local democracy and trashes our landscapes

EU law introduced in 2009 set the target for Member States to get 20% of their energy from renewable sources by 2020.

In 2005 The Welsh Government introduced new planning policy to facilitate large scale onshore wind farm developments in the Welsh countryside. The Guidance known as TAN8 became part of Planning Policy Wales. TAN8 set out 'guidance' on the location of wind farms in Strategic Search Areas (SSAs). These locations were expected to host the majority of Wales' wind farm generating capacity in the years to come.

Anglesey was not identified as an SSA, but Planning Policy Wales stated that "*Local Planning Authorities should facilitate the development of all forms of renewable and low carbon energy*"

(excluding nuclear power) in all areas outside the SSAs as long as developments did not alter the character of the local area too much and provided the developments did not severely impact protected sites or heritage assets, such as Sites of Special Scientific Interest (SSSI); Areas of Outstanding Natural Beauty (AONB); World Heritage Sites etc.

When the Conservative and Liberal Coalition came into being after the 2010 General Election they had to implement the 2009 EU law, i.e. the 'Renewable Energy Directive'. To achieve the target set by the EU the UK Coalition Government introduced new subsidies for onshore wind and solar pv. The subsidies were exceptionally generous and offered the developers unusually high profits, guaranteed for at least 20 years. Consequently by 2011 there was an explosion of applications for these developments all over the UK.

The Welsh Government wanted these developments, so it put pressure on the County Councils to replace their existing Local Plans with policies that would enable them. The Welsh Government had taken Anglesey Council into special measures in 2009 and in March 2011 it suspended all executive functions putting in a team of Commissioners appointed by the Welsh Government and led by Labour AM Carl Sargeant. At this point the Welsh Government held all the levers to force the Council to replace its 1996 Local Plan and to control the content of what went into the new Plan.

Consequently Anglesey County Council was in a weak position to challenge or scrutinise the Welsh Government's renewables policy in the early stages of the plan making process. But even when the Welsh Government handed control back at the end of May 2013 the Council failed to appreciate that the emerging Anglesey and Gwynedd Joint Local Development Plan (JLDP) was opening the door to a huge number of renewable energy developments that would obviously cause great harm to the County and its landscape. This was not helped by the fact that the Labour Party had labelled Anglesey 'Energy Island' and the Council was grateful for the grants that flowed from this moniker to College Menai for conventional and nuclear energy skills training and also to the island's enterprise zones. It's not clear though, when the Council accepted this branding, that local politicians envisaged the possibility of Anglesey becoming a giant windfarm. But it certainly paved the way.

Meanwhile the combination of extraordinarily generous subsidies and the favourable disposition of the Welsh Government towards wind farms meant that by 2011 around 171 individual turbine and larger wind farm applications had been lodged with the Council. Local citizens became alarmed and during 2011 and 2012 there were numerous public meetings held around the County. These were convened and well supported by local communities who wanted to put a stop to the blight. A campaign group formed called Anglesey Against Wind Turbines (AAWT). After a series of mass demonstrations and publicity in the local press the Council was persuaded to draw up 'Supplementary Planning Guidance' (SPG) to sit alongside and update the 1996 Local Plan.

The two stage public consultation on 'Supplementary Planning Guidance for Onshore Wind Energy' elicited the largest ever public response to a planning policy consultation on Anglesey. There were in total around 9000 public responses. During the second stage a petition was collected door-to-door around the island. It was signed by over 8000 residents and households before being submitted to Anglesey County Council. Not all of the island could be canvassed during the 6 week consultation, however as can be seen from the addresses listed, approximately 90% of people contacted were

eager to sign, and so it provides clear evidence that many more signatures could have been collected.

The Petition called for a separation distance of 1.5 kilometres between commercial wind turbines and homes and for there to be no commercial wind turbines in the AONB. The Petition defined a commercial turbine as a turbine of any size which is not primarily for the use of an individual domestic residence.

Given the sheer number of local petitioners and a largely sympathetic community of Councillors, the County Council incorporated many of the points raised by the residents into the SPG. To a large extent the SPG was still constrained by the overarching policies of the Welsh Government, however it gave weight to certain local criteria that would have to be considered before planning applications could be approved.

Anglesey Against Wind Turbines was assured by the Council's planning policy unit that the SPG Onshore Wind Energy, would be rolled forward and included within the upcoming new plan for the County i.e. what became the Anglesey and Gwynedd Joint Local Development Plan (JLDP) 2017. But it was not.

Cardiff removes landscape protection policy from Anglesey's Local Plan

The 1996 Local Plan included the local designation 'Special Landscape Area' (SLA), which covered all that part of the County which was not covered by Anglesey's Area of Outstanding Natural Beauty (AONB). The AONB covers almost the entire coast, so the interior landscape was protected by the SLA.

The 1996 Local Plan SLA policy wording was as follows:-

POLICY 31. LANDSCAPE

With the exception of the AONB, and that land which falls within the settlement boundaries as defined in the Plan, the island is designated as a Special Landscape Area. Proposals for development in the Special Landscape Area will be expected to have particular regard to the special character of their surroundings. In considering the landscape impact of any proposal, the Council will need to be satisfied that the development can be fitted into its surroundings, without unacceptable harm to the general landscape character, before planning permission is granted."

The Welsh Government wanted to get rid of the island-wide SLA as it was a legal impediment to plans for large wind turbines.

Like the 2013 SPG for onshore wind, Anglesey's 1996 SLA policy did not survive into the JLDP.

The JLDP reduced the Special Landscape Area to six tiny areas. The rationale for this was the choice of just two of the four criteria which had originally been drawn up by the Countryside Council for Wales (CCW), all of which could have been used to justify the local designation of SLA. One of the criteria that could have been applied, but was excluded, was the geological quality of the landscape.

Yet despite the UNESCO Global GeoPark designation, for some unfathomable reason, the “outstanding areas of geological landscape” identified by the CCW was one of the categories of landscape criteria that was discarded.

Furthermore the desktop study and computer modelling used to justify the almost complete abolition of the SLA was deeply flawed not only in its methodology and selection of incomplete criteria, but because it choose to exclude factual evidence. I submitted detailed evidence to the Examination in Public for the JLDP on behalf of CPRW Anglesey Branch; to show why the island should, at the very least, retain the local landscape SLA designation. I was invited to participate in the Public Hearings Session 6, Natural & Built Environment. Before the session I had asked the Welsh Government to provide some of the CCW’s background data that was not publicly available but had apparently been used to justify the removal of the SLA policy. When I eventually saw the data I realised that the data did **not** support the removal of the SLA and there were factual errors in the way it had been used by the consultancy firm LUC, but unfortunately this left me with little time to prepare my supplementary evidence for the session, and when I tried to present a folder of photographs and historical documentation the Inspectors ruled they could not accept this addition to my submission as I had only prepared one folder containing the evidence not two copies as was required.

The Welsh Government ignores UNESCO Global GeoPark

UNESCO Global Geoparks use geological heritage, in connection with all other aspects of that area’s natural and cultural heritage, to enhance awareness and understanding of key issues facing society in the context of the dynamic planet we all live on.

In the case of Anglesey the UNESCO designation is made to protect the Island as a unified geographical area of international geological significance. The citation reads “*The tectonic island of Anglesey includes more than a hundred different rock types and the oldest fossils in England or Wales within 1,800 million years of Earth's history. GeoMon is the UK’s most geologically diverse Global Geopark.*”

<http://www.unesco.org.uk/designation/geoparks/>

You would think that the Welsh Government would be delighted to give appropriate weight to this highly valued international designation. And that the JLDP would contain a specific policy recognising the special nature of ‘GeoMon Global GeoPark’, and the fact that Anglesey’s island nature has created a cultural heritage that derives from both the geology and geography of the place. A central purpose of the JLDP is to deliver economic benefits to the area. And part of our JLDP submission for the proper recognition of GeoMon was that the UNESCO Global GeoPark designation brings with it not only valuable international recognition and kudos but also significant economic opportunities. We referenced the most recent report available in 2016:-

*“The UK’s Global Geoparks generated an estimated **£8.7 million** from April 2014 to March 2015 through their association with the global network”.*

<http://www.unesco.org.uk/wp-content/uploads/2016/02/UK-National-Commission-for-UNESCO-Wider-Value-of-UNESCO-to-the-UK-UK-Organisations-January-2016.pdf#32>

We explained why GeoMon should be both recognised and protected by the Welsh Government as follows:-

“The UK Government and the UK National Commission for UNESCO have supported the process for Global Geoparks to become part of a formal UNESCO programme.”

“This expresses the UK Government’s recognition of the importance of managing outstanding geological sites and landscapes in accordance with UNESCO’s objectives, ie. to promote the Global Geoparks as unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development.”

“This UNESCO recognition follows on from the Convention concerning the Protection of the World Cultural and Natural Heritage (1972), which was ratified by the United Kingdom in May 1984. The 1972 World Heritage Convention links together in a single document the concepts of nature conservation and the preservation of cultural properties. The Convention recognises the way in which people interact with nature, and the fundamental need to preserve the balance between the two. The Convention defines the kind of natural or cultural sites which can be considered for inscription on the World Heritage List. The Convention sets out the duties of States Parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage. The States Parties are encouraged to integrate the protection of the cultural and natural heritage into regional planning programmes, set up staff and services at their sites, undertake scientific and technical conservation research and adopt measures which give this heritage a function in the day-to-day life of the community.”

Both conventions are highly relevant to any Plan for Anglesey, as Ynys Mon is a Global Geopark with a World Heritage Site (Beaumaris Castle). The wider contextualisation is the local vernacular architectural, agrarian and seafaring heritage that is physically and culturally rooted in the local geology, natural landscape and seascape.

The geological uniqueness of the diversity and disposition of Anglesey’s geology, combined with the significance of the fossilised remains within the bedrock and the knowledge that this reveals about our planet’s history is the reason why Anglesey’s landscape has been recognised by UNESCO. But that fact was almost entirely overlooked in the process of agreeing a new local development plan with the Welsh Government.

During the Public Examination of the JLDP I had to correct the paragraphs referring to GeoMon and alert the Planning Inspectors to the fact that UNESCO had recognised the whole of Anglesey, not merely a few RIGGS sites, as an international geological landscape asset and had awarded it the designation of Global GeoPark, equivalent in status to World Heritage Site. However despite this the **Welsh Government has yet to afford any meaningful planning protections for the whole island in respect of this international landscape designation.**

Furthermore in its total ignorance the Welsh Government has decided that it is appropriate to excavate crater sized holes in this geological treasure so that tons of 21st century concrete and steel can be embedded in the bedrock to secure huge wind turbines to the ground.

Once the SPG and island-wide SLA had been dispensed with and the UNESCO Global GeoPark status essentially ignored, the Welsh Government was free to introduce renewable energy development targets into the JLDP knowing that they could not be resisted even if they fundamentally changed the County's landscape.

Consequently in the late spring of 2017, long after the Public Hearing sessions the Welsh Government introduced a target for 271% of the Anglesey's electricity use to be provided by local onshore renewable energy developments.

In July 2017, I wrote the following letter to all Anglesey County Councillors to alert them to the danger of adopting the JLDP:-

"According to figures just released by the department for Business, Energy and Industrial Strategy, during 2016 the entire installed fleet (i.e. the total generation capacity) of onshore and offshore wind turbines, combined with 12GW of solar pv installations supplied the UK with just 47,900 GWh of electricity.

Yet this latest version of the proposed Joint Local Development Plan is aiming to facilitate 2,226.7 GWh of electricity from land within the Plan area (i.e. Anglesey and that part of Gwynedd outside of the National Park).

While there are certain constraints within the plan as to where developments can go, and while a large part of this renewable energy target is expected to come from biomass, in particular the Orthios development, it is nevertheless a highly questionable and contentious target that is probably unrealistic.

This controversial target of producing 271% of the plan area's electricity from renewable sources by 2026 has only just been introduced into the Written Statement. It was first mooted as a Matters Arising Change in spring 2017 as part of the Monitoring Framework. Therefore the process for introducing such an unrealistic target was obscured. And in the context of the main body of the plan it has not been subject to a proper and transparent process of public consultation.

Please note that the Arup report 'Potential Renewable Energy Study – towards renewable energy targets, 2016', commissioned by the JPPU, and upon which the Matters Arising Change was based, estimated "that approximately 37.8% of the total electricity demand [in the Plan area] is currently provided by renewable electricity" (JLDP 2017 Written Statement). The ambitious target of leaping from 37.8% to 271% in just 8 years should have been made public.

I respectfully request that you and your colleague County Councillors reject the target, until such time as there has been a full public consultation which considers whether this target is:-

- i) supported by the local population and whether the means of achieving it are acceptable to them*
- ii) a credible target given the technologies that might be employed*
- iii) achievable without damaging the island's landscape and biodiversity*
- iv) achievable without damaging Anglesey's tourism sector and economy*

v) achievable without damaging public amenity

vi) necessary or proportionate given that a new 2.7GW nuclear power station is planned at Wylfa, which will generate in excess of 20,000GWh per annum (a calculation based on the latest BEIS figures for nuclear power)."

I watched the webcast of the Full Council Meeting called on 31 July 2017 to discuss the JLDP, not one Councillor raised an objection to the renewables target. The discussion of the JLDP was mainly around the Welsh Language.

So the final nail in the coffin for policies that had previously given some protection to Anglesey's interior landscapes came on 31st July 2017 when Anglesey Council adopted the Anglesey and Gwynedd Joint Local Development Plan 2017. The Councillors could have made a stand and refused to adopt those parts of the JDLP, which inserted unreasonable renewable energy targets, excluded the best of the provisions in the SPG for Onshore Wind Energy, and removed or ignored landscape protection policies that had long been a part of the County's Local Plan, but they did not.

<https://www.gwynedd.llyw.cymru/en/Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Joint-Local-Development-Plan/Joint-Local-Development-Plan.aspx>

The Welsh Government's plan of systematically removing and ignoring the planning protections, that in the past have afforded protection to our landscapes, has culminated in this NDF.

I hold Plaid Cymru Anglesey County Council to a large extent culpable for the fact that the Welsh Government has been able to identify Anglesey as Priority Area 1 for the development of onshore wind and solar farms and the fact that if this plan is realised it will completely destroy the County and turn it into an industrialised wasteland, where no one will want to live or work.

Wind and solar farms - an industrial landscape that pollutes with noise and waste

Since the installation of the three wind farms in the north of the island in the 1990's, the Council's Environmental Health Department has received complaints about noise disturbance. Some of these complaints have figured in the discussions with the Institute of Acoustics (IOA) when it has been asked to consider wind turbine noise.

AAWT noted that this information was only put into the public domain following FOI requests, and asked what information would be put into the public domain about the actions the Council has taken to investigate and resolve the problems that have arisen. And what actions does the Council believe may still be required to prevent future occurrences of noise disturbance.

The Welsh Government has always denied there is an issue with excessive or damaging noise emitted from wind turbines.

When the National Assembly for Wales Petitions Committee produced a report 'Control of Noise from Wind Turbines' in May 2012, the Welsh Government sidelined it and ignored its recommendations. A pdf of the report can be downloaded from the Assembly's website. See the link below, the report can be found on the list:-

<http://senedd.assembly.wales/mglIssueHistoryHome.aspx?IId=2449>

At the time of the SPG consultations in late 2012 and early 2013, despite mounting evidence that the IOA's guidance for wind turbine noise, i.e. ETSU-R-1997 was not fit-for-purpose, it was the only form of regulation that the Welsh Government would use.

There were also complaints about noise in the north of the island at the time that Anglesey Against Wind Turbines (AAWT) submitted its first responses to the draft Joint Local Development Plan.

Despite the recurrence of complaints neither the Council nor the Welsh Government maintains an accessible public record of wind turbine noise complaints, so it's difficult for the wider public to judge the extent of the problem. However that may change if more people become affected and alarm bells start ringing on social media. Of course any public record would have to anonymise the complainants' details and may have to redact other information for reasons of confidentiality. But a transparent and useful record could easily comply with this.

Evidence that wind turbine noise disturbs sleep

During the SPG and subsequent JLDP consultations AAWT submitted a list of evidence that wind turbine noise can disturb sleep and harm health as follows:-

1. The research published in Noise and Health Journal, October 2012, Volume 14 Issue 60, 'Effects of Industrial Wind Turbine Noise on Sleep and Health'. www.noiseandhealth.org

This is still available on the website and can be freely downloaded as a pdf:-

<http://www.noiseandhealth.org/showBackIssue.asp?issn=1463-1741;year=2012;volume=14;issue=60;month=September-October>

2. We also referred to the fact that in 2006 the French National Academy of Medicine recommended that turbines should be sited at least 1.5km from homes in order to protect people from Amplitude Modulation (AM) and low frequency noise, which clinicians identified as the probable cause of sleep disturbance and health problems in some people.

3. Research published in:- *'The Bulletin of Science, Technology, and Society'* volume 31, no.4 August 2011 - a research paper by Carl V. Phillips PhD, 'Properly Interpreting the Epidemiologic Evidence about the Health Effects of Industrial Wind Turbines on Nearby Residents'. The abstract reads "There is overwhelming evidence that wind turbines cause serious problems in nearby residents, usually stress-disorder type diseases, at nontrivial rate. The bulk of the evidence takes the form of thousands of adverse event reports. There is also a small amount of systematically-gathered data. The adverse event reports provide compelling evidence of the seriousness of the problems and of causation in this case because of their volume, the ease of observing exposure and outcome incidence, and case-crossover data. Proponents of turbines have sought to deny these problems by making a collection of contradictory claims including that the evidence does not count, the outcomes are not real diseases, the outcomes are the victims' own fault, and that the acoustical models cannot explain why there are health problems, so the problems must not exist. The failure of models to explain the observed problems does not deny the problems. It does mean that we do not know what, other than kilometres of distance, could sufficiently mitigate the effects. The attempts to deny evidence cannot be seen as honest scientific disagreement but rather it is gross incompetence or intentional bias".

4. *"The British Medical Journal published research in March 2012 undertaken by Christopher D. Hanning, (Honorary Consultant in Sleep Medicine, Sleep Disorders Service, University Hospitals Leicester, and Alun Evans, Professor Emeritus, Centre for Public Health, Queens University Belfast, which concluded that wind turbine noise seems to affect health adversely and that an independent review of evidence is long overdue. "A large body of evidence now exists to suggest that wind turbines disturb sleep and impair health at distances and external noise levels that are permitted in most jurisdictions, including the UK. Sleep disturbance may be a particular problem in children and it may have important implications for public health."*

www.bmj.com

5. *'Location, Location, Location – An Investigation into Wind Farms and Noise' published by The Noise Association in 2006 researched noise at a property in Mid-Wales, where the residents had been complaining for some years about the physical effects that noise from turbines situated about 2 miles from their home was having on their health. After monitoring the noise the authors were unable to explain why the effect was so profound. However they did conclude "There is a case for "C" weighting to be used in measuring wind farm noise as "A" weighting doesn't fully capture the low frequency content. "G" weighting is most appropriate for measuring infrasound."*

<http://docs.wind-watch.org/UKNA-WindFarmReport.pdf>

6. *"The research produced and published by Dr Amanda Harry into wind turbine noise and health impacts. She concludes "it is clearly evident from these cases (detailed in the study) that there are people living near turbines who are genuinely suffering from health effects from the noise produced by wind turbines. These neighbours of turbines clearly state that at times the noise from turbines is unbearable. The developers are usually heard to say that noise is not a problem. Clearly that cannot be the case."*

http://docs.wind-watch.org/wtnoise_health_2007_a_harry.pdf

7. *"The open letter from a Danish Doctor warning about the serious health effects of wind farms."*

<http://www.epaw.org/documents.php?lang=en&article=ns55>

8. *"There is also disturbing medical evidence of 'Wind Turbine Syndrome' emerging from other countries including Canada, Australia and the USA. This syndrome has been clearly evidenced to occur within the 1.5km buffer zone we are calling for. Numerous witness statements provide graphic and disturbing evidence as can be seen in the recording we have submitted on DVD and which can also be seen on you tube:-"*

<https://www.youtube.com/watch?v=5rguPxQ93Qc>

The link above is the first hearing that was conducted on 24 May 2012, of the Falmouth Board of Health, which took evidence on wind turbine noise, and which eventually forced the local authority to remove the offending turbines.

AAWT also requested that a provisional AM noise condition regulation be adopted by the Welsh Government. And that the condition wording should be as per Appeal/Q1153/A/06/201716 heard on 11th December 2009 by Inspector Andrew Pykett, and this should be the basis for a standard 'AM Condition' applied to all permitted wind turbine developments.

<http://www.ref.org.uk/publications/242-the-den-brook-amplitude-modulation-noise-condition>

However AAWT believed that what all this evidence suggested was that the safest option would be to create a minimum buffer zone of 1.5km between turbines and homes. While we also acknowledged that in some locations even that separation distance might not be enough.

AAWT explained its reasoning for the 1.5 kilometre a buffer zone as follows:- *"It is recognised that AM noise (the modulation of aerodynamic noise at blade passing frequency) is not adequately dealt with in ETSU-R-97 which is the methodology published in 1996 to measure and predict noise from wind turbines. The causes of excessive levels of AM are not clearly understood. Close sited or number of turbines; landform and surroundings; ground conditions; vegetation; atmospheric conditions; design; age and type of turbine are all contributory factors. There is also 'wind shear' which can be difficult to measure and predict and is thought to occur around the 'nocturnal jet', i.e. where speeds are faster at the 'jet' height but more stable at heights above and below. The frequency of nocturnal jets below 100 metres in the UK is not known, but they are considered to be a regular feature, especially of the boundary layers between clouds and mist. All of these factors are possible triggers for high level AM and are reasons why AM is very difficult to measure and predict. It is also recognised that in some situations AM noise seems to travel considerable distances."*

"The authors of ETSU-R-97 advised that their recommendations should be reviewed after two years use."

AAWT noted that *"At various inquiries and planning appeals it has been recognised that ETSU-R-97 fails to pay adequate attention to the impact of wind shear resulting from atmospheric changes and that the manner in which wind turbine noise is propagated is not considered. Some of the acousticians, who practice in this field, fear that the failure to pay sufficient regard to variations in wind shear could result in significant errors when comparisons are made between background noise levels and wind turbine noise levels. And if the natural wind noise is also added to other background noise this can also give a false picture of the overall noise and its variability any given location."*

AAWT also reported indications and allegations of bad practice in *"the way microphones are used, and the type of microphones used for on-site measurements, for example microphones without properly designed and fitted wind shields which will give an extraordinarily loud and unreal background noise level reading."*

AAWT also referred to the Communities Against Turbines Scotland (CATS) submission to an inquiry in the Scottish Parliament and who included a DVD presenting evidence from four households *"whose living environment has been so damaged by wind turbine noise as to make their lives intolerable"*.

http://www.scottish.parliament.uk/S4_EconomyEnergyandTourismCommittee/Inquiries/CATS_Submission_-_Main_Document.pdf

At the time The World Health Organisation (WHO) had no recommendations for wind turbine noise, but it did have recommendations for reductions in noise levels at night designed to “preserve the restorative process of sleep”. The WHO’s ‘Guidelines for Community Noise’ published in 1999 recommends a limit of 30dB (A) Leq 8h for continuous noise in bedrooms which equates to about 28dB (A) LA90.

AAWT explained “Planning inspectors and professional acousticians agree, any predictions of noise received at homes and other sensitive receptor locations are inherently uncertain, and measurements of noise, including low frequency noise and AM noise, have often been found to be different to actual noise emissions after development. Sometimes lengthy monitoring is required to obtain reliable measurements. For example, at a development in Rhede north western Germany long term measurements of over 400 night hours have had to be made.

It has been accepted at Planning Appeals that the developer should pay the cost of independent acousticians for noise tests on behalf of residents. But it is far better to spell out in advance situations and locations that are not appropriate for onshore wind turbines by setting a precautionary buffer zone between homes and developments. In this way no one will have to bear the burden and costs of proving a noise problem or legal nuisance is occurring.

Buffer zones should apply regardless of turbine size given the case of the Jackson family of East Renfrewshire whose “happy family life has been destroyed” by a 15 metre hub height turbine. <http://www.windwatch.org/documents/submission-to-renewables-inquiry/> “

We highlighted the Bill introduced in the House of Lords, sponsored by Lord Reay, ‘Wind Turbines (Minimum Distances from Residential Premises)’. The Bill set out minimum distances according to the size of the turbine as follows:- 25 – 50 metre turbines must be 1km from residences, 50 – 100 metre turbines must be 1.5km distant, 100 – 150 metre turbines must be 2km and any turbines higher than 150 metres must be 3km distant.

Unfortunately Lord Reay’s Bill did not become law but it was part of the clamour on the Government’s back benches to recognise that there was a problem and that there should be buffer zones to protect from noise and flicker.

During the SPG consultation I visited a home in the north of the island that was surrounded on three sides by wind farms. On two sides of the residence the turbines were close and one was exceptionally close appearing large and overpowering when standing in the garden. This turbine cast flicker across the front of the house as its blades rotated. The owner submitted a video of the effect it was having indoors to the Council and I could see this strobe effect clearly during my visit as it was a bright sunny day. I do not understand how a turbine could have been permitted in such a position, or why it was allowed to continue operating.

I wrote directly to the then First Minister, Carwyn Jones, presenting the evidence of excessive wind turbine noise causing sleep disturbance and harm to the health of wind farm neighbours. I requested his Government take a precautionary approach. deliver justice for the victims of this pollution and institute a buffer zone. I had no direct reply, and my request was ignored.

The 2015 General Election saw David Cameron's Conservative party win an outright majority enabling the Conservatives to ditch their Liberal Democrat coalition partners from Government, which in turn meant they could adopt different energy policies to those of the previous Lib Dem Secretary of State, Ed Davey.

Immediately after the election in July 2015 a Private Members Bill was introduced by Conservative MP, David Davis. It highlighted the need for wind farm operators to hold public liability insurance for any nuisance including noise nuisance. This Bill was part of the mounting pressure on the new Government to adopt a more fundamental approach to the problems of onshore wind farms.

AAWT was very grateful to another Conservative MP, Chris Heaton Harris, who was a tireless campaigner for justice on behalf of victims of onshore wind turbine blight and sleep disturbance. He ran a compendium website on the subject and in 2015 he convened an Independent Noise Working Group (INWG). The group published a highly influential study of AM noise and this helped focus the newly elected Conservative Government's mind and ensured that the ETSU-R-97 guidance was reviewed:-

http://www.heatonharris.com/sites/www.heatonharris.com/files/inwg_acoustics_15_oct_2015_presentation_final_0.pdf

<https://www.heatonharris.com/campaigns/wind-publications>

The wealth of information and expert analysis undertaken by INWG is recorded in the above links, and although the ETSU-R-97 guidance has since been updated, much of this is still useful information in respect of any planning applications for new onshore wind turbines.

Finally in August 2016 the IOA updated its guidance for evaluating wind turbine noise, however in an accompanying press release it was made clear that what the IOA was publishing was a method of calculating AM noise. It was a matter for Government not the IOA as to what the acceptable maximum noise level should be for planning policy and public health:-

'A Method for Rating Amplitude Modulation in Wind Turbines, Institute of Acoustics, IOA Noise Working Group (Wind Turbine Noise), Amplitude Modulation Working Group, Final Report Aug 2016'.

<https://www.ioa.org.uk/publications/wind-turbine-noise>

http://www.ioa.org.uk/sites/default/files/AMWG%20Final%20Report-09-08-2016_1.pdf

At around this time Poland introduced a new law requiring a minimum setback between turbines and buildings and forests of at least ten times the turbines' height. This followed a report from the Polish Public Health Institute in March 2016 which said "*wind turbines are dangerous for you, and there are no regulations to protect you from wind turbine syndrome*". It had proposed that wind turbines should have setbacks of at least two kilometres.

AAWT operated its own compendium website from 2011. It was run and paid for by volunteers. After the UK Government stopped subsidies for onshore wind and once there were no more applications in the pipeline for turbines on Anglesey, the site was closed.

Anglesey Against Wind Turbines maintains a list of over 350 supporters and its Facebook page has 240 local members. It's a closed group to stop trolls and timewasters.

Welsh Government still refuses to set a buffer zone

The Welsh Government accepted the new IOA guidance. But it still hasn't learnt the lessons that it should have done.

Prior to 2016 and the new IOA guidance the Welsh Government hardly bothered to justify its position on wind turbine noise, when it did it was on the basis of old studies, one dating back to 2005 and the other being a report for the Massachusetts Department of Environmental Health dated January 2012. This latter report was produced prior to the public evidence given in the May 2012 Hearing in Falmouth, Massachusetts. AAWT had highlighted this case and submitted a DVD of the public hearing as part of our response to the SPG consultation. The evidence given at the hearing overturned the January 2012 report, so the Welsh Government should not have continued to rely on it.

The Falmouth case is an interesting one, because far from proving wind turbines don't create damaging noise it is a classic example of how these problems have persisted and escalated, ending up in the Appeal Court, and forcing a re-appraisal of policy in the Massachusetts State.

In its JLDP submission Anglesey Against Wind Turbines once again highlighted the case of Falmouth Town, Massachusetts, where by then the Court of Appeal had ruled against the local authority for allowing turbines too close to homes.

The town's local authority spent "*hundreds of thousands of dollars*" defending its decision to erect two turbines and was forced to bring in new zoning restrictions. Too late however, to avoid law suits from residents claiming compensation.

<http://www.windaction.org/posts/42262-falmouth-loses-court-appeal-in-turbine-case#.XaxrOvZYbIV>

The noise pollution began in 2009 after Falmouth Town local authority installed two 1.6MW turbines. The first action was taken in 2013 when the turbines were closed down overnight for 8 hours, and then the operational hours were reduced again to 7am to 7pm Monday to Saturday. Then on February 27th 2015, after years of intolerable problems for the affected Falmouth residents, a report was produced by Noise Control Engineering, LLC, www.noise-control.com.

The report was written by Michael Bahtiarian, INCE Bd. Cert. and Allan Beaudry and entitled TECHNICAL MEMO 2015-004, Infrasound Measurements of Falmouth Wind Turbines Wind #1 and Wind #2.

Finally in 2017 the Superior Court shut down the Falmouth turbines completely.

After fighting in court for more than 4 years the residents were finally victorious and were duly compensated.

https://www.capenews.net/falmouth/news/falmouth-wind-turbines-called-disaster-on-national-stage/article_7fb950b0-2758-54b3-a61b-1a26ce9d0906.html

The case in Falmouth Town is important because the specialist acoustics consultancy had conducted a study at one home situated within 1300 feet of one of the wind turbines and had identified worrying levels of infrasonic sound pressure levels inside the residence.

<http://www.windaction.org/posts/42443-infrasound-measurements-of-falmouth-wind-turbines-wind-1-and-wind-2#.XaxitfZYbIV>

The Massachusetts Department of Environmental Health now has its own website listing those cases being handled by local authorities together with detailed acoustics surveys and reports.

Its website doesn't refer to 'infrasound' or 'low frequency inaudible sound' but it does refer to AM noise levels and explains that ***"Amplitude modulation is defined as a periodic variation in sound levels over time. Wind turbines regularly generate broadband amplitude-modulated sound that is often characterized as a "swishing" sound and is associated with the turbine rotational speed and blade passage frequency, typically with a period of around 1 second which is equivalent to a modulation frequency of about 1 Hz and corresponds with one blade on a three-blade turbine passing a point in space each second."***

The website is proof that there have been a number of long running complaints raised by local authorities or by residents concerning compliance with regulations, and which have required lengthy and repeated noise studies to allow *"Modulation Depth Calculations"* to be made.

An example from one such study explains why the sound is annoying *"the modulation depths calculated for periods with the KWI turbine operating at moderate to higher wind speeds of 8 to 10 m/s are up to approximately 1 to 3 dBA greater as compared with ambient conditions, a level of increase which is likely noticeable to the average person"*.

But graphs included in other cases demonstrate the extent of harm that is being caused and explain that the *"A weighted sound pressure level (dBA)"* increased in proportion to the size of the turbine as expressed by *"Average Hub-Height Wind Speed (m/s) reaching a maximum of 53dBA."*

53dBA is a sound similar in intensity to an electric fan or hair dryer. These increases in sound levels are relative to ambient or background noise and are proof that the levels exceed WTO recommendations and will cause sleep disturbance.

Other reports filed show that at some properties *"The turbine-operating Avg Lmax over ambient L90 sound level increases exceed 10 dBA at higher wind speeds of 9 m/s and above"*. This is also a significant increase in level and will exceed regulations in certain jurisdictions. The Massachusetts Department of Environmental Protection (DEP) requires that there be no more than a 10 dBA increase in a specific standard of averaged noise and that there be no 'pure tone' conditions which cause specific spikes in specific frequencies which are disruptive. So in this case the states regulations are being broken.

<https://www.mass.gov/info-details/wind-turbines>

The World Health Organization sets guidance for environmental noise of an annual average of 40 dBA outside homes.

And WHO guidelines state that if maximum noise inside a bedroom exceeds 45 dBA more than 10-15 times in a night, sleep can be sufficiently disrupted to cause concern.

Many of the tests in Massachusetts are conducted in urban areas that are close to busy highways. It's clear that the levels of AM wind turbine noise relative to background noise is likely to be much more marked and therefore more disturbing in tranquil rural areas such as Anglesey, particularly at night.

However the legal cases being taken forward in Massachusetts are not unique. Challenges and legal actions continue to be brought against wind farm operators around the world.

And there are a number of expert acoustics consultants who challenge not only the exclusion of infrasound in the calculations for wind turbine noise emissions, but also the basis on which AM sound is calculated.

They point out that as many of the noise complaints relate to sleep disturbance it is also the noise occurring inside the dwelling which has to be calculated. And as the attenuation of a building is not linear across the frequency spectrum the dB(A) value is not appropriate for evaluating internal environments.

World Health Organisation introduces guidance for wind turbines

Whatever method is used to measure and evaluate sound. It is clear that Governments around the world are starting to look more closely at the issue of wind turbine noise; the extent to which it disturbs sleep and causes other health concerns; which kind of sounds and frequencies to measure and how best to do that; how to regulate developments and how to ensure compliance with those regulations. There are also moves towards regulations that will force developers to have insurance cover for all manner of compensation claims that might be brought against the developer or the authorities.

Against this growing body of evidence, in October 2018 the World Health Organisation (WHO) introduced, for the first time, guidelines specific to wind farm noise.

<http://www.euro.who.int/en/publications/abstracts/environmental-noise-guidelines-for-the-european-region-2018>

The WHO decided that the volume of 'cause and effect' medical evidence up to that date was insufficient for it to make stronger recommendations. It had been unable to consider a number of more recent studies, though some are listed in the annexes to the report.

I think it's reasonable to assume that this recommendation is the first step, which as the WHO says, it has made because wind turbines are getting bigger and there is clearly more evidence of health effects being amassed.

The following two quotations from the WHO report are significant and repudiate the assumptions made in the NDF.-

“Whereas the general population tends to value wind energy as an alternative, environmentally sustainable and low-carbon energy source, people living in the vicinity of wind turbines may evaluate them negatively. Wind turbines are not a recent phenomenon, but their quantity, size and type have increased significantly over recent years. As they are often built in the middle of otherwise quiet and natural areas, they can adversely affect the integrity of a site. Furthermore, residents living in these areas may have greater expectations of the quietness of their surroundings and therefore be more aware of noise disturbance.”

*“In many instances, the distance from a wind farm has been used as a proxy to determine audible noise exposure. However, in addition to the distance, other variables – such as type, size and number of wind turbines, wind direction and speed, location of the residence up- or downwind from wind farms and so on – can contribute to the resulting noise level assessed at a residence. Thus, using distance to a wind farm as a proxy for noise from wind turbines in health studies is associated with high uncertainty. Wind turbines can generate infrasound or lower frequencies of sound than traffic sources. However, few studies relating exposure to such noise from wind turbines to health effects are available. It is also unknown whether lower frequencies of sound generated outdoors are audible indoors, particularly when windows are closed. The noise emitted from wind turbines has other characteristics, including the repetitive nature of the sound of the rotating blades and atmospheric influence leading to a variability of amplitude modulation, which can be a source of above average annoyance (Schäffer et al., 2016). This differentiates it from noise from other sources and has not always been properly characterized. **Standard methods of measuring sound, most commonly including A-weighting, may not capture the low-frequency sound and amplitude modulation characteristic of wind turbine noise (Council of Canadian Academies, 2015).***

Even though correlations between noise indicators tend to be high (especially between LAeq-like indicators) and conversions between indicators do not normally influence the correlations between the noise indicator and a particular health effect, important assumptions remain when exposure to wind turbine noise in Lden is converted from original sound pressure level values. The conversion requires, as variable, the statistical distribution of annual wind speed at a particular height, which depends on the type of wind turbine and meteorological conditions at a particular geographical location. Such input variables may not be directly applicable for use in other sites. They are sometimes used without specific validation for a particular area, however, because of practical limitations or lack of data and resources. This can lead to increased uncertainty in the assessment of the relationship between wind turbine noise exposure and health outcomes. Based on all these factors, it may be concluded that the acoustical description of wind turbine noise by means of Lden or Lnight may be a poor characterization of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes.”

In due course the WHO will go further, as the following critique suggests and will for example look at more specific recommendations for night time noise levels:-

<https://www.masterresource.org/wind-turbine-noise-issues/wto-wind-turbine-noise-as-a-health-hazard/>

The wind industry continues to downplay the health hazard

There's an annual event in Lisbon now that considers these persistent issues. The **'Wind Turbine Noise'** conference in June 2019 was as usual primarily held for the benefit of the industry and professionals involved in regulation and compliance. But as the organizers admit, *"If there were no people affected by wind farm noise we would not be having these conferences."*

All the main issues were discussed and it's interesting to see that they are fundamentally the same as when AAWT first starting looking into wind turbine noise. I've selected below a few quotes from the published summary of proceedings:-

"Tones were covered by three papers but the study of tones is not going to go away. There is increasing pressure to reduce tones as the overall noise level of turbines is reduced."

"Amplitude modulation featured less this time compared with recent conferences but there is definitely a need for more work as it is perceived to be a key factor in several countries. There is still not enough work on the impact of AM on people."

"Assessment and compliance and background noise brought us a respectable number of papers with several raising new ideas. The variability of background noise is something we still do not understand well."

"More accurate propagation methods and, importantly, verification of them are needed."

"Trailing edge mitigation research is essential to drive down the cost of renewable energy."

There was a forum that looked at infrasound and concluded *"The EARS project shows that Salt's theory on Infrasound is not true in practice. Infrasound just below the threshold can excite anxiety centres in the brain but EARS showed that this only extends to a couple of decibels below threshold. At 1Hz turbine noise is typically 60dB below threshold. In more general terms, there are lots of other sources of infrasound and that from turbines is no more than some other sources. It was also felt that some of those promoting the danger of infrasound were causing unnecessary anxiety and distress to wind farm neighbours. There is nothing in the sound of wind turbines – infrasound or audible sound – that can directly affect the pathology of your tissues and make you sick that way. The amount of energy in sound waves at the levels we are talking about here does not support any direct effect other than through the ears. Nevertheless, there is no doubt that there are people who are ill near wind farms."*

The unpredictable factors were discussed, such as *"the variability of the atmospheric wind which cannot be predicted accurately due to its turbulent nature. It can manifest itself as AM and other unsteady/intermittent phenomena. It results in a potentially high variability of the noise emissions which cannot be quantified accurately. Nevertheless, manufacturers provide uncertainty together with their certified noise levels, which are used subsequently by operators and developers for their immission noise predictions. However, it is difficult to take these aspects into account during the design phase. In this respect, it is pointed out that AM is site dependent. Therefore, it is difficult - if not impossible – for the manufacturer to design wind turbines for noise and including mitigation of*

AM. It is difficult for the manufacturers to be pro-active on this front as long as there is no theory or sufficient information to predict this phenomenon.”

Various factors affecting accuracy were discussed such as “how accurate propagation modelling was and, in particular, how accurate it needed to be. For example, does turbine wake increase noise levels in some places? There was a feeling that if that were the case it might be offset by the fact that wake reduces wind speeds at downwind turbines which has the opposite effect.”

Another cause of uncertainty for noise predictions is the degradation of blade surfaces. “This is a real concern for manufacturers and operators as degrading blade surfaces can result in increased noise emissions as well as the loss of energy yield.”

On the modelling side, there are still some uncertainties “of the impact of using a concentrated single point noise source at the hub position to represent the wind turbine noise emission, or if more advanced modelling strategies should be applied. This may become sensitive for the prediction of immission noise at shorter distances from the turbine, say below 1 km. The same goes for directivity. It is usual to assume a monopole directivity pattern when it is well known that wind turbines have a more complex directivity emission pattern.”

I agree completely with the Secretariat’s final assessment of proceedings at Lisbon, “a lot remains to be understood and there is a need for further scientific advancements in the domain of wind turbine noise prediction at the source. There is still a lot of room for improvements in the prediction and reduction of wind turbine noise, although it has nowadays become a quite difficult endeavour after the important progress in this field during the last few decades”.

<https://www.windturbinenoise.eu/content/conferences/8-wind-turbine-noise-2019/>

This is precisely why there must be a buffer zone of at least 1.5 kilometres between wind turbines and homes.

There are buffer zones in other countries.

In Germany, for example, the government says that any new turbines and new models replacing older ones (so-called “repowering”) must maintain a minimum distance of 1,000 metres from the nearest residential area. However, federal states and municipalities can opt out of this distance rule. The existing minimum distance in Bavaria, is ten times the turbine’s height (the “10H rule”).

Research continues but it’s mainly funded by the industry

More recently two papers on wind turbine noise were presented at the 23rd International Congress on Acoustics in September 2019.

The first, by Steven Cooper, The Acoustic Group, Australia, offers a simplified method for determination of “amplitude modulation” of audible and inaudible wind turbine noise. It claims its a cheaper and easier method of assessing wind turbine noise than the method selected by the IOA.

The abstract reads:-

“The operation of a wind turbine results in a series of pulses where there is a significant instantaneous increase in the amplitude of the pressure signal dependent upon the loading (power output and wind strength) of the wind turbine. Such amplitude variations can be significant. The modulation of the amplitude of the acoustic signature for wind turbines is often referred to as “amplitude modulation”. One method of assessment of the degree of amplitude modulation for a wind turbine used in the UK is complex, time-consuming and expensive to undertake. A simplified method has been developed that is not just restricted to the dBA level and can be used to cover both inaudible and audible dynamically pulsed amplitude modulation. This simplified analysis method is not just restricted to wind turbine noise but has uses for other pulsating noise sources. Investigation of recreational music and industrial noise sources that give rise to the generation of pulsations occurring at an infrasound rate using the simple methodology is discussed.”

Cooper concludes:- *“Amplitude Modulation” typically associated with wind turbines varies over time as a result of different wind speeds and changing power output. The degree of modulation on the dB(A) level can vary significantly with higher modulation depths identified as excessive amplitude modulation. What constitutes excessive modulation, and how long the occurrence of excessive modulation requires a correction to the A-weighted Leq level, has not been established. If a modulation index greater than 3 for say 10% of the night represents the necessity to add a penalty of +x dB to account for the subjective impact then a more efficient analysis method is required than either of the current UK methods. The alternative method using statistical analysis presented in this paper has been found to be a relatively straightforward and simple method to evaluate “amplitude modulation” or “fluctuation”, not only for wind turbines, but has been used for other noise sources exhibiting pulsations occurring at an infrasound rate.”*

<https://www.wind-watch.org/documents/simplified-method-for-determination-of-amplitude-modulation-of-audible-and-inaudible-wind-turbine-noise/>

The second paper was an epidemiological study on long-term health effects of low-frequency noise produced by wind power stations in Japan by Tatsuya Ishitake; Yoshitaka Morimatsui; Kunio Hara; Kurume University, School of Medicine, Japan and University of Occupational and Environmental Health, School of Health Science, Japan.

The abstract reads:-

We investigated whether long-term exposure to wind turbine noise (WTN) including low-frequency noise generated by wind power facilities is a risk factor of sleep disorders. We performed an epidemiological study of living environment and health effects, surveying 9,000 residents (≥20 years) living in areas with operational wind power facilities. Sleep disorders were assessed using the Athens Insomnia Scale. To assess environmental noise in residential areas near the wind turbines, low-frequency sound exposure levels were measured at 50 community centres of the town. Multiple logistic regression analysis was used for evaluation of a risk factor for several noise exposure indices.

Significant relationships between the distance from the nearest WT to dwellings and hearing, annoyance, sleep disorders were observed. By multiple logistic analysis the prevalence rate of sleep disorders was significantly higher for residents who reported subjectively hearing noise than for those who did not. Moreover, the reported prevalence rate of sleep disorders was significantly higher in residents living at a distance of ≤1,500 m from the nearest wind turbine compared to that

for residents living at a distance $\geq 2,000$ m. The attitudes of residents towards wind power facilities and sensitivity to noise strongly affected their responses regarding sleep disorder prevalence.

<https://www.wind-watch.org/documents/epidemiological-study-on-long-term-health-effects-of-low-frequency-noise-produced-by-wind-power-stations-in-japan/>

The problem for wind farm neighbours is that the operators of wind farms have deep pockets whereas local residents and County Councils often have neither the financial or legal resources. However as on-line crowd funding becomes more commonplace there is the possibility that this will change, not only in respect of new wind farm developments but also where old wind farms are seeking to re-power and residents are just not prepared to put up with the noise any longer as, for example, in Cumbria:-

“Residents are claiming a nearby wind farm has been noisy for 20 years and have convinced councillors to pause plans to keep it open for another decade. They said noise from the Askam and Ireleth wind farm, near Barrow, Cumbria, was “unbearable”. A decision on an application to extend its life has been deferred while Barrow Council seeks independent evidence.” :-

<https://www.bbc.co.uk/news/uk-england-cumbria-49675439>

At least the Conservatives have listened

Since 2015 when the Conservative Government gave local people in England the right to choose whether they want wind turbines in their neighbourhoods the rate of planning applications has dropped by 94%.

Like the battles associated with many other types of pollution and environmental health hazards it's obvious that wind turbine noise will be further scrutinised and that tighter regulations for onshore wind will be applied. However the Conservative Government has to an extent got ahead of the curve by giving more control to local communities. This will restrict the number of retrospective damages sought from local authorities or whoever else approved the wind farm. It would be good if Welsh Labour and Plaid Cymru politicians copied the English planning policies to get ahead of the litigation curve and put a stop to onshore wind.

If the Welsh Government does not give people in Wales the right to refuse wind farms then in a few years' time Anglesey will be suffering just like this rural community in the US:-

https://www.youtube.com/watch?v=CuW0iB_l1hl&feature=share

Handing the problem of waste disposal to future generations

A 10 MW wind or solar farm requires vast quantities of materials and rare earths and frequently needs new access roads. Wind turbines also require massive concrete and steel foundations. And they present huge volumes of toxic and non-toxic waste at the end of their short life.

<https://scotlandsnature.blog/2018/02/28/wind-farms-for-life/>

Ysgelloch Farm Wind Farm in north Anglesey was approved by the Council's Planning Committee in June 2011. It consists of two wind turbines 92.5 metres in height.

During construction a vast amount of material was brought on site for the foundations. 25 tons of steel were used to construct each turbine base. The bases were then filled with 600 tons of concrete. A 500 ton telescopic crane was used to hoist the tubular tower, the nacelle, generator and rotors into position. The turbines took five months to construct. The wind farm is now operational with the installed maximum capacity of both turbines totalling 4.6 mega watts.

https://www.youtube.com/watch?v=Ps82cDrE_o0

According to a report from the National Renewable Energy Laboratory, wind turbines are predominantly made of steel (71-79% of total turbine mass), fiberglass, resin, or plastic (11-16%), iron or cast iron (5- 17%), copper (1%), and aluminium (0-2%).

A study commissioned by Scottish Natural Heritage, quotes a forecast that by 2034 there will be a need to recycle about 225,000 tonnes of rotor blade material every year worldwide. They produced the following guidance:-

<https://www.nature.scot/guidance-decommissioning-and-restoration-plans-wind-farms-february-2016>

Wind turbines have a lifespan of around 20 years. As more and more turbines are coming to the end of their short lives, the industry has to take the problem of decommissioning and disposal seriously.

As Pagh Jensen of Siemens Gamesa has said *"Why is blade recycling a challenge for the industry? It's because they're not yet recyclable,"*

Incineration or burying the blades in landfills has been the choice for disposal hitherto, but that's being ruled out now in many countries.

Europe's wind industry says it's unclear how a 10 percent landfill cap on municipal waste by 2030 will affect industrial and construction waste. But disposing of turbine blades is more difficult. They are designed to be light and strong yet able to withstand enormous forces without bending or breaking, to do that they are made of either reinforced carbon or glass fibre, combined with polyesters and thermoplastics. Such materials aren't designed to be easily recycled. The industry claims the blades can be shredded and burnt to produce fuel for industrial processes, but the fact is it's not that easy. This is just a bit more spin and hype.

To recycle the blades for any kind of use means they have to be cut up and that generates potentially dangerous amounts of dust.

The scale of the problem is likely to grow fast. Today there are about 77,000 onshore and offshore wind turbines in Europe, according to WindEurope, and 640 megawatts worth were decommissioned in 2017:-

<https://www.politico.eu/article/small-old-wind-towers-make-for-big-new-problems/>

Of course most of the bases remain in the ground adversely affecting the water table and fertility of the land.

The environmental health hazards emanating from solar farms are less obvious. However insidious environmental hazards occur particularly during the replacement and disposal of panels.

Scientists have told us that *“Contrary to previous assumptions, pollutants such as lead or carcinogenic cadmium can be almost completely washed out of the fragments of solar modules over a period of several months, for example by rainwater”*.

And the volume of panels that need to be disposed of is growing, but we don't have a viable and environmentally sustainable way of coping with the waste.

Waste solar panel recycling costs more than the economic value of the materials recovered, so most solar panels end up in landfills.

A team of scientists presented their research in the International Journal of Photoenergy in 2017 and found the problem of solar panel disposal “will explode with full force in two or three decades and wreck the environment” because it “is a huge amount of waste and they are not easy to recycle. The reality is that there is a problem now, and it’s only going to get larger, expanding as rapidly as the PV industry expanded 10 years ago.”

The full report is here <https://www.hindawi.com/journals/ijp/2017/4184676/abs/>

Safety Hazards for Workers, Firefighters and the Community

Wind turbines are huge structures, they require trained staff to check them and this can lead to accidents:-

<https://gineersnow.com/industries/renewables/two-mechanics-died-wind-turbine-fire-helped-wind-industry>

They also pose huge problems for firefighters:-

Here are just a few recent examples:-

<https://www.energyvoice.com/video-2/117887/video-german-firefighters-tackle-wind-turbine-blaze-dont-ladders-high-enough-reach/>

<https://www.hartlepoolmail.co.uk/news/people/wind-turbine-blaze-sparks-more-90-calls-fire-service-flames-rise-propellers-637561>

<https://www.whfp.com/2019/04/24/firefighters-tackle-blaze-near-wind-farm-on-skye/>

<https://scotlandagainstspin.org/2019/04/firefighters-tackle-blaze-near-wind-farm-on-skye-west-highland-free-press/>

<https://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-48017104>

In Anglesey when three of the older turbines caught fire they just had to be left to burn out. Luckily it didn't cause a great deal of damage or start other fires. But that was just a matter of luck.

<https://www.dailypost.co.uk/news/north-wales-news/anglesey-wind-turbines-catch-fire-6706133>

Equipping the local Fire and Rescue service with equipment and ladders sufficient for them to deal with these super sized structures imposes another unwanted cost on local Council tax payers.

Labour has form when it comes to ill-judged and damaging environmental policies

Labour's misinformed policies on 'global warming' have caused great harm to human health and the environment.

In 2001, the then Chancellor Gordon Brown introduced a new system of car tax aimed at protecting the environment. But as the BBC reported *"In actual reality it fostered a popular move towards highly polluting diesel cars - a trend which according to some experts has been associated with thousands of premature deaths a year"*

Then in 2009 Gordon Brown, followed in the footsteps of other EU countries, and introduced a scrappage scheme for 'old bangers'. Some 400,000 cars were scrapped in exchange for Government cash to help fund the purchase of a new car. The main beneficiaries of the scheme were of course the better off who frequently scrapped perfectly good vehicles because they fancied a newer model.

The scheme's environmental credentials were no better than the social ones. For when calculating a car's lifetime carbon footprint, you need to look at ALL the CO₂ it produces - not just the amount emitted when its engine is running, but also the amount produced when it was built and, for that matter, when it was scrapped.

This is Money reporting at the time said *"manufacturers need to haul about ten tons of iron ore out of the ground to make the average automobile. That process produces a lot of CO₂. As does the manufacturing, Ford says that between a quarter and a third of all the CO₂ emitted by a car in its lifetime comes not from driving it but from its manufacture. The best estimates are that the combined process of scrapping an old car and replacing it with a new one emits between three and five tons of climate-changing CO₂. For example, if you swap a 12-year-old family hatch for a brand new one of similar power, the efficiency savings will take a full six years to pay off the initial 'CO₂ debt'. But that is based on an average driver's use of about 8,000 miles a year. Those cars that are driven less frequently will take far, far longer before there is a net benefit to the environment. So long, in fact, that it is perfectly possible that the 'new' car might be damaged, or scrapped itself, before then."*

Many people who sold their old petrol bangers replaced them with new diesel cars.

Diesel fuel contains more energy per litre than petrol and coupled with the fact that diesel engines are more efficient than petrol engines, diesel cars are more efficient to run. However, when compared to petrol cars with a catalyst, diesels have higher emissions of NOx:-

<http://www.air-quality.org.uk/26.php>

And produce much higher levels of fine particulate matter:-

<http://www.icopal-noxite.co.uk/nox-problem/nox-pollution.aspx>

As Defra's 2012 publication 'Fine Particulate Matter (PM2.5) in the United Kingdom' explains:-

"Airborne particulate matter has consequences for human health, the environment and climate change."

On the health effects of PM2.5 it says *"There is clear evidence that particulate matter has a significant contributory role in human all-cause mortality and in particular in cardiopulmonary mortality. PM2.5 penetrates deeply into the human respiratory system. The acute effects of particle exposure include increases in hospital admissions and premature death of the old and sick due to diseases of the respiratory and cardiovascular systems."*

So Labour's legacy has left us with an increase in GHG's and serious health hazards arising from their botched policies to avert 'global warming'.

Some scientific advisors warned about diesel fumes, but Labour didn't listen. Turning a deaf ear is a strategy the party has become expert at deploying.

The beauty of nature destroyed by wind and solar farms

The mountains of Snowdonia National Park tower above the Menai Strait and Anglesey's mostly low lying topography. Holyhead Mountain on Holy Island is a mere 220 meters high. At just 178 meters Mynydd Bodafon is the highest point on the Isle of Anglesey. The island's landscape slopes away from the mini-mountains, ridges, and clifftops which are scattered along the eastern side of the island (i.e. Mynydd Eilian; Mynydd Nebo; Parys Mountain; Mynydd Bodafon; Pentraeth Forest, and the hill fort Bwrdd Arthur) towards more gently undulating landscapes in the interior and the flat marshes and wide estuaries of the west coast. Drumlins, rocky outcrops, streams and rivers intersect with **some of the most fertile soils in Wales**, and there are stunning views across the whole island towards the majestic backdrop of Snowdonia.

The dramatic open and rugged seascapes within the coastal Area of Outstanding Natural Beauty offer wonderful prospects, both inland and out to the sea's horizon - as far as the eye can see.

The beauty of Anglesey and Holy Island is renowned.

One well travelled former resident, Prince William, declared his appreciation during a speech at Anglesey County Show *"I know that I speak for Catherine when I say that I have never in my life known somewhere as beautiful and as welcoming as Anglesey, the views across the Menai Straits are undoubtedly among the most stunning in the British Isles,"*

Now imagine the height of these proposed turbines and how incongruous they would be. They would be taller than anything else in the built environment and would dwarf our traditional vernacular buildings. They could be taller even than any natural landform i.e. Holyhead Mountain or Mynydd Bodafon. Like the existing wind farms in the north of Anglesey, but even more gargantuan, they will be totally out of place in this landscape.

If the Labour Party's 2019 manifesto and this NDF plan is executed, in less than 20 years time anyone standing in the AONB will look inland towards wind farms, look out to sea towards wind farms and have to look through the masses of whirling turbines when trying to focus on Snowdonia. Anglesey will have been wrecked and its few remaining inhabitants 'imprisoned'.

But if this Welsh Government's dystopian vision is realised all Wales will be affected.

In total this NDF has designated around a fifth of the country as new 'priority' areas where Planning Inspectors will have to comply with the Welsh Government's diktat that there will be 'a presumption in favour' of building large scale wind and solar farms.

These new 'priority' areas are in addition to those parts of Wales that have already been ruined by the presence of large wind and solar farms. Indeed the Welsh Government's policy is to "maximise opportunities" to build wind and solar farms, so that while National Parks and Areas of Outstanding Natural Beauty have nominal protection, in fact they will lose a great deal of their natural beauty because of the overpowering scale of these proposed developments in the surrounding areas. And of course they will be directly affected by the detrimental impacts on the natural geology, hydrology, topography, habitats and wildlife of the newly industrialised landscapes adjoining their boundaries.

Areas of Outstanding Natural Beauty and National Parks are not isolated 'islands' of natural beauty, ecosystems and wildlife habitats, they are jewels in the crown of the wider landscapes that support them.

The 'State of Nature Report 2019' warns us that *"on average Wales' wildlife has declined in recent decades"*. <https://nbn.org.uk/stateofnature2019/reports/>

The report goes on to explain the importance of interconnected land and seascapes. *"From the mountains of Snowdonia and the Brecon Beacons through the enclosed farmland dominated by livestock production and down the numerous wooded valleys to the estuaries and sea, Wales holds a diverse range of habitats. The Welsh Sessile Oak woodlands, which make up half of Europe's "temperate rainforests", hold rich communities of bryophytes, lichens and fungi, while the mountains host rare invertebrates, including the Snowdon Leaf Beetle, and arctic-alpine plants such as the Snowdon Lily. The Welsh coastline stretches for over 2,000km. The islands off Pembrokeshire, Anglesey and the Llŷn Peninsula hold seabird colonies of global significance, including the world's largest Manx Shearwater breeding colony and the UK's fourth largest gannetry. Cardigan Bay supports one of the larger semi-resident populations of Bottlenose Dolphin found in the UK."*

The height of wind turbines means that these huge industrial kinetic structures, must be secured in the ground by tons of deep concrete and steel foundations, and require miles of new roadways and transmission pylons such that these developments become a sprawling, incongruous and ubiquitous

part of the landscape throughout Wales, presenting hazards to humans and wildlife, particularly birds.

A new publication from the Global Warming Policy Foundation reviews the impact of wind energy on the environment and finds that it is already doing great harm to wildlife.

“The Impact of Wind Energy on Wildlife and the Environment” contains contributions from both researchers and campaigners, with a focus on birdlife.

Professor Oliver Krüger describes his cutting-edge research, which has shown how birds of prey and ducks are being killed in their thousands in Germany. The risk to these species is so great that there is a possibility of whole populations being wiped out.

Klaus Richarz, the former head of a major bird reserve in Germany, describes how windfarm operators are evading strict compliance with the rules, to the detriment of both birds and bats.

Dr Peter Henderson, of the University of Oxford, reviews the effects of wind turbines on a wide variety of animals. He suggests that death toll on bats may already be ecologically significant:

“About 200,000 bats are annually killed at onshore wind turbines in Germany alone. These numbers are sufficient to produce concern for future populations, as bats are long-lived and reproduce slowly, so cannot quickly replace such losses.”

Lastly, Paula Byrne of WindAware Ireland describes how windfarms in her native country have desecrated landscapes, and have even threatened the endangered Nore Freshwater Pearl Mussel.

The report concludes ***“With an extraordinary expansion of renewable energy planned, there is potential for these serious environmental impacts to become catastrophic.”***

We depend on all our landscapes for our food, water, clean air, outdoor recreation and peace of mind. The Labour Welsh Government, supported by Plaid Cymru, is prepared to steal our beautiful landscapes and replace them with impoverished soils; impervious concrete which will induce flooding; rows of pylons and humming power lines; gargantuan towers sprouting mammoth whirling blades that slice through birds, bats and insects while emitting excessive Amplitude Modulated noise and infrasound to disturb our sleep.

Labour’s Dystopian Vision

Labour hasn’t grasped the simple truth that a clean, reliable, non-intrusive and inexpensive energy system is the foundation for our well-being and our future. This should be the raison d’être of a National Development Framework.

In its complete ignorance of physics and arithmetic the Labour Welsh Government has singled out wind and solar farms as the way to replace fossil fuels - demanding ludicrous ‘targets’ for these weather dependent ‘renewables’. To satisfy its recent Party Conference Motion to ‘decarbonise by 2030’, it will have to demand yet more of these monstrous and invasive structures and simply designate every part of Wales as suitable for large scale wind and solar farms.

In May 2019 Labour told us *“the Green Industrial Revolution will be as transformative as the first Industrial Revolution, but led by Labour”* and to facilitate the massive roll out of renewables that

Labour is planning it will “*bring gas and electricity networks back into public ownership*”. This will ensure that the thousands of wind turbines and hundreds of solar parks can be connected to thousands of new pylons all over Wales.

Labour’s publication ‘Bringing Energy Home’, is one part of its blueprint for energy policy at the forthcoming General Election, it informs us of their intentions:-

“Decarbonising the energy system is central to tackling climate change, and will require energy networks to upgrade infrastructure and invest in flexible systems that can integrate tens of gigawatts of new wind, solar and tidal power. Labour has set out ambitious proposals including a seven-fold increase in offshore wind by 2030 and almost trebling solar power as part of a Green Industrial Revolution. Labour anticipates that the rollout of renewable energy generation will be driven by a mixture of public, private and community level investment.

Reaching the high levels of renewables deployment needed to meet Labour’s 60% target by 2030 and net zero emissions before 2050 will require a greater degree of network planning. Distribution and transmission networks will need to be pro-active, initiating electricity connections to parts of the country with high solar, wind and tidal potential..... But market arrangements have created inefficiencies, such as a plethora of cables separately bringing to shore generation from different offshore windfarms, as opposed to higher capacity hubs offshore, into which individual windfarms feed.”

The whole focus of the document is to cater for a massive increase in renewable energy developments, both on and offshore.

Nowhere in Labour’s 13 page ‘policy document’ for energy is there a single mention of nuclear power.

At Labour’s election launch in November it published the other half of its energy plans in the report ‘Thirty by 2030’.

This is a plan to “Immediately embark on a vast expansion of offshore wind, onshore wind and solar power.” And “to deliver a 77% reduction in energy emissions by 2030 compared to 2010 levels. This is more than the global average 45% cut in emissions that the IPCC climate scientists say is needed and would make the UK a world leader in climate action. If implementation goes very well by the mid 2020s, the UK could even be on track for a zero-carbon energy system sometime in the 2030s.” And the “emissions reductions” will require “much more reliance on intermittent sources”.

In fact the report says by 2030 “69% of electricity generation is from intermittent sources”.

The plan would expand the electricity supply by **“an increase to 137GW in generation capacity, from today’s 44GW.”**

In the report’s 187 pages there are less than three pages about nuclear power, and most of that is talking about the problems the authors see with nuclear power.

The plan doesn't go as far as closing down nuclear power stations. It says *"For the purposes of this analysis, we have considered nuclear power as a contributing towards renewable and low-carbon energy supply."*

And adds *"The nuclear power capacity contributing to supply in 2030 is therefore 8.9GW, resulting in around 63TWh of output in 2030, contributing 15% of the renewable and low-carbon electricity needed. Given the large number of nuclear plants being decommissioned over the coming 7 years, it may be possible that in the mid 2020s the nuclear capacity drops below that of today, but this strategy assumes that this number then increases back to 8.9GW by 2030. However, at the time of writing there remains uncertainty around much of the planned and proposed new capacity in the UK."*

"It is clear however that ensuring 90% renewable and low-carbon electricity is still technically feasible without any further development of nuclear energy beyond Hinckley Point C, with other renewable and low-carbon technologies expanded to make up supply."

So I think we can safely say Labour has no intention of putting any money into nuclear power.

Let's look at the figures that Labour wilfully ignores:-

Last year it took all 44 gigawatts (GW) of the different types of renewable energy generators, installed in the UK, to contribute 33% of the UK's electricity. This 33% figure breaks down as follows, the share from wind and solar was 21%, thermal renewables contributed 10.4% and the share of generation from hydro natural flow was 1.6%.

In 2018 we consumed 352,064 gigawatt hours of electricity. The demand at any one time, averaged over the year, is about 35GW. But we need to have a total of at least 55GW of reliable dispatchable 'capacity', i.e. power plants that can ramp up or down to meet the demand for electricity during peak periods, for example in the early evening or during cold spells in winter. So for every GW of weather dependent renewables we also need a GW of 'back-up' for when there is little or no wind or sun.

In 2018, our consumption of electricity accounted for just 17 per cent of the UK's total 'final energy consumption'.

The total megawatts (MW) of plants connected to the UK transmission network has reduced each year from 2012 to 2015 due to closures and conversions of coal, oil and gas plants. Conversely since 2011 connections to the distribution network increased as 'embedded capacity', i.e. renewables were installed. **Embedded generation turned a lightning strike into a widespread blackout in August.**

In 2018 the total installed capacity of all types of power generation plant and for both transmission and distribution networks in the UK was 105 GW. This compares with 71GW in 2008. So since 2008 we have increased the amount of generating capacity by around 48%. However as most of this has been renewables we don't actually get any more electricity. The extra infrastructure and additional costs are the price we pay for converting to renewables because you need to build a great deal of energy generation infrastructure to capture the energy from the wind and the sun. And on top of that you need many more lines of pylons and interconnectors. Of course National Grid and its ESO

benefit enormously from the diffuse and dispersed sources of wind and solar power, because it costs more to get this power onto and transmitted around the grid, they can charge us more for delivering and balancing the supply. No wonder they sing the praises of wind and solar farms.

Wind and solar make the transmission and distribution system very expensive and extremely vulnerable to collapse.

As the wind varies from storm force to nil and the sun isn't always shining, we have to calculate how many wind and solar farms we might need based on the average hourly quantity of electricity supplied by wind and solar farms during past years. We call this average figure the 'Load Factor'. It's an imprecise figure because the weather is capricious and it changes according to geographic location and from day to day and year to year. But by using data from previous years this rule of thumb calculation allows us to estimate that for every 1MW of onshore wind plant installed and operational you get 25% of that potential energy each hour, i.e. 0.25 megawatt hours (MWh), on average over the course of the year. For solar PV it's 10% and for offshore wind it's around 40%, natural flow hydro is 33%.

<https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes>

When we look at the progress the UK has made towards the targets set in 1990 by The Renewable Energy Directive 2009/28/EC, (which is a European Union directive which mandates levels of renewable energy use within each EU member state) we see that **in 2018 11 per cent of our total energy consumption came from renewable sources**. This 11% figure is for all types of renewables, less than a quarter of that came from wind turbines, most came from burning biomass. To be precise wind made a 22.0% contribution to the total figure for renewables and solar pv and active solar heating contributed 5.2%.

So the total contribution of wind and solar to the energy we use in the UK is around 4%. And if you include the energy embedded in our imported goods and the energy we use for air travel then these renewables probably contribute less than 2% of all the energy we use.

So when you look at the figures it's easy to see how difficult it would be to attempt to obtain all our energy from renewables, let alone from unreliable wind and solar farms.

And none of the above figures take into account the need to bring back some of our heavy industries that have been lost overseas. And neither do they take into account the projected growth in the UK's population of 3 million people during the next decade. The population of Wales is currently 3.2million.

Labour just hasn't figured any of this out.

"I love renewables but I'm also pro arithmetic"

So said DECC's Chief Scientific Advisor, Professor David MacKay in his wonderful 2012 TED lecture.

He had done a lot of calculations about energy use around the world and projections going forward.

His ‘back of the envelope’ calculation for the UK was based on each of us using 125kilowatt hours (kWh) of energy per day. Therefore if we expect wind turbines to produce all the energy we use, then we will need to cover at least half the UK with wind farms. And MacKay cautions us that his 125kWh doesn’t include the energy embodied in the goods we import or our air travel.

It’s the sort of statistic that ought to make environmentalists sit up. Nobody can claim they are genuine about wanting to protect our environment and ecosystems if this is what they intend doing.

He explains that when trying to figure out what energy sources to use in future, land use becomes the biggest issue, particularly for densely populated countries like the UK. And as countries develop, their peoples use more and more energy per capita. This growth in energy use becomes exponential as the global population grows.

MacKay’s brilliant TED lecture is here:- <https://www.youtube.com/watch?v=-5bVbfWuq-Q>

And his charts are here:- https://ukerc.rl.ac.uk/DC/cgi-bin/edc_search.pl?GoButton=Detail&WantComp=70&WantResult=LD&&BROWSE=1

Not a lot has changed since he produced his figures and projections. Wind turbines have got bigger but because of the turbulence and wake they create they have to be spaced further apart, so the land take figures are pretty much the same.

As The Times reported on 30th October, “Orsted shocked investors yesterday by saying that it had reviewed extensive data from its projects and had concluded that current production forecasts underestimate the negative impact of two effects across our asset portfolio. These were the ‘blockage effect’, under which wind slows down as it approaches wind turbines, and the ‘wake effect’, which produces a wake after each wind turbine where the wind slows down. The industry had modelled the wake effect for years, but Orsted’s results pointed to ‘a higher negative effect on production than earlier models’ and said that turbines would need to be spaced further apart, especially given that more wind farms were now likely to be built.”

https://www.thetimes.co.uk/article/orsted-s-paradox-more-turbines-mean-less-wind-xs0mss7gf?utm_source=CCNet+Newsletter&utm_campaign=9e105f31d3-EMAIL_CAMPAIGN_2019_10_30_04_29&utm_medium=email&utm_term=0_fe4b2f45ef-9e105f31d3-36457565&mc_cid=9e105f31d3&mc_eid=bff0b8c627

The Department of Business, Energy and Industrial Strategy produces annual facts and figures about energy consumption in the UK. They do not include figures for the embedded energy in the goods we import, or the energy used in air travel, as it would be too difficult to calculate.

‘UK Energy in Brief’ is the latest summary detailing the figures for indigenous energy production and territorial energy consumption in the UK during 2018:-

<https://www.gov.uk/government/statistics/uk-energy-in-brief-2019>

The figures show that “the total production of primary fuels, in the UK, when expressed in terms of their energy content, rose by 2.9% in 2018 compared to 2017. The rise was due to increases in primary oil production due to new fields opening as well as the closure of the Forties pipeline in

December 2017, and from wind and solar production mainly due to increased capacity. There was also growth from bioenergy and waste, driven by conversions from coal to biomass at the Drax and Lynemouth power stations. However, gas and nuclear production both decreased. Coal production fell to a record low level in 2018. *Primary oil (crude oil and Natural Gas Liquids) accounted for 43% of total production, natural gas 30%, primary electricity (consisting of nuclear, wind, solar and natural flow hydro) 16%, bioenergy and waste 10%, while coal accounted for the remaining 1%.*

As the UK does not produce all its own energy we have to import the shortfall:-

“In 2018, 36% of energy used in the UK was imported, down sharply from the 2014 level due to increases in indigenous oil and gas output and, more recently, renewables. Latest comparable data from Eurostat, for 2016, show that the UK had the seventh lowest level of import dependency in the EU. All EU countries are now net importers of energy.”

“In 2018 the UK obtained 19% of its primary energy from low carbon sources, with 39% of this from nuclear power. The second largest component of low carbon was bioenergy, accounting for 37% of the total low carbon energy sources.”

“In 2018 UK emissions were provisionally estimated to be 448.5 million tonnes of carbon dioxide equivalent. This is 2.5% lower than the 2017 figure of 460.2 million tonnes and 44% lower than the 1990 figure of 794.4 million tonnes. Carbon dioxide emissions, which are primarily created when fossil fuels are burned, were estimated to account for about 81% of total UK anthropogenic greenhouse gas emissions in 2018. Estimates based on energy production and consumption in 2018 indicate that carbon dioxide emissions were 2.4% lower than the previous year and 39% lower than in 1990. The decrease in emissions since 2017 can largely be attributed to a change in the fuel mix for electricity generation, with less use of coal and gas and increased use of renewables.”

“The figures for Electricity generated by fuel type are Coal 5.1%, Oil and other fuels 2.9%, Gas 39.5%, Nuclear 19.5%, Hydro 1.6%, Wind and Solar 21%, Other renewable 10.4%. Nuclear capacity was broadly the same as the capacity in 2017, at 9.3 GW. Renewables capacity has seen a significant increase, with installed capacity increasing by roughly 18.5 times the capacity in 1996 to 44.3 GW in 2018.”

“Compared to 2017, total domestic energy prices in 2018 increased in real terms by 4.8%. Within the overall movement liquid fuels increased by 23%, gas prices increased by 1.9%, and electricity prices increased by 6.6%. Between 2017 and 2018 crude oil prices rose by 31% to \$71 per barrel. This increase in the raw material prices was passed through to petroleum products produced from refining crude oil, leading to the increase in liquid fuel prices. Between 2008 and 2018, real prices for domestic energy increased by 22%, with the real price of electricity increasing by 28% and the real price of gas increasing by 16%. Liquid fuel prices decreased by 12% over this period but compared to the peak in 2012 liquid fuel prices were 21 per cent lower in 2018.”

What these figures tell us is that because renewables are intermittent and unreliable we need to build roughly 5 times more renewables ‘generating capacity’ as is needed for nuclear to produce the same amount of low carbon electricity. And we know that the area of land and sea required per MW of ‘generating capacity’ for these renewables developments are many orders of magnitude more than would be required for nuclear developments. As the Ted lecture from David MacKay graphically explains.

It's obvious therefore that renewables will desecrate huge areas of our natural environment and cause great damage to our ecosystems.

But the problem is not only one of destruction it's also about the cost. These figures show how over the period we have been building renewables the price of electricity has steadily gone up, compared with the price of oil, gas and coal.

What is also revealed is that despite the great cost in monetary *and* environmental terms wind turbines and solar PV only contribute around 4% of all the primary fuels that we use to create our energy. The BP 'Statistical Review of World Energy' has calculated that these technologies contribute just 4.3% to the UK's final energy consumption.

Imagine the devastation and poverty that will be caused by attempting to reach a 'zero carbon' target using these technologies.

A disastrous step backwards for Wales

Our ability to use the energy around us sets us apart from other life forms and species. It has enabled us to create our 21st century civilisations.

This Welsh Government's retarded view of which energy sources we should use has produced a National Development Framework with a central purpose to base the entire economic, social and environmental wellbeing of Wales on Labour's choice of throwback technologies and energy supplies that are unreliable, non dispatchable and expensive sources of power.

We left these ideas behind when, at the start of the industrial revolution, we discovered that fossilised solar power (i.e. coal, gas and oil) could be harnessed to improve living standards and take us forward from our agrarian societies to less poor and healthier modern societies. This NDF is not merely a flawed route to decarbonisation it is a disastrous step backwards for Wales.

The Welsh Government does not seem to understand that if we want societies to prosper and develop in the 21st Century we cannot go back to the capricious sources of energy that were used in the 17th Century when people depended on diffuse wind power for their sail ships; and wind and watermills to grind their corn; or the solar power stored in trees and peat bogs for their fires.

If we are to prosper Wales urgently needs a combination of reliable and dispatchable energy sources so that the cost of energy is affordable for everyone and attractive for industry and businesses.

Pursuing a goal of using only renewables will drive people into fuel, work, and skills poverty.

Instead of pursuing its dystopian backward looking vision for Wales, based around a policy of pointless destruction and uncaring vandalism on a scale that is almost unimaginable, our Welsh Government could pursue a far better energy policy. It could choose to take the country forward using nuclear power – a power source that by many orders of magnitude is, less destructive; more

reliable; sustainable and effective. Instead it chooses to align itself with greedy narrow- minded lobbyists and rent seeking developers who are trying to fool us into thinking renewables are the way to avert the 'climate emergency'.

An underwhelming economic 'opportunity' for Wales and Anglesey

In January 2013 Regeneris Consulting and the Welsh Economy Research Unit at Cardiff Business School produced a report for the Welsh Government entitled 'Economic Opportunities for Wales from Future Onshore Wind Development'.

Regeneris Consulting had been appointed by Renewable UK Cymru, the Welsh Government and a group of wind farm developers to undertake an assessment of the economic opportunities from onshore wind development for Wales.

The report explained *"Welsh policy towards the onshore wind sector has evolved in recent years. TAN 8 planning guidance, published in 2005, sets out guidance on the location of wind farms in Strategic Search Areas (SSAs). These locations are expected to host the majority of wind farm capacity in coming years."*

The report endeavoured to paint a positive picture as it considered impacts under the scenario of building 2000MW of onshore wind farms by 2025 and suggested:-

"Most of this impact in the 2,000 MW scenario would be felt in construction activities, with manufacturing (particularly steel) also benefitting. Employment in private services is estimated to increase by almost 300 FTE jobs annually to 2025 and almost 400 thereafter, whereas professional and financial services (focussed here on planning and engineering activities) accrue around 300 jobs annually to 2050. Grid Infrastructure investment required to support the placement of wind turbines in Mid Wales would also bring economic benefits. Depending on the eventual solution (overhead vs. underground), we estimate that this investment would support between £11m and £57m in GVA and 360-1,950 person years of employment in Wales."

During the Development and Construction phases the report says that:-

"Developers are generally positive about the presence of Welsh based suppliers in the areas of civil engineering, environmental services and consultancy, and most are aware of the presence of towers manufacturing in Wales (i.e. Mabey Bridge).

On average, developers expect to source around three quarters of the requirement for turbine towers from Wales, with Mabey Bridge and potentially other suppliers with the capability to supply steel towers. Whilst Mabey Bridge has capacity to supply this requirement, for prudence and to reflect downside risks on this expectation, we have reduced this sourcing assumption to 50% for modelling purposes. Civil engineering also has a strong presence of potential Welsh suppliers, along with forestry and environment services.

Given the lack of a turbine manufacturer in Wales, all expenditure on wind turbines leaks fully out of Wales. We do not expect it to be possible to attract a turbine manufacturer to Wales, given existing capacity in Europe and the economies of scale that would be needed to drive such an investment.

We estimate that in 2005-11 the planning and construction of onshore wind projects in Wales contributed an annual average of £7.8m in GVA and 335 FTE jobs.”

Yes you read that correctly. In the previous six years the Welsh Government’s renewable energy policy i.e. TAN8, had delivered a miniscule 335 full time equivalent temporary jobs, in for example planning consultancy and lawyers offices or for mainly transient construction workers, some of whom would be forestry workers employed to fell and remove trees to make way for wind turbines. That is what RenewableUK and misguided political parties like the SNP and Labour think is good environmental policy:-

<https://www.scotsman.com/news/environment/5-million-scottish-trees-felled-for-wind-farms-1-3253041?fbclid=IwAR3paspPJ12bC4IzYk1qC7dG-smDCLUW6E8PTz-JIOkJBXLhWuF9mEnVSaM>

However the Regeneris report makes no mention of all the public unrest; protests at the Senedd; controversy and time wasted by campaigners and local authorities in trying to prevent the unwanted destruction of landscapes.

Under operations and maintenance (O&M) the report tells us:-

“The largest items of expenditure include land rentals and access payments, which are paid to the Forestry Commission/ Welsh Government and local land owners. Direct employment costs borne by developers total £9,800 per installed MW,”

“We estimate that between 2005 and 2011 O&M activity supported an annual average of £6m of GVA and 210 FTE jobs per annum.”

So the number of permanent or semi permanent jobs provided in Wales as a result of Labour’s TAN 8 onshore wind policy over the previous six years was a dismal 210 full time equivalent posts.

Under the heading ‘Local Economic Benefits’ the report was honest enough to say:-

“The economic opportunities would not be spread evenly throughout Wales and some of the benefits would take place outside the immediate proximity of wind farm developments. Nonetheless, there are opportunities for local areas hosting wind farms to benefit from the developments, including: contracts won by local firms during planning, development, construction and operations; employment of local residents supported in these phases, either directly or through supply chains; local expenditure in the retail and hospitality sectors as workers involved in these phases spend their income in the local economy; the wider economic benefits for local communities, including investment in local physical, economic and community infrastructure and financial benefit for particular groups such as land owners.”

What an underwhelming prospect for Wales!

On providing local work in operations and maintenance the picture fades to a dim and distant hope:-

“Rural areas have more scope to benefit from opportunities in the O&M phase. Larger schemes tend to require more workers to be permanently located on the ground. For example, Wern Ddu, a 9.2

MW wind farm, only requires 2-3 weeks of maintenance per year. By contrast, Cefn Croes requires 4 operations and maintenance FTEs and Pen y Cymoedd is expected to require 12 FTEs, with 90% of these being based locally. The maintenance of wind farms is often built into the turbine manufacturing contract for a specified warranty period. Since the turbine contracts typically go to overseas firms, maintenance is often undertaken by non-UK based firms. The extent to which local firms and employees are able to benefit from this work depends on the balance between the manufacturers' use of local teams and their use of their own workers. Where activities are contracted out following expiry of the warranty, this is sometimes done through a single contract covering all O&M activities, which brings potential for local companies to benefit through the use of a framework agreement of local contractors which the main O&M contractor can draw on where required. This has been achieved around various wind farm sites in Wales by holding open days for local firms to highlight the potential supply chain opportunities and supporting local suppliers to become approved suppliers for the wind farm. Where developers choose to deliver the maintenance in-house, local opportunity partly depends on the developer's approach to managing their portfolio of wind farm schemes across Wales. Larger developers may have a portfolio of wind farms in Wales, and choose to centralise their approach to operations and maintenance of these wind farms, sharing responsibility across existing staff, especially for smaller schemes. A relatively small proportion of equipment and spares tend to be sourced from Wales, since this generally links to where turbines and components are actually manufactured. However, there is much more scope for forestry and environment services to be sourced from local areas given the presence of these skills, especially in rural areas. There is also scope for induced benefits to be secured locally within the hospitality sector where maintenance staff need to stay locally."

Well it's a fact that the small entrepreneurial wind farm developers who pushed forward these developments in the early days of this marketplace hardly exist nowadays. Large multinational companies have bought out the small operators and centralised O&M activities to make efficient use of trained staff and reduce costs. This aggregation of assets is one of the reasons why developers have been able to bid for contracts with smaller subsidies attached.

So given the vanishingly small number of potential jobs and lack of a turbine manufacturer in Wales it is stretching it a bit too far to think these insignificant benefits are remotely likely to outweigh lost business in a County like Anglesey, which is so dependent on the natural beauty of its landscape as the basis for its crucial tourism economy.

Jobs destroyed, communities impoverished

In 2011 the long established Lydney, Gloucestershire based bridge building company Mabey Bridge invested £38m in a turbine tower-building plant in Chepstow. I understand that the Welsh Government gave Mabey Bridge grant funding of £30 million pounds. The expectation was that 240 workers would be employed to manufacture 30 turbine towers each year. I believe Mabey Bridge subsequently produced 30 turbine towers and then in 2015 the Chepstow factory closed, having been unable to find a buyer and some 120 workers lost their jobs. The company said despite continued efforts to improve productivity it faced "an exceptionally competitive international market for renewables."

The company with 160 years experience of bridge building consolidated its business in Lydney and is today busy producing modular steel bridges, which it is successfully selling around the world.

In the same year that the Regeneris report was published Anglesey Against Wind Turbines could only identify 2 local jobs connected with onshore wind O&M operations at the 3 wind farms in the north of the County. And there had been no other community benefits worth mentioning.

The lack of local jobs and benefits was revealed at community meetings convened in 2011, 2012 and 2013 by north Anglesey residents who were concerned by the number of wind farm planning applications being made and the possibility of yet more turbines being built near their villages. They felt their homes and businesses had already suffered and it would get worse if more were built. Feelings ran high and at one meeting a long standing County Councillor claimed the only benefit his community had seen in the 20 or so years of hosting a large wind farm was a pair of curtains for the village hall.

The north of Anglesey struggles to attract a good level of tourism business. And falls short compared with the rest of the County despite having more hours of sunshine and some beautiful landscapes and coastal areas within the AONB. Many people attribute this to the high visibility of the 3 wind farms built in the 1990's, Rhyd-y-Groes, Trysglwyn and Llyn Alaw. The turbines in these older wind farms are mostly around 35 to 46 metres high to the tip of the blade. After much controversy there have recently been some additional individual turbines erected, some of which are much bigger, including two at Yscellog, which are 92.5 metres high to the tip of the blade.

In 2015 there was considerable local opposition to the planning application for 're-powering' the Rhyd-y-Groes wind farm. The application was for fewer but bigger turbines and these new structures had to be placed on new foundations and set away from the existing turbines. At least one of the old turbines was no longer in operation.

During the application process it emerged that there was no planning obligation committing the wind farm operators to remove the existing obsolete turbines at the end of their operational life. Eventually planning approval was given for the 're-powering' plans, conditional on the old turbines being removed as the new ones were installed. The Council took this "pragmatic" decision as it feared that obsolete turbines might be abandoned with no one responsible to pay for the removal and disposal. In that situation the Local Authority might become liable for demolition and clean-up costs or damages if structures became dangerous. The development was approved, but building works have yet to commence, no doubt the developer is waiting for subsidies to be re-introduced by an incoming Labour Government.

It's obvious that the Welsh Government has produced this NDF in anticipation of a Labour Government being elected to Westminster, one that will find the money to fund these plans.

However what this Welsh Government and its NDF will achieve, and in short order, is the loss of manufacturing jobs, particularly those in energy intensive industries, which will depart our shores for countries in Europe, Asia and the Americas, or any part of the world that has more sense than to rely solely on renewables.

Having driven more of our industries, like Anglesey Aluminium, offshore we will then be left having to import not only cheap clothes from China and lightweight aluminium bodied vehicles from India but all manner of goods manufactured abroad. So instead of reducing our 'carbon footprint' in Wales it will significantly increase due to the GHG emissions embedded in the high volume of imported goods we will consume. Unfortunately our impoverished citizens will be paying more for their electricity and will have lost many of the better paid jobs that will have relocated to companies overseas. We in Wales will be less able to buy not only the high value goods available to us today, but also everyday necessities. **This NDF is economically incompetent.**

Labour politicians in Cardiff can't blame the Conservatives

At this juncture Welsh politicians cannot foist the blame for a depressed economy onto the Government in Westminster. The Welsh Government now has control of all energy developments up to 350MW and like every other country in the world it could use its control of energy policy and new technologies to drive the economy of Wales forward.

Neither can the Welsh Government claim to be unaware of the fast moving developments in nuclear power. But Labour isn't talking about nuclear power, instead it is incessantly calling for the re-introduction of onshore wind and solar subsidies.

In 2015 the Conservative Government began to withdraw subsidies for renewables because of the huge and unanticipated overrun in power generation costs after 5 years of giving subsidies to onshore wind and solar developers. These costs are passed on to consumers in their electricity bills and the Chancellor realised that contrary to what renewables advocates had promised the cost to consumers was rising steeply.

The Conservative Government realised that the cost of electricity was set to continue rising for a number of years because of the contracts already issued and that subsidies to onshore wind and solar farms had to be completely withdrawn. In the Autumn Budget 2017 it announced a 'Control for Low Carbon Levies', which means that a Conservative Government will not introduce new low carbon electricity subsidies until the burden of costs that renewables are placing on the network reduces. On the basis of the current forecast, this means there will be no new low carbon electricity subsidies, apart from the 'capacity market' auctions, introduced until 2025 at the earliest. Offshore wind farms are permitted to compete in the capacity market auctions, but onshore wind and solar are not, as they are judged to be mature technologies that should by now be able to operate without subsidy. However, without subsidies very few developers have wanted to build onshore wind or solar farms. The Conservatives will continue to monitor spend against the original 'Levy Control Framework' budget until 2020/21 to see if costs can be brought back under control.

The contracts given to renewables developers are usually for at least 20 years and guarantee that consumers pay them a minimum price for the electricity they produce. There are many developments with planning approval in the pipeline that have yet to be built, just waiting for these contracts and subsidies to be re-introduced by Labour.

As well as considering the rising cost of renewables, the Conservative Government has been forced to listen to rural communities who don't want wind and solar farms, and who have complained about the AM noise emissions from turbines and about the negative impacts the developments are having on their quality of life at home and the blight and consequent devaluation of their houses and businesses. As a result the Conservatives made changes to the planning laws in England to give

communities greater say in what renewable developments could be approved in their neighbourhoods.

The Welsh Government, who control planning in Wales, did not consider giving communities a say and instead chose to remove the voice of the community by inserting new renewables targets into upcoming Local Plans, such as the Joint Local Development Plan for Anglesey and Gwynedd. And it introduced a threshold of 10MW at which point the Welsh Government makes the decision, over the heads of the County Council. A single large scale wind turbine of 250 metres high has a 'capacity' to generate more than 5MW:-

<https://www.ge.com/renewableenergy/wind-energy/onshore-wind/turbines/cypress-platform>

This offshore model can potentially generate 12MWs:-

<https://www.ge.com/renewableenergy/wind-energy/offshore-wind/haliade-x-offshore-turbine>

This means that under the provisions of the NDF most large scale renewable energy developments will now be approved in Cardiff.

In 2012 the Welsh Government introduced permitted development rights for small scale wind turbines. The Town and Country Planning (General Permitted Development) (Amendment) (Wales) Order, Statutory Instrument No. 1346 (W.167), makes provision in certain locations for Stand Alone Wind Turbines (SAWT) up to 11.1 metres high. This is considered large enough for household or small business use. There are a few constraints in respect of for example SSSI sites. So the Local Planning Authority will still have a small role to play in upholding such conditions and determining some small scale developments:-

<http://www.legislation.gov.uk/wsi/2012/1346/made>

The 21st Century solution to safe, clean, cheap, abundant energy

We cannot continue using unabated the fossil fuels that gave us the industrial revolution. Yes there are opportunities for carbon capture usage and storage (CCUS) but these technologies have yet to be fully developed and will, in any case, add considerable costs to energy production. So we must look for new solutions.

The accepted figures for CO2 emissions from burning unabated coal and gas are:-
800g of CO2 per kWh coal and 400g of CO2 per kWh gas.

Wind and solar, are estimated to produce around 50g of CO2 per kWh.

However nuclear plants produce just one-quarter of the carbon emissions of solar farms, according to the Intergovernmental Panel on Climate Change. And solar farms require 450 times more land than the current generation of nuclear power plants.

Wind farms require 400 times more land than the current generation of nuclear power plants.

So it is clear only nuclear power, which for the last 60 years has provided the largest source of reliable and decarbonised energy, gives us the opportunity to meet our objectives of having a secure, reliable, decarbonised, inexpensive and sufficient energy supply for a modern economy.

<http://environmentalprogress.org/the-complete-case-for-nuclear/>

New developments in nuclear technologies, including Small Modular Reactors (SMRs) and Advanced Modular Reactors (AMRs) will further reduce the ‘carbon footprint’ of new nuclear power developments. And more importantly they will have an even smaller ‘physical footprint’ in the landscape than existing nuclear power plants.

New nuclear technologies by far the smallest ‘physical footprint’

SMRs and AMRs, many of which will fit on the back of a standard lorry, will not require new roads or massive quantities of concrete and steel foundations or high volumes of rare earths. And the volume of waste products will be a tiny fraction by comparison with renewables, i.e. not the high volumes that will end up going to landfill from wind and solar farms.

Furthermore the new inherently safe nuclear fuels and technologies will not require massive concrete domes to enclose the reactors because for example, they do not operate under pressure and have inherently safe non-volatile chemistry, and don’t require ancillary power or water cooling to prevent the reactor overheating. Such reactors ‘are walk away safe’ and can be sited almost anywhere. Some can be situated on brownfield sites as small as 13 acres and only 9 storeys high including all the ancillary plant such as the steam turbine house. See for example Terrestrial Energy’s video, March 2019 <https://www.youtube.com/watch?v=xs8p8rYRLBM>

The functionality of this type of reactor means it can be used for many purposes such as desalination; splitting water into hydrogen and oxygen; medical isotopes etc. They could be directly connected to industrial premises to provide the power for all manner of industrial heat processes. Or they could be situated close to towns and connected to district heating networks or the electricity distribution networks. When used in this way the need for transmission infrastructure and network balancing to match demand is greatly reduced. It’s also more efficient as there is less energy lost in transmission.

The NDF sidelines small modular nuclear reactors (SMRs). It identifies just two locations as suitable for this fast developing class of technologies that range in output from less than 5MW to over 350MW. Multiple SMR units can of course create GW size developments. And the wonderful thing is that even GW size developments could be accommodated on sites of less than 100 acres. At Rhyd y Groes solar farm in north Anglesey the developers required a site of 222 acres to accommodate the solar panels and batteries that together would have a maximum generating capacity of 50MW and in reality the average output would be around 10MW. The development has yet to be built.

We need to embrace new nuclear technologies and make them the ‘Priority’ for development in this 20 year NDF plan. And to ensure this happens we should be working with developers such as UK based Moltex Energy to get new nuclear developments up and running as quickly as possible.

Prime Minister Boris Johnson has called for a “nuclear renaissance”. He has pledged to further fund the development of new nuclear power, and continue the work that the previous Conservative

Administration began in 2015 with its ‘competition’ for new generation small modular reactors (SMR). Some developers were awarded funding and many of the developers are also seeking support from other Governments and private investors. There are broadly two classes of SMRs and for the purposes of supporting the new technologies the UK Government describes them as SMRs and AMRs. See link and quote below:-

.....
<https://www.gov.uk/government/publications/advanced-nuclear-technologies/advanced-nuclear-technologies>

“Generally advanced nuclear technologies fall into one of 2 groups:

- Generation III water-cooled Small Modular Reactors (SMRs), similar to existing nuclear power station reactors but on a smaller scale*
- Generation IV and beyond Advanced Modular Reactors (AMRs), which use novel cooling systems or fuels to offer new functionality (such as industrial process heat) and potentially a step change reduction in costs”*

.....
The Conservative Government has recently confirmed that it intends to follow up on the work done in this area by the Department for Business, Energy and Industrial Strategy (BEIS) and has announced:-

“Funding for small and advanced modular reactors

In a further boost to the nuclear sector, we are proposing to invest up to £18 million of government money in the creation of innovative mini nuclear power stations which are smaller and less expensive to build than traditional nuclear plants. A consortium led by Rolls-Royce has proposed a significant joint investment of more than £500 million focused on designing a first-of-a-kind small modular reactor (SMR). The consortium expects to more than match any government funding both by direct investment and by raising funds from third party organisations.

A working model is expected to be up and running in the early 2030s, creating 40,000 jobs at its peak, with each power station producing enough clean energy to power 750,000 homes.

Additionally, we are providing up to £40 million through the Advanced Modular Reactor (AMR) programme and are currently considering project bids. Up to £5 million will also be provided to the Office for Nuclear Regulation and the Environment Agency to build readiness for SMRs and AMRs, subject to outcome of the AMR R&D competition.”

BEIS has also announced a new method of funding nuclear power and other new low-carbon technologies, the **‘Regulated Asset Base’ (RAB)**:-

“Already used in major infrastructure projects like the Thames Tideway Tunnel, the alternative model could reduce the cost of financing infrastructure and risk for developers while limiting the impact on consumers’ bills in the long-term.

The RAB approach could also be used to reduce the costs of the transport and storage of carbon dioxide. A funding model similar to the Contracts for Difference scheme, which provides developers with a set price for low-carbon electricity will be explored alongside other options to deliver investment in Carbon Capture Usage and Storage (CCUS) power projects while cutting emissions. The government's ambition is to roll out the technology at scale by the 2030s, subject to costs coming down, as part of its world-leading commitment to become a net zero emissions economy by 2050."

<https://www.gov.uk/government/news/innovative-funding-models-and-technologies-to-drive-investment-in-new-wave-of-low-carbon-energy?fbclid=IwAR1msC0ekAjmjyg3R1rEG4I7J42rjdH7dbU9CPW4Kw9dXGc6RRt-uhZQjnU>

One of the first visits Boris Johnson made after becoming Prime Minister was to the UK Atomic Energy Agency's (UKAEA) Culham Science Centre for Fusion Energy. The PM and BEIS announced:-

"Innovation investment for zero carbon nuclear fusion technology"

"As part of the UK's commitment to invest in innovative technologies to help tackle climate change in the UK and across the world, the UK will accelerate efforts to realise fusion energy through a £222 million investment in a visionary fusion reactor design programme, known as [STEP](#) (Spherical Tokamak for Energy Production).

A world first, the UK will aim to design, develop and build a commercially viable fusion power plant ready to provide energy to the grid by 2040. The 20-year project will create highly skilled jobs across the country and could create a brand-new industry for the UK with global export potential.

In parallel, the government will provide £184 million over the next five years to develop new fusion facilities, infrastructure and apprenticeships, centred on the Culham Campus in Oxfordshire. This investment will make the UK a global hub for fusion innovation, support the delivery of STEP and attract private sector fusion companies to the UK.

The objectives of STEP include delivering predictable net electricity greater than 100 MW, to use fusion energy beyond electricity production, and develop affordable lifecycle costs.

UKAEA said the latest investment will allow engineers and scientists to produce a conceptual design for the Tokamak reactor which should be completed by 2024. "

<https://www.gov.uk/government/news/new-measures-to-back-business-boost-innovation-and-supercharge-uk-science>

The Welsh Government however appears to take no account of how such technologies will bring huge benefits to Wales. But worse than this is the Welsh Government's refusal to accept that new nuclear developments would enable it to meet its decarbonisation objectives without destroying wholesale Wales' landscapes, natural habitats, the economy and people's lives.

I believe this may be because the First Minister Mark Drakeford and Labour Party Leader Jeremy Corbyn are 'dyed in the wool' CND supporters and their out-of-date ideological beliefs mean they won't support any form of nuclear power. Just prior to becoming First Minister Mark Drakeford spoke at a CND rally and said he would review the Welsh Government's policy on nuclear power. Based on past knowledge of Jeremy Corbyn's views about nuclear power, it would be reasonable to assume that under his leadership an incoming UK Labour Government would not fund or in any

other way help facilitate new nuclear power in the UK. That is certainly the impression given in the Party's energy plans, where it claims the UK could reach zero-carbon in the 2030s without adding any new nuclear power. Labour's plans proffer a fantasyland of unicorns and fairy dust. But the reality is they forebode the ruination of the true beauty of the natural world.

The previous Welsh Labour Government did support Wylfa Newydd and policies for new nuclear power. However as soon as Mark Drakeford took office he called a halt to the Wylfa Newydd site development plans on Anglesey, plans that had been approved by Anglesey Council.

The marginalisation of nuclear power in the NDF is consistent with Labour's emerging policy of excluding new nuclear power from the UK.

Labour should listen to the world's best brains

The visionary climate scientist and inventor James Lovelock celebrated his 100th birthday in July. He is probably the most influential environmental thinker of our time, he's just published his latest book and views on our planet's future 'Novacene –The Coming Age of Hyperintelligence'. His 'Gaia Theory' changed our view of the earth and our appraisal of how our ecosystem works. Like most physicists and scientists in the field Lovelock has no time for wind turbines and believes nuclear power is essential.

In fact most experts consider that it is only possible to meet our energy needs and decarbonise global energy use if we utilise new nuclear power technologies.

One of the most successful business minds of our time, Bill Gates, is also developing this technology which he believes is crucial if we want to decarbonise our energy use:-

<https://www.nextbigfuture.com/2018/08/global-race-for-transformative-molten-salt-nuclear-includes-bill-gates-and-china.html>

And the International Energy Agency cannot see a realistic pathway to decarbonisation if we don't use nuclear power. It heralds the value of SMRs and AMRs:-

<https://www.iea.org/topics/innovation/power/gaps/small-modular-reactors-and-advanced-reactor-demonstration.html>

China is powering ahead and already building its first small modular reactor. It will be finished within the year and be the first of many:-

<https://uk.reuters.com/article/us-china-nuclearpower/china-launches-small-reactor-project-in-push-for-nuclear-dominance-idUKKCN1UD0W9>

In any country, especially those with a high population density, the combination of a reliable, clean, high energy dense source of power that does not have a destructive and all consuming 'physical footprint' must be a compelling offer.

If the Welsh Government accepted this simple argument and genuinely supported new nuclear the NDF would 'maximise opportunities' for AMRs across Wales. But in breathtaking ignorance of the

facts and adherence to its political dogma it has instead sidelined new nuclear preferring to destroy the countryside with vast swathes of ineffective wind and solar farms in the pretence that this is how to stop 'global warming'. Only Greta Thunberg's financiers and publicists could hope to better deceive.

It's true that some people get nervous about nuclear power, they think of nuclear weapons, or about safety, or worry about toxic waste and costs. But instead of stoking these fears, politicians ought to be better informed and prepared to explain that within the AMR category of new nuclear technologies there's a brilliant new class of new modular reactors called molten salt reactors (MSRs). This technology is 'walk away safe', in the event of any kind of external problem or accident, the reactor just shuts down. The physics and chemistry used in MSRs mean there can be no unstoppable 'meltdown' or explosion of gasses.

MSRs can also massively reduce the stockpile of nuclear waste from the first generation of nuclear power stations. This is because the existing nuclear power plants only get 5% of the energy available from the fuel they use. MSRs can take that left over 'waste product' and use it as fuel to create enormous amounts of energy leaving just a tiny residue of far less toxic waste. This residue will only need safe storage for around 100 years.

So MSRs have a wide range of functionalities besides producing electricity for the National Grid. They can even be used to create storage facilities to provide power for use on the grid at another time. And they can also be used as backup for unreliable and intermittent renewables, although it's questionable as to why you would want to bother with non-dispatchable renewables on the Grid, as this new form of nuclear power can 'load follow' and thus respond to peaks and troughs in demand so as to reliably meet our electricity requirements.

MSRs are a game changer in our search for clean power. This technological advance gives us the opportunity to have safe, clean, cheap and abundant power. We'll only need a few small developments to generate much more electricity than we get from all of the UK's wind farms. Reliable power will be available day and night; summer and winter, and it will cost less than the cheapest power we use today.

A transformative technology with a proven track record

There are various types of MSRs in early stage development. They are mostly advances on the basic prototypes that were in operation, and proven to be safe, in research laboratories in the USA during the 1960s. At that time the US Government decided it did not need to continue with these projects or take this type of reactor forward as a commercial product for the civil nuclear power market.

The TEDx Lecture given by Kirk Sorensen in 2014 describes the provenance of the technologies being developed today:-

<https://www.youtube.com/watch?v=kybenSq0KPo>

As the imperative to decarbonise our energy supply has grown, several countries have re-examined the science, made some modifications and improvements to the original designs, and are now well on the way to having their own First of a Kind (FOAK) MSR reactors in operation.

China is expected to have its first MSR operating in 2020. Canada and the US anticipate they will be operational by the mid 2020's, Estonia and other EU countries as well as the UK anticipate we will have them by 2030.

Once the first reactors are up and running the supply chain will quickly be established to produce hundreds of these factory-built reactors for sale around the world. The huge market for these reactors is the reason why China is moving ahead so quickly with its programme to commercialise the 'product' and bring it to market. It hopes to capture the lion's share of international sales just as it has done for solar PV and more recently for electric car batteries.

China's CATL is the world's leading maker of car batteries. As much as half the cost of an electric car is its battery and this has fast become a sector that is dominated by China and other Far Eastern suppliers.

However the downsides of battery technology, whether used for electrifying transport or for storing wind and solar power are not just to do with the significant costs. They also present significant environmental issues, both in minerals extraction and waste disposal.

The most commonly used battery is the lithium-ion battery, however the required increases in the materials needed for battery manufacture are already leading to environmental and human health concerns. The majority of lithium mined today comes from South America, and is evaporated out of brine using the power of the sun. As demand increases new deposits are being accessed, and more energy intensive techniques, such as crushing, will be used to extract the lithium. Another component of the lithium-ion battery is cobalt, used in the cathode, a mineral with a poor sustainability in relation to its extraction. There may not be enough cobalt in current mines or mines being developed to meet the needs of the electric vehicle revolution. Another concerning aspect is the life of the lithium-ion battery and the ability to effectively recycle these materials; currently less than 5% of lithium-ion batteries are recycled.

We must surely consider the ethical aspects of depending on batteries for our energy future.

However MSRs could be used split water into hydrogen and oxygen, giving us another option for transport fuels.

So by comparison with other technologies that are being used to facilitate the decarbonisation of our energy supply MSRs are an extremely attractive solution to the environmental problems of waste products and our ability to control the cost of energy.

Not long to wait for the cheapest and least polluting power

Two companies that are already in the early stages of the Canadian licensing process, and have FOAK sites identified as part of that process, are Canadian based Terrestrial Energy, and the UK company Moltex Energy. <http://www.globalconstructionreview.com/news/uks-moltex-energy-signs-deal-install-molten-salt-r/>

Moltex Energy was one of the companies that took part in the UK's 2015 SMR competition. It subsequently received funding from the UK Government. It is currently focussing its efforts in Canada, with its Stable Salt Reactor (SSR) MSR design. Design review processes in the UK and

Canada are seen as more supportive for new technology licensing as these regulators use a principles-based analysis rather than prescriptive approach.

Moltex Energy has said that its SSR can supply electricity at £40per MWh. At this price it competes with coal and gas. While the latest round of offshore wind tenders came in at this price too, in the case of wind energy that per MWh cost does not include the costs for additional network infrastructure to cope with their intermittency and unreliability. So the SSR will be much cheaper than wind and solar farms when total system costs are included.

Moltex Energy has used conventional components and materials already qualified in the nuclear sector where possible to benefit from quick deployment timelines. It says licensing of the SSR plant could be completed in five years and that construction time for its FOAK 300 MW plant would be three years.

Moltex link <https://www.moltexenergy.com/ourbreakthrough/>
<https://www.youtube.com/channel/UCLzfCBcnyZLzr9OQ3ZE9vqQ> moltex energy youtube channel

<https://www.moltexenergy.com/news/details.aspx?positionId=122> summary of advantages

In August it was announced that *“the US Department of Energy (DOE) has launched the National Reactor Innovation Centre (NRIC). The facility will provide private sector developers’ access to US national laboratory assets and infrastructure to support the testing and demonstration of reactor concepts and assess their performance, helping accelerate licensing and commercialisation”.*

And Moltex Energy has been awarded US Federal Funding for its SSR 150 MW MSR reactor.

Shale oil and gas rich America has decided it too needs to speed along new nuclear developments.

If the Welsh Government genuinely wanted to support a transformational energy generation technology developed by a UK company, it would be talking to Moltex Energy.

See the companies’ brief overview of its reactors in the panel below:-

.....
<https://www.moltexenergy.com/stablesaltreactors/>

The Stable Salt Reactor Family

Stable Salt Reactors are modular in construction. Their rectangular cores can be extended module by module to create reactors from 150MW to 1200MW power.

Many versions of Stable Salt Reactors are possible. The first being developed now is a "waste burner". SSR-W
Second generation Stable Salt Reactors will be able to breed new nuclear fuel from depleted uranium and thorium.
SSR-U and SSR-Th

<https://www.moltexenergy.com/learnmore/>
.....

Stop building unreliable renewables and focus on new technology

It can be seen that MSRs would be a far superior choice to renewables in many situations and applications and offer a more reliable and realistic way of cheaply and effectively decarbonising our energy consumption.

Overall in 2018, nuclear generation supplied more than 2500 terawatt hours (TWh) of electricity, meeting 10.5% of global demand and, after hydro, was the second largest low carbon energy source. And membership of the World Nuclear Association continued to grow over the course of 2018, with 185 member companies from 40 countries.

The NDF covers the period 2020 – 2040 it should be looking to the future not looking backwards at technologies that rely on the vagaries of the weather.

Molten Salt Reactors bring real hope beyond anything ‘renewables’ can do to reduce our greenhouse gas emissions. They are the quickest and most effective way to achieve our sustainable energy and environmental goals.

They will save our farmland, wildlife habitats and beautiful landscapes and vastly improve the quality of our lives.

There is only one problem, the Welsh Government and Plaid Cymru are so ideologically wedded to renewables that, despite all the evidence, they are set on a course of attempting to derive 100% of Wales’ energy from renewables. In their attempt to prove Wales’ doesn’t need either fossil fuelled power or nuclear power they’re intent on sacrificing our beautiful land and seascapes to wind and solar farms and pointless ruination, in the vain hope that this can stop climate change.

Youngsters won’t be fooled forever

It is often said by advocates of renewables that children and young people support ‘renewables’. Well maybe they do, but obviously young people do not have as much experience as adults, and many are probably not aware of the adverse consequences of pursuing an energy policy that only, or primarily, permits renewables. It’s unfair and manipulative, to be playing on their innocence and idealism by suggesting that our use of fossil fuels and nuclear power can be replaced by renewables without there being dire consequences both for Wales and the many poorer countries around the world.

Few of us are physicists or grasp the full consequences of choosing highly diffuse weather dependent energy sources. But it is unforgivable to deceive people into thinking that wind turbines and solar farms can, in our modern societies, be the solution to climate change.

When young people begin to see the wholesale destruction that this deeply flawed NDF will wrought upon Wales they will not forgive those of us who brought this destruction about, nor those of us who failed to speak out and stop it.

To quote John Stuart Mill's words, amended for gender balance, in a way he would have approved, ***"Bad men and women need nothing more to compass their ends, than that good men and women should look on and do nothing."***

Conclusion

Energy policy underpins everything – our economy, our wellbeing and our environment

Labour's decarbonisation policy is all about 'renewables targets' and thus the inevitable massive renewable energy developments that will be required to meet such targets.

However attached you are to the romantic idea that renewables can power Wales in the future you cannot ignore the basic facts and mathematics. Researchers at Imperial College London have urged caution when basing future energy decisions on over-optimistic models that predict that the entire energy system could be run on renewables by the middle of this century.

You don't have to take my word for it, listen to what they say:-

"The models are only as good as the data and underlying physics they are based on, and some might not always reflect 'real-world' challenges. For example, some models do not consider power transmission, energy storage, or system operability requirements."

"Using data for the UK, the team tested a model for 100% power generation using only wind, water and solar (WWS) power by 2050. They found that the lack of firm and dispatchable 'backup' energy systems – such as nuclear or power plants equipped with carbon capture systems – means the power supply would fail often enough that the system would be deemed inoperable."

"The team found that even if they added a small amount of backup nuclear and biomass energy, creating a 77% WWS system, around 9% of the annual UK demand could remain unmet, leading to considerable power outages and economic damage."

*Lead author Clara Heuberger, from the Centre for Environmental Policy at Imperial, said:
"Mathematical models that neglect operability issues can mislead decision makers and the public, potentially delaying the actual transition to a low carbon economy."*

"Nuclear, sustainable bioenergy, low-carbon hydrogen, and carbon capture and storage are vital elements of a portfolio of technologies that can deliver this low carbon future in an economically viable and reliable manner."

"Finally, these system transitions must be socially viable. If a specific scenario relies on a combination of hypothetical and potentially socially challenging adaptation measures, in addition to disruptive technology breakthroughs, this begins to feel like wishful thinking."

I encourage everyone to read the full research that can be accessed via the link below:-

<https://www.imperial.ac.uk/news/185146/running-renewables-sure-about-future/>

To sum up here are the actual figures which Roger Pielke Jr has kindly compiled and published in Forbes:-

“The IPCC target for 2030 is a 45% reduction in emissions from 2010. To reach that target the world will need to add about 1000 million tonnes of oil equivalent (mtoe) of carbon-free energy every year over the next decade.

Over the past decade, the world added about 64mtoe of carbon-free energy every year. And in 2018 it added a record 114mtoe. So the world would need to accelerate the deployment of carbon-free energy by 9 times or more the rate observed in 2018. And the deployment of new carbon-emitting energy would obviously have to cease immediately.

Over the past decade fossil fuel consumption has increased annually by an average of about 150mtoe. In 2018 the increase in fossil fuels was 275mtoe.

It is accurate to say that the world’s growing supply of carbon-free energy is additive and not replacing fossil fuels.

The magnitude of the net-zero by 2050 challenge is equivalent to the deployment of a new nuclear plant every day for the next 30 years, while retiring an equivalent amount of fossil fuel energy every day.”

He concludes, “the world is going to miss the 2030 target whether we talk about that reality or deny it, so we had better work on rethinking climate policy”. I agree.

But I am in no doubt that the Welsh Government will ignore my objections as they have in the past. Indeed they will no doubt ignore any objections individuals or communities make. The Labour Welsh Government has consistently brushed aside communities’ objections to wind and solar farm developments, and has purposefully written and re-written Welsh planning and environmental law to facilitate the imposition of these developments throughout Wales. The NDF consultation is a tick box exercise that frames the responses that the public are invited to give so that the Welsh Government gets the answer it wants.

Labour is stuck in a CND mind-set that discounts nuclear power and overwhelmingly favours renewables.

If a Labour UK Government comes to power this December it will fund the plans in this draft NDF and Anglesey will be pointlessly destroyed and will become a place where few people want to live and where even fewer people want to visit.

If those people who are better informed and educated don’t speak out then our beautiful country will be lost. Future generations won’t thank us for that.

Postscript

Labour is demanding that we sacrifice our well-being, landscapes, seascapes and the economy in Wales in order to achieve a zero-carbon target by the 2030s and help stop global CO₂ emissions.

An analysis of how effective such a strategy would be, when set alongside the agreed international legal framework, has been undertaken by David Campbell, Professor of Law at Lancaster University Law School. His conclusion is that **the Paris Climate Agreement, far from securing a reduction in global CO₂ emissions, is fundamentally a blank cheque that allows China and India to increase their emissions as they see fit in pursuit of economic growth:-**

“The UK is responsible for circa 2% of global emissions. UK decarbonisation of 80% or even 100% cannot achieve any significant reduction of the global concentration of CO₂e (carbon dioxide equivalent) without complementary action by other more significant emitters, particularly China and India, and continuation with decarbonisation in the absence of such action would be irrational. It would be as if the UK was emptying a bath with a ladle whilst China was filling it with a bucket, with India standing behind with another bucket.”

“Article 4(7) provided that: The extent to which developing country Parties will effectively implement their commitments under the Convention. . . will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties.”

“The major industrialising countries, including China and India, are classed as developing countries and their economic policies are precisely ones of such growth. The permission given to these countries by the UNFCCC to emit as much as they see fit was affirmed at Kyoto and at all of the climate change conferences, including and subsequent to Copenhagen, and now including Paris.”

“These countries have been principally responsible for the enormous growth in emissions since 1990 and their emissions trajectories are, in themselves, not merely enough to make the reductions necessary to achieve the 2°C target, but to prevent any global reductions at all.”

“The UNFCCC is, then, based on an agreement to allow an unbounded growth of emissions and has made mitigation impossible from the beginning of international climate change policy; the Paris Agreement affirms this. It is arguably supererogatory, then, that that agreement actually strengthens the permission granted to China and India not to make reductions. Article 4(4) of the agreement provides that: ‘Developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances’. ‘Absolute’ emissions reductions are actual reductions of emissions. Other ‘mitigation efforts’ are in this provision explicitly distinguished from absolute emissions reductions and the newly industrialising countries, including China and India, are in the category of developing country Parties, which cannot be asked to make absolute reductions. The implicit, though categorical enough, permission to increase emissions under Article 4(7) of the UNFCCC is now strengthened by an explicit provision under Article 4(4) of the Paris Agreement that China and India cannot be required to make reductions.”

http://www.thegwpf.org/content/uploads/2016/09/Campbell.pdf?utm_source=CCNet+Newsletter&utm_campaign=e66d88e5c0-EMAIL_CAMPAIGN_2019_11_05_03_16&utm_medium=email&utm_term=0_fe4b2f45ef-e66d88e5c0-36457565&mc_cid=e66d88e5c0&mc_eid=bff0b8c627