Environment and Sustainability Committee

Inquiry into Energy Policy and Planning in Wales

EPP 8 – Calor Gas

ENERGY POLICY AND PLANNING FOR WALES

EXECUTIVE SUMMARY

1. **The last WAG's low carbon plan majored on wind for the short to medium term, but tripling the current onshore capacity and raising the offshore capacity by a factor of seven in four or five years appears over-optimistic and potentially politically explosive.**
2. **The last WAG's assumption of load factors for the wind farms are similarly unrealistically high. If their targets persist, the result is likely to be a significant under-delivery in wind-powered generation in Wales.**
3. **The incoming administration has responded to political outrage at projected wind developments in Wales, by calling the old targets "unacceptable" and by seeking to restrain the growth in capacity - but still to over double the level already installed. This is unlikely to defuse the growing political storm, and WAG's Planning Guidance TAN 8, the future acceptable level of installed capacity and the split of responsibility over energy between WAG and Westminster all need to be revisited.**
4. **The last WAG dismissed nuclear power but in any case the necessary capex looks unaffordable for current utilities and even with fast planning permission nuclear would not be there in time for the expected shortages and blackouts as from 2015/17.**
5. **Offshore wind power is an extremely expensive option to back: with its generation costs roughly double that of other sources it is not a technology to cherry pick for a nation with over a quarter of its population in fuel poverty.**
6. **If OFGEM's prediction of fuel price rises of up to 60% to pay for the renewables strategy proves correct up to a half the population of Wales could find themselves in fuel poverty. This is socially unacceptable. Counter-measures to fuel poverty adopted in Wales such as HEES will be swamped by the impact.**
7. **DECC has fully outlined the potentially significant deleterious negative effects of wind, but believes the environmental sacrifice to be worth the carbon savings. However, if Danish experience is correct and the blades last only 10 years rather than 25 which DECC foresees the carbon savings are likely to be correspondingly less, and correspondingly more expensive.**
8. **Subsidy to wind has been on a rising trend since 1991: the annual subsidy is projected to reach £5bn in 2020. Subsidising an industry for 30 years leads to a dependent and vulnerable industry rather than a commercially viable industry. The Danes, who now enjoy 19% of their electricity from wind have found that the subsidy creates no net jobs, has depressed their GDP and has distorted their economy from more profitable sectors. Wales should avoid this fate.**

9. **Wind is an intermittent technology with an unfortunate tendency not to deliver during the coldest weather. It has to be backed up 80% by fossil fuel power, and thus embeds a significant need for fossil fuel generation for decades to come.**
10. **The Manomet Centre for Conservation Science expresses growing doubts about the sustainability of biomass. Recovering the carbon debt is a gamble at best. Over the next 20 years they recommend other low carbon plays.**
11. **Westminster maintains that biomass is "zero carbon" even if it emits 60% less greenhouse gases than fossil fuels – a classic but unsustainable fix.**
12. **As with wind, DECC has been open about the environmental damage caused by biomass, especially in terms of transport and emissions to air. Meeting Westminster's biomass targets would mean doubling current mortality levels from air pollution. Wales should eschew this avoidable cardiovascular burden.**
13. **Planning guidance recommends the placing of biomass away from polluted urban areas. We are concerned that a biomass plant has been consented in Port Talbot which already suffers the worst air quality in Wales.**
14. **Common sense dictates a move to a much lower cost, low carbon solution in Wales – and, there will be one available: decentralised micro-generation, fuelled by natural gas in urban areas and LPG in rural areas.**
15. **Since fuel cell mCHP reduces household fuel bills by up to 25% it will be an antidote to rather than cause of fuel poverty.**
16. **Fuel cell mCHP will be able to produce up to 80% of the electricity needs of the home, and will thus act as a protection against power shortages and blackouts expected after 2015.**
17. **With the prospect of biomethane and biopropane coming on stream, fuel cell technology provides the key rather than a bridge to a decarbonised economy without beggaring the population and destroying the economy.**

INTRODUCTION

This submission from Calor Gas Ltd responds to the following elements of the Environment and Sustainability Committee's call for evidence on "Energy Policy and Planning in Wales": "The potential contribution and likelihood that different types of renewable and low carbon energy (offshore wind, tidal, onshore wind, hydro-power, nuclear, bio-energy/waste, micro-generation, community energy projects) will be capable of delivering the Welsh Government's aspirations for energy generation as set out in "A Low Carbon Revolution – Energy Policy Statement and the UK Renewable Energy Roadmap" and "The transport issues relating to wind turbines and other forms of renewable energy including their impact on roads, traffic and tourism".

A Low Carbon Revolution states that, "Our future well-being, both material and social, will be dependent on achieving sufficient supplies of affordable low carbon energy." This is quite correct, but our fear is that current energy policies will not deliver sufficient supplies, and are unaffordable, especially in Wales. As the Wales Energy Summit concluded in Summer 2010: "There is too much green bling".

ARE THE WIND TARGETS DELIVERABLE?

Let us look first at whether the energy plans are on a deliverable trajectory. In the short to medium term the renewables play in Wales revolves about wind. The previous WAG envisaged 2GW of capacity coming from onshore wind by 2015/7 and 6GW of onshore wind capacity by 2015/16 (Appendix 1, Low Carbon Revolution, March 2010). Operational and consented onshore wind capacity is currently 0.7GW and offshore it is 0.9GW. Is it really credible that by 2015/7 we should have operational in Wales three times the onshore current capacity and some seven times the current offshore capacity - and the latter in four to five years' time? Given the surge in opposition in Wales to the blight caused by wind farms, and given the limited installation capacity for offshore wind – even if it gains consent – these targets look impossible.

In addition, the assumptions of actual load factors – the proportion of capacity actually generated – for onshore wind of 30% and for offshore wind of 40% look hopelessly optimistic. Onshore and offshore wind averaged load factors of 27.6% and 31.1% between 2006 and 2009 WA, House of Lords col. 628, 2.2.11). In 2009, the offshore load factor was 26% (WA, House of Lords 16.11.11, col.187) The prospect for wind, is if anything diminishing under a climate change scenario: "A future climate with a large number of lulls in wind is likely to result in increased carbon emission, since wind requires back-up support from fossil based peaking plant (or other flexibility options)…There is a suggestion that these events may become more frequent, particularly in the summer, and may even become more intense" (AEA: "Evaluation of the Climate Risks for Meeting the UK's Carbon Budgets," May 2011).

Note also that the 2010 renewable electricity target was missed in the UK by 28% (WA, Commons, 13.1.11, col.581W).

NO NEED FOR NUCLEAR?

Despite the apparent likely underwhelming contribution from wind on which it has made its major short to medium term play the WAG at the time of composing its paper felt that the potential for renewables was so exciting that it "obviates the need for new nuclear power stations". This is a very confident approach. It is quite true, as the paper notes, that nuclear has a long history of cost over-runs: EDF's new nuclear power station in Flamanville is already two years behind schedule, and facing a cost overrun of 1bn Euros. It is the same model as expected for the UK. Most commentators believe that energy shortages will begin to appear 2015-17, even if renewables fulfil their promise, but nuclear has no hope of filling that gap. It takes at least 11 years to construct a nuclear power station – after it has been accorded planning permission. So, if renewables fail to deliver, nuclear cannot ride to the rescue.

Besides, there is serious concern that utilities do not have the balance sheets to carry nuclear investment. "Utility Week" reported on 27th July 2011 that, "Utilities have no hope of finding the £200 billion plus needed for capital spending on the new infrastructure necessary to achieve the UK's ambitious energy goals" and pointed out that, "The attractiveness of the companies expected to do the heavy lifting on UK investment in renewable and new nuclear was poor". Peter Atherton, Head of European Utility Sector and Climate Change Research at

Citigroup commented: "Even if the utilities could finance the investment, the consumer wouldn't be able to afford their bills".

IS WIND AFFORDABLE FOR WALES?

Westminster's target is that there should be 4,000 offshore wind turbines by 2020 (WA, House of Lords, 19.1.11, col. 3): WAG with its heavy emphasis on offshore appears complicit. A recent report for DECC by Mott MacDonald, "UK Electricity Generation Costs Update" (June 2010) estimated the levelised cost of offshore generation to be £157-186/MWh, roughly twice that for onshore wind (£94/MWh). Offshore wind was by far the most expensive technology that MacDonald compared with gas (£80/MWh), coal with CCS (£104.5/mWh), nuclear (£99/MWh) and onshore wind (£94/MWh). Offshore wind has high and uncertain capital costs, carries high technology risks and high operational and maintenance risks – all admitted by Westminster in a recent consultation paper. Why are we subsidising such poor value for money in such a risky and intermittent technology? Wales will be investing in a technology that will generate electricity very expensively (roughly double market costs) and the cost will be paid by taxpayers and/or consumers of electricity.

The Annual Report on Fuel Poverty Statistics 2011 reads: "In 2009, there were around 5.5 million fuel poor households in the UK, up from 4.5 million in 2008. In England, there were around 4.0 million fuel poor households, up from 3.3 million in 2008. The increase in fuel poverty between 2008 and 2009 was largely due to rising fuel prices. Gas prices rose by 14%, and electricity prices by 5%, between 2008 and 2009". The figures have been rising inexorably since 2003. Since 2009, gas and electricity prices have risen further. The rise in fuel poverty has swamped countermeasures such as the Warm Front Scheme.

Fuel poverty figures for Wales are somewhat dated. In 2008, 332,000 of households in Wales were estimated to be fuel poor and that this figure had risen by 198,000 since 2004. The rise has swamped Welsh counter-measures such as the Home Energy Efficiency Scheme. The rise represents an increase of 15%: in 2008 26% of Welsh households were estimated to be in fuel poverty. BRE models fuel poverty in Wales rising to cover 368,000 households in 2009. The targets set out in "A Fuel Poverty Commitment for Wales" (2003) remain rather heroically in place and are that, as far as reasonably practicable, fuel poverty will be eradicated: amongst vulnerable households by 2010; in social housing by 2012; and by 2018, fuel poverty in Wales would be abolished. These targets are now risible. Even if the rate of WAG's target in its position paper of HEES for 3,000 homes a year were to be met it would take the programme over 120 years to cover the existing population in fuel poverty.

So, nearly a fifth of all households in England, and over a quarter of those in Wales, are in fuel poverty. The figures have been going significantly in the wrong direction for years. It is not credible that the fuel poverty targets can be met in the statutory timeframe in any of the nations of the UK even with counter-measures.

Wales is a poorer country than England, and it is more rural with a housing stock harder to heat. As WAG's position paper admits the average electrical power consumption per person per day in Wales is some 22kWh/d/p compared with 18kWh/d/p in England. Any policy, then, such as the heavy play on offshore wind that will drive electricity prices up, will impinge more severely on Wales than England. As, the Wales Energy Summit found in 2010: "RHI could add between 9% and 20% to people's bills". That is just the start of it.

OFGEM suggests that £200bn of investment in the UK's energy infrastructure is necessary before 2020 (*Project Discovery*, 2009). Note though that this cost was calculated on the basis of flat generational demand of 60GW. Westminster has since accepted that decarbonising the grid will need two or three times that capacity. No-one has yet costed the bill for that as far as we are aware. £200bn remains the quoted figure despite the need for doubling or tripling the original capacity targets.

On 16th December 2009, an OFGEM presentation showed 4 million households in fuel poverty and forecast fuel poverty to rise to cover 6 million. OFGEM has predicted a rise of up to 60% domestic fuel bills (Evidence to Energy and Climate Change Committee 2.12.09). The Renewable Energy Strategy admitted: "Poorer households are likely to spend a higher proportion of their income on energy and so increases in bills will impact more on them".

Tom Lyon, an energy expert at uSwitch, claims that the necessary investment, "Comes with a hefty price tag and mounting concern over who should be footing the bill…The overall cost of the investment programme…equates to £769 per household. If consumers do end up footing the bill we could see the average annual household bill reach over £2,000, a huge 68% rise" (Daily Mail, 4th October 2010). An energy analyst at the M&C Energy Group, David Hunter, said in the same article: "Customers should expect a 60% hike in bills over the next decade or so".

The Scottish Government states that up to 2% of Scottish households will be pushed into fuel poverty every time energy prices rise by 5%. OFGEM's prediction of a 60% domestic fuel price rise would mean if translated to Wales, **50% of all households in Wales could find themselves in fuel poverty.**

In the current economic context, these very high rises in fuel costs are unlikely to be underwritten by social transfers. This must raise questions of the potential impact on fuel poverty and social cohesion, especially for Wales.

IS WIND ENVIRONMENTALLY DESIRABLE?

DECC has assembled the evidence. In the "Appraisal of Sustainability for the revised draft NPS for Renewable Energy Infrastructure: Non-Technical Summary" (DECC, October 2010) we find:

"3.24 The overall effect of onshore wind turbines in relation to traffic is considered negative in the short term. During construction the disruption may be high due to large vehicles on minor roads and there are potential negative environmental effects, including on climate change and air quality, of increased transportation. In the event that a number of wind farms are located close together, the effect on traffic and other road users will be compounded and therefore would be a severe negative effect in the short term.

3.25 The potential consequences of development of offshore wind farms that affect recognised international navigation routes would be a significant negative effect at an international level. However, the safeguard and mitigations set out in EN-3 would enable the development of wind farms with potentially low negative effects. The effects could be regional in the short and medium term. In the long term, it is assumed that new local navigation routes would become accepted.

3.27 EN-3 states that the design of onshore wind farms and their siting relative to residential areas should be such that noise levels are within 'acceptable limits'. However, humans vary in sensitivity to noise, so disturbance cannot be ruled out entirely. EN-3 does not propose mitigation measures for the impacts of noise on ecological receptors, so disturbance effects could be significant for sensitive fauna. Noise effects are likely to be experienced in close proximity to the wind farm, but could be significant at the regional level if energy generation is located in clusters or if species of conservation importance are disturbed. Any effects experienced would be short to medium-term, throughout the lifetime of the development (typically 25 years).

3.30 The visual effects of onshore wind turbines resulting from the implementation of EN-3 are considered to be reversible and in the order of 25 years. The resulting negative effect is therefore considered uncertain in the medium and long term, as the effect may be significant, depending on the location, but would be reversed when the facility is decommissioned. In the short term, the effects are considered neutral.

3.31 The result of developing offshore wind farms in line with measures set out in EN-3 is uncertain. Since EN-3 states that visual effects should not be the primary reason for refusing to grant consent, there may be circumstances where the effect has the potential to be significant on a regional or even international scale. The effects would be for the duration of construction through to decommissioning and would be reversible. Implementation of EN-3 is, therefore, considered to have an uncertain visual and seascape effect, with any effects likely to be in the short and medium term.

3.46 EN-1 notes that the renewable energy targets will primarily be met by onshore and offshore wind. It is therefore likely that a number of wind farms could be proposed in areas with good wind resources. This clustering of facilities has the potential to lead to cumulative effects during construction and operation. Potential cumulative short term effects (during construction) in relation to the development of onshore wind turbines, as facilitated by EN-3, are likely to relate to landscape and visual effects, noise, traffic and transport, ecology, economy and skills, soils and geology and health and well-being. In the medium term, there is the potential for cumulative operational impacts related to landscape and visual effects, noise, ecology and health and well-being. A positive cumulative impact may result if a manufacturing industry develops as a result of numerous onshore wind developments through the implementation of EN-3. This in turn may have positive impacts on skills and the economy and health and well-being. Adverse cumulative impacts may be difficult to mitigate since the facilities need to be located where there is sufficient wind resource.

3.47 Multiple offshore wind facilities, which have the potential to be clustered, could also, potentially, result in cumulative effects. EN-3 identifies that there are potential cumulative effects on the subtidal and intertidal habitats and species if a number of offshore facilities are located along the same stretch of coastline. EN-3 also proposes that effects of multiple cable routes could be mitigated by cooperation between developers of these facilities. Cumulative impacts on flood defences may result in increased risk of flooding along the coast. Further cumulative impacts are likely to relate to visual and seascape effects, skills and economy (through fishing impacts), shipping and navigation, and health and well-being effects resulting from visual impacts and impacts on employment (potentially positive or negative)."

In summary, the construction of wind farms has a negative environmental effect; this impact could be severely negative when wind farms are close together. Offshore wind farms could have a severely negative impact on international navigation routes. Noise disturbance cannot be ruled out for humans, and it could be significant for sensitive fauna. The disturbance would last for 25 years. The visual effects could be significant and would last 25 years, but are considered "reversible" because after the plant life the ground could be restored (NOTE: who pays these back end costs?). Visual effects for offshore are uncertain but could be significant even reaching international dimensions. Once again the effects last for 25 years. Where wind farms are clustered the impact will be cumulative. Clustered wind farms offshore may result in increased flooding of the coast. Odd, is it not, that once these negatives are openly identified by Government they can be thereafter effectively ignored? As Prostetnic Vogon Jeltz says in "Hitchhikers' Guide to the Galaxy": "All the planning charts and demolition orders have been on display at your local planning department in Alpha Centauri for 50 of your Earth years, so you've had plenty of time to lodge any formal complaint and it's far too late to start making a fuss about it now".

An interesting study of Denmark where there has been significant investment in wind-power finds that, "Many ten to fifteen year-old turbines are past their useful life. By contrast, most conventional rotating power plant can enjoy a working life of 40 to 60 years, as evidenced by most power plants in Europe today. This puts into question the strategic, economic and environmental benefits of a power plant that may have to be scrapped, replaced and resubsidized every ten to fifteen years" ("Wind Energy – the Case of Denmark", by CEPOS, September, 2009). On the plus side, then, the negative environmental effects noted by Government may last 10 years less than DECC envisages, but conversely a subsidised plant which lasts half as long as expected will produce a lot less electricity, a lot more expensively over its lifespan.

The debate on wind power in Wales is made more complex by the fact that energy policy is not devolved to the Assembly but WAG has inherited TAN 8 Planning Guidance issued by a previous WAG in 2005. The First Minister of the recently elected WAG has responded to growing outrage at the intended despoliation of parts of Mid Wales in particular by the turbines, a planned 19 acre substation and the grid connection of 26 miles of 154ft high pylons marching across the Welsh countryside for 26 miles into England by issuing a Statement on 17th June 2011. TAN 8 sought to restrict the environmental impact of wind by funnelling wind development into specifically chosen areas (Strategic Search Areas - SSAs) but, of course, that means the selected areas bear most of the strain, and the necessary grid connections blight areas outside the SSAs. The First Minister views the current level of developer interest as "unacceptable" but still foresees a need for up to 1120MW of installed capacity (more than twice the current installed capacity of 538MW – Source: BWEA) but wishes the 1120MW limit to be regarded as a new cap. He feels that if that cap were accepted it, "Would negate the need for the large obtrusive pylons which are causing such concern. My Government would not support the construction of large pylons in Mid Wales". The scene, it seems, is set for at least double the current capacity being installed, and for conflict between WAG and Westminster as WAG seeks to distance itself from its original own emphasis on wind (at a target of 2GW by 2015/16) , and WAG bewailing its lack of power to halt the blight. If powers over energy were devolved to Wales, then the WAG would either have to face down public outrage as double the current installed wind capacity is inflicted on Welsh SSAs, or it would need to resile from its not only from its original wind power targets, but even its newly reduced cap of 1.1GW. It would seem that TAN 8, the projected levels of wind that would be acceptable, and the boundaries of responsibility on energy between WAG and Westminster all need to be revisited.

SUBSIDY TO WIND AND ITS EFFECTS

The first wind farm, operational from 1991 received subsidy under the non fossil fuel obligation. The concept originally was that subsidy would be degressive as wind approached commercial viability. The opposite has been the case and subsidy has been on a rapidly rising trajectory. In 199/2000 total subsidy to wind was £7.3m (WA, Commons, 28.2.11, col. 244W). In 2020, DECC estimates the subsidy will have risen to an eye-watering £5bn in that year alone (WA, Lords, 19.1.11, col. 33). Of course, such subsidy will bring "opportunities for new jobs and skills across Wales", as WAG's position paper hopes, but as the unsubsidised jobs in the fossil fuel industries wither as the economy is decarbonised, what is the substance of these new jobs? If after thirty years of rising subsidy the industry remains commercially unviable we suggest it is never likely to be commercially viable. Soviet Russia was able to provide large number of subsidised jobs in its economy, and the old leviathan industries of coal and steel were propped up for many years in the 60s and 70s in Britain - until the subsidy became insupportable.

The Danes have been subsidising wind power since 1988, and in 2007 generated 19% of their demand by wind turbines. They are further along the curve than we are. The conclusion of CEPOS ("Wind Energy – the Case of Denmark", September, 2009) on the value of the subsidy is damning:

"The Danish Wind industry counts 28,400 employees. This does not, however, constitute the net employment effect of the wind mill subsidy. In the long run, creating additional employment in one sector through subsidies will detract labor from other sectors, resulting in no increase in net employment but only in a shift from the non-subsidized sectors to the subsidized sector.
Allowing for the theoretical possibility of wind employment alleviating possible regional pockets of high unemployment, a very optimistic ballpark estimate of net real job creation is 10% of total employment in the sector. In this case the subsidy per job created is 600,000- 900,000 DKK per year ($90,000-140,000). This subsidy constitutes around 175-250% of the average pay per worker in the Danish manufacturing industry.
In terms of value added per employee, the energy technology sector over the period 1999-2006 underperformed by as much as 13% compared with the industrial average.

This implies that the effect of the government subsidy has been to shift employment from more productive employment in other sectors to less productive employment in the wind industry.
As a consequence, Danish GDP is approximately 1.8 billion DKK ($270 million) lower than it would have been if the wind sector work force was employed elsewhere."

Apply the same logic to Wales, and the effect of the subsidy will be not the net creation of jobs, but a reduction in Welsh GDP and a distortion of the economy away from more profitable sectors. Plus, Welsh consumers and Welsh taxpayers will be making their contributions to this ever growing subsidy.

IS WIND RELIABLE?

The UK Renewables Strategy 2008 was frank about wind:

"3.9.4 Analysis of wind patterns suggests that, at high penetration levels in the UK, wind generation offers a capacity credit of about 10-20%. This is an indicator as to how much of the capacity can be statistically relied on to be available to meet peak demand and compares to about 86% for conventional generation. This means that controllable capacity (for example fossil fuel and other thermal or hydro power) still has to be available for back-up at times of high demand and low wind output, if security of supply is to be maintained. New conventional capacity will, therefore, still be needed to replace the conventional and nuclear plant which is expected to close over the next decade or so, even if large amounts of renewable capacity are deployed…
3.9.6 In the British market electricity generating capacity does not earn money simply for being available; it earns money only when it actually generates. This is consistent with striking the optimal balance between costs and benefits of spare capacity on the system. It also means that wholesale electricity prices are likely to rise to very high levels at times when high demand and low wind speeds coincide. This is necessary in order to cover the costs of plant which does not get to generate very often, and so ensure that generators are incentivised to provide back-up capacity.
3.9.7 It is nevertheless possible that uncertainty over returns on investment, because of the difficulty of knowing how often plant will get the opportunity to run, will discourage or delay investment in new conventional capacity – or speed up the closure of existing capacity – and hence increase the risk of occasional capacity shortfalls."

The Revised Draft NPS on Energy accepts this argument: "However, some renewable sources (such as wind, solar and tidal) are intermittent and not all renewable sources can easily be adjusted to meet demand. An increase in renewables will therefore require additional back-up capacity and mean that we will need more total electricity capacity than we have now" (Para.3.3.11).

Put more plainly, every 10 new units worth of wind power installation has to be backed up by what are likely to be 8 new units worth of fossil fuel generation, because fossil fuel can and will have to power up suddenly to meet the deficiencies of wind. **Wind does not provide an escape route from fossil fuel but embeds the need for it**. Nuclear runs at base load and cannot power up to cover the absence of wind.

The true picture is even bleaker than that. If fossil fuel plant has to be constructed and stand by waiting for wind to default then its power will have to be more expensive in order for the plant to "wash its face". So, the effect of having a large investment in wind is to drive up the price of power generally. Charles Hendry has admitted that no-one has worked out the costs: "The Department has not provided estimates of the cost of constructing fossil fuel power stations to compensate for intermittency in the period out to 2030" (WA 9th February 2011, col. 356W).

Fells Associates Report (17th September 2008) points out that, "The National Audit Office identified wind power as one of the most expensive ways of reducing carbon emission, with recent reports claiming that abating one tonne of carbon costs between £280 and £510. This compares with £10 to £20 per tonne in the European Emission trading scheme (National Audit Office, "Department Of Trade and Industry: Renewable Energy", report by the Comptroller and Auditor General,Hc 210; Session 2004-2005, 11 February 2005)".

The Daily Telegraph reported on 11th January 2010 that out of a UK capacity of 5% wind was delivering 0.2% during the January cold spell. The wind was not blowing when most needed. Andrew Horstead, a risk analyst for energy consultant Utilyx, commented: "This week's surge in demand for energy in response to the cold weather raises serious concerns about the UK's increased reliance on wind power…Failure to address these concerns could mean further rationing of energy in future years and could even lead to black-outs, so it is vital that the UK Government takes action now to avoid the lights going off," (ibid.) The poor performance of wind in January 2010 was echoed in the cold snap of December 2010: The Times of 3rd January 2011 reported that since the beginning of December turbines had been operating at only 20% of their capacity – on 2nd January wind was contributing but 0.5% of the country's power. At the coldest times of year then, wind power has an unfortunate tendency to make itself unavailable.

The Renewable Energy Foundation has put the following research data on its website: "It is now well known that low wind conditions can prevail at times of peak load over very large areas. For example, at 17.30 on the 7th of December 2010, when the 4th highest United Kingdom load of 60,050 MW was recorded, the UK wind fleet of approximately 5,200 MW was producing about 300 MW (i.e. it had a Load Factor of 5.8%). One of the largest wind farms in the United Kingdom, the 322MW Whitelee Wind Farm was producing approximately 5 MW (i.e. Load Factor 1.6%).

Load factor in other European countries at exactly this time was also low. The Irish wind fleet was recording a load factor of approximately 18% (261 MW/1,425 MW), Germany 3% (830MW/25,777 MW), and Denmark 4% (142 MW / 3,500 MW).

Such figures confirm theoretical arguments that regardless of the size of the wind fleet the United Kingdom will never be able to reduce its conventional generation fleet below peak load plus a margin of approximately 10%.

They also suggest that while widespread interconnection via the widely discussed European Supergrid, may assist in managing variability, its contribution will not on its own be sufficient to solve the problems, since wind output is approximately synchronised across very large geographical areas.

Conventional generators acting in the support role and guaranteeing that load is met will be faced with operating in a market that is physically and economically volatile.

The now emerging fact that wind power can be highly variable year on year adds further layers of complication to this problem. Conventional generators will not only have uncertain income over shorter timescales, but will face significant year on year variations.

The all but inevitable result of such uncertainties is higher prices to consumer."

So, the current WAG has inherited an energy policy which eschews a contribution from nuclear and majors on wind for the short to medium term. The wind targets, especially offshore look increasingly unrealistic. Wind-power from offshore is probably double the cost of cheaper, alternative means and will make an energy policy already beggaring large sections of the Welsh population completely socially unacceptable. Westminster's renewables strategy may raise electricity prices by a further 60% and this could result in 50% of Welsh households being gripped by fuel poverty. The Government recognises significant negative environmental negatives from wind, but is determined to carry on raising the subsidy to wind to a figure of £5bn in 2020 alone. Danish experience shows that the subsidy will depress Welsh GDP, create no net jobs, and distort the economy away from more profitable sectors. All this is in pursuit of a power technology which ironically tends not to function in the coldest weather, and which requires 80% back up of fossil fuel technology, thus embedding fossil fuel generation for the foreseeable future.

BIOENERGY SUSTAINABLE?

WAG's aim is to double biomass capacity by 2020 to 1GW and up to 6kWh/p/d of electricity from this source by then. As WAG's paper admits, "What constitutes sustainable development is [a] matter of considerable debate". This is so for biomass.

In June 2010, the Manomet Centre for Conservation Science issued a 182 page report commissioned by the Commonwealth of Massachusetts entitled, "Biomass Sustainability and Carbon Policy". It reported, "Growing concerns about greenhouse gas impacts of forest biomass policies" and quotes the IEA report "Bioenergy (2009): "Conversion of land with large carbon stocks in soils and vegetation can completely negate the climate benefit of the sink/bioenergy establishment".

The Manomet study pays particular attention to the varying rates by which regrowing forests repay the carbon debt incurred by their removal and combustion: one important point is that burning biomass emits more greenhouse gases than fossil fuels: "Forest biomass generally emits more greenhouse gases than fossil fuels per unit of energy produced. We define these excess emissions as the biomass *carbon debt*. Over time, however, re-growth of the harvested forest removes this carbon from the atmosphere, reducing the carbon debt." In relation to electricity generation the ratios of the emission of carbon dioxide per BTU of heat generated are 863 for biomass: 642 for coal: 355 for natural gas. In relation to thermal heat generation, the ratios are 360 for biomass: 217 for heating oil: 138 for natural gas. Depending on what form of electricity generation it displaces biomass repays its carbon debt over a number of years: if it is displacing electricity generated by natural gas this repayment period may be up to 90 years. The report concludes: "So, over a long period of time, biomass harvests have an opportunity to recover a large portion of the carbon volume removed during the harvest. However, this assumes no future harvests in the stand as well as an absence of any significant disturbance event. **Both are unlikely**." Recovering the carbon debt is thus a gamble.

Since the drive to biomass significantly increases the level of GHGs in the atmosphere potentially for decades, any environmental benefit from biomass is significantly in the future, and the report basically implies that if no or low carbon technologies other than biomass can reliably come available within one or two decades they may represent a better play: "If policymakers believe it will take a substantial amount of time to develop and broadly apply low or no carbon sources of energy, they may be more inclined to promote the development of biomass. Conversely, if they think that no or low carbon alternatives will be available relatively soon, say in a matter of one or two decades, they may be less inclined to promote development of biomass, especially for applications where carbon debts are relatively higher and where longer payoff times reduce future carbon dividends."

The UK regards biomass as "zero carbon" yet defines it as sustainable if it makes GHG savings of 60% over fossil fuels: "These sustainability criteria include a minimum greenhouse gas emissions saving of 60% compared to fossil fuel" (Written Answer, 20th January 2011). It does not need an advanced arithmetical or logical mind to recognise that a 60% reduction in emissions from fossil fuel levels is not and cannot be regarded as "zero-carbon". This is a logical somersault too far, conveniently - for the sake of cherry picking this technology - equating 40% to 0%!

ENVIRONMENTAL DAMAGE FROM BIOMASS

The UK Revised National Policy Statements on Energy reveal the damage to the environment likely from "considerable" transport movements: "Depending on the location of the facilities, air emissions and dust, which could impact sensitive flora, may also be increased through the high number of heavy goods vehicles transporting fuel and combustion residues" (p25). "There are potential negative environmental effects, including on climate change and air quality, of increased transportation throughout the lifetime of the facility…The overall effect of implementation on traffic and transport of biomass/waste combustion through the implementation of EN-3 is considered to be negative in the short, medium and long term. These effects are primarily from the movement of fuel and residue during the operational phase of the facility, although some significant, short term, local negative effects may result from the movement of component parts to the facility during construction" (p.39/40). The Revised Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) admits some of this environmental damage: "Biomass or EfW plants are likely to generate considerable transport movements. For example, a biomass or EfW plant that uses 500,000 tonnes of fuel per annum might require a minimum of 200 heavy goods vehicles (HGVs) movements per day to import the fuel. There will also be residues which will need to be regularly transported off site" (para.2.5.22).

The pollution caused by biomass does not end there: "Biomass combustion plant will also produce both combustion and flue gas treatment residues…Waste combustion fly ash is classified as a hazardous waste material and needs to be managed as such (EN-3, paras. 2.5.67 and 2.5.68). The Appraisal also identifies significant negatives arising from biomass in terms of water quality, noise, visual intrusion, soil contamination and flood risk.

We know from an AEA study ("Technical Guidance: Screening Assessment for Biomass Boilers" July 2008) that a typical domestic wood burning boiler of <50kWth would emit over 15kg of large particulates (PM_{10}) and over 15kg of small particulates ($PM_{2.5}$) per year per household. The paper states: "For modern appliances with well-designed combustion the particles emitted are all thought to be less than 2.5μ". This is no comfort. As "The Air Quality Strategy" (2007) states: "Recent reviews by WHO and Committee on the Medical Effects of Air Pollutants (COMEAP) have suggested exposure to a finer fraction of particles ($PM_{2.5}$, which typically make up around two thirds of PM_{10} emissions and concentrations) give a stronger association with the observed ill-health effects". These observed ill-effects include congestive heart failure, heart disease, cerebrovascular problems and asthmatic attacks.

On 26th March 2009, in a Written Answer (col. 695/6W) to Graham Stringer MP the last UK Government quantified the social (=health costs in terms of increased mortality) costs caused by emissions from biomass plants under various scenarios. For an uptake of 52TWh of biomass the social costs were estimated as £2,803,000,000 and for 38TWh (the Government target) the comparable costs were £557,000,000 – these figures were calculated on the basis of existing technology. Since the pollution is being directed to rural areas these health burdens will be largely borne by rural dwellers.

Andrew Tyrie MP asked a follow up question answered on 10th November (col.219W):

*"**Mr. Tyrie:** To ask the Secretary of State for Energy and Climate Change what recent assessment he has made of the effects of the use of biomass boilers installed to meet Renewable Energy Strategy targets on (a) air quality, (b) levels of particulate emissions and (c) levels of (i) morbidity and (ii) mortality.*

***Jim Fitzpatrick:** (a) The Government have, in support of the development of the Renewable Energy Strategy (RES), carried out modelling of the effect of an increase in the use of biomass for heat and power on the emissions, ambient air concentrations and public health impacts of fine particles (PM2.5), coarser particles (PM10) and nitrogen dioxide. The key air quality results of this analysis are given in the Renewable Energy Strategy on page 121.*
(b) As part of the analysis the increases in the emissions of particulates were estimated over a number of different scenarios. For PM2.5 these were between 0.75 and 9.1 ktonnes from a baseline in 2007 of 82 ktonnes. For PM10, emissions were estimated as being between 1.3 and 9.5 ktonnes from a 2007 baseline of 135 ktonnes.
(c) (i) The impacts on morbidity resulting from the uptake of biomass as a renewable energy source were not assessed.

(ii) The mortality health impacts of these scenarios were estimated to be between 340,000 and 1,750,000 measured as the number of life years lost in 2020 from the impact on air quality of increased biomass combustion."

Presumably, then, the social costs of the increase in particulate emission would be higher than £557m because this costing does not include morbidity. This could be significant. The emission of particulates is estimated to advance 8,100 deaths a year (=mortality) in Great Britain and to cause an additional 10,500 respiratory admissions to hospital (=morbidity)("Quantification of the Effects of Air Pollution on Health in the United Kingdom", DoH, 1998).

Since then, a COMEAP report, "The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom" (December 21st 2010) has been published. They estimate that the 2008 burden level of particulates cost an "associated loss of total population life of 340,000 life-years…a greater burden than the mortality impacts of environmental tobacco smoke or road traffic accidents". This figure is remarkable. It is exactly the level of extra burden to be inflicted on the UK atmosphere by 2020 under Government policy on biomass, and so, in simple terms, defined public policy can be expected to double existing mortality rates.

Biomass for domestic households is not an economically viable technology. That is why the UK Government plans to subsidise biomass to the tune of 9p per kWh for 15 years at taxpayers' expense under the Renewable Heat Incentive: no-one has yet revealed the total likely cumulative on-costs to the taxpayer as a result of this subsidy. This is in the context of biomass being unlikely to repay its carbon debt created by its combustion, of it significantly reducing lifespans while significantly increasing morbidity, of it causing widespread environmental damage according to HMG's own assessments and inevitably of it contributing to as yet an unassessed degree to global warming through the emission of black carbon. Economic, health, and environmental policies are being subjugated to the needs of this dubious technology.

The original consultation paper on the UK Renewables Strategy favoured the siting of biomass in rural areas, and Wales as a rural area might have expected to shoulder a disproportionate burden of the resulting air pollution:

"4.6.14 The potential cumulative effect on air quality of fine particles and nitrogen dioxide emissions from a future large-scale deployment of biomass appliances or plant is not yet well understood...In rural areas the impact on air quality, and public health, is likely to be lower, due to both lower population densities and 'background' levels of pollution.
4.6.15 The results from preliminary analysis undertaken by AEA Energy and Environment on behalf of DEFRA indicates that if high levels of solid combustible biomass were used in dense urban areas, where heat demand is highest, the impact on air quality would be likely to be very significant.

In addition, a "Consultation on Draft Local Air Quality Management Guidance" stated, "In the light of current Government policy, it is particularly important that climate change and air quality policies are joined up…It is essential that technology which is used to reduce greenhouse gas emissions is used in the right place, and not in an area where such technology will impact on the ability of the local authority to work towards air quality objectives".

We were amazed, therefore, when one of the first biomass plants was consented in Port Talbot which suffers the worst air pollution in Wales as things currently stand. South Wales remembers generations of miners and workers in heavy industry suffering cardiovascular disease. Knowingly to double the burden of mortality from particulate pollution in pursuit of a "cleaner" technology should be rejected in a civilised democracy.

ARE THERE ALERNATIVES FOR WALES?

We believe there are common-sense alternatives. We can meet carbon targets and avoid penury by relying more on gas generation, and making gas work harder in the home by deploying microgeneration. Low cost, low carbon solutions are available.

- **CALL FOR COMMON SENSE**

In view of the dire consequences of current energy policy trajectory, it is worth stating some simple objectives for energy policy: ideally, energy policy should not impose massive burdens on the Welsh economy or on social cohesion. Solutions which reduce the increase in consumer bills, and which lessen the strain rather than add to the strain on the power generation industry should be favoured. Value-for-money solutions – which tend to be market-driven or close to market – should be adopted over cripplingly expensive solutions, and every pathway to our necessary generative capacity should be subject to full cost benefit analysis. The precautionary principle might be cautious of massive taxpayer subsidy on unproven technology. The risks are too great of throwing taxpayers' money away.

- **GAS CAN RIDE TO THE RESCUE**

An alternative pathway has been advanced recently by the Energy Networks Association in their report "Gas Future Scenario Project" (9th November 2010): "There are credible and robust scenarios in which gas could play a major ongoing role in the GB energy mix while meeting both the 2050 carbon targets and the 2020 renewable energy targets" it says. "Pathways with ongoing gas use could offer a cost-effective solution for a low-carbon transition relative to scenarios with higher levels of electrification." The report shows potential savings of almost £700bn over the 2010 to 2050 period – about £20,000 per household or £10,000 per person "with consequential benefits for consumers, the economy, and the competitiveness of GB industry". The report points out that the low-carbon technologies all, "Involve significant investment in new technology, with its associated risks" (reflecting our precautionary principle) and concludes that, "There appears to be significant value in retaining the option for a 'high gas' future".

For urban areas, it points to the value of enjoying the sunk costs in the gas mains: "The costs of maintaining the existing gas transmission and distribution networks are relatively small in comparison to the other system costs associated with a low-carbon transition. Together these findings suggest a compelling economic rationale for maintaining the operation of the GB gas transmission and distribution networks for the foreseeable future".

- **MAKING GAS WORK HARDER**

Projects are underway to decarbonise gas (deploying biomethane or biopropane) but meanwhile we can make the fossil fuel work harder by deploying micro-generation. Micro-CHP (mCHP) involves the use of gas to generate both heat and electricity and is available now. It is a low cost, low carbon solution delivering secure low carbon electricity. One possible component of the domestic heating scenarios contemplated in DECC's "Pathways Analysis" is mCHP – reaching up to 90% of the technology mix in one illustrated case, and with a maximum penetration of 36 million households by 2050. This scenario complies with our common-sense principles outlined above.

Highly efficient mCHP units can generate up to 80% of the electricity required by a typical home – as well as heating and hot water. Fuel cell mCHP units can reduce total household energy bills by 25% (a figure confirmed by Oxera) and provide cost-effective carbon emission reductions. Owners of compliant mCHP units can sell electricity back to the grid. So, mCHP will lower, not raise household energy bills. Indeed, because the potential energy cost savings are so significant, a mass move to mCHP could be an antidote to fuel poverty.

OFGEM predicts "real risks to supply" from 2015. These risks will be aggravated by the likely underperformance of wind. Nuclear cannot fill the gap by then. mCHP is a technology working today – 80,000 mCHP units have been installed in Japan units and mCHP units are already available on the UK market. The next generation mCHP fuel cell boilers will be ready for market in urban areas in 2013 and in rural areas by 2014, well before the 2015 "crunch".

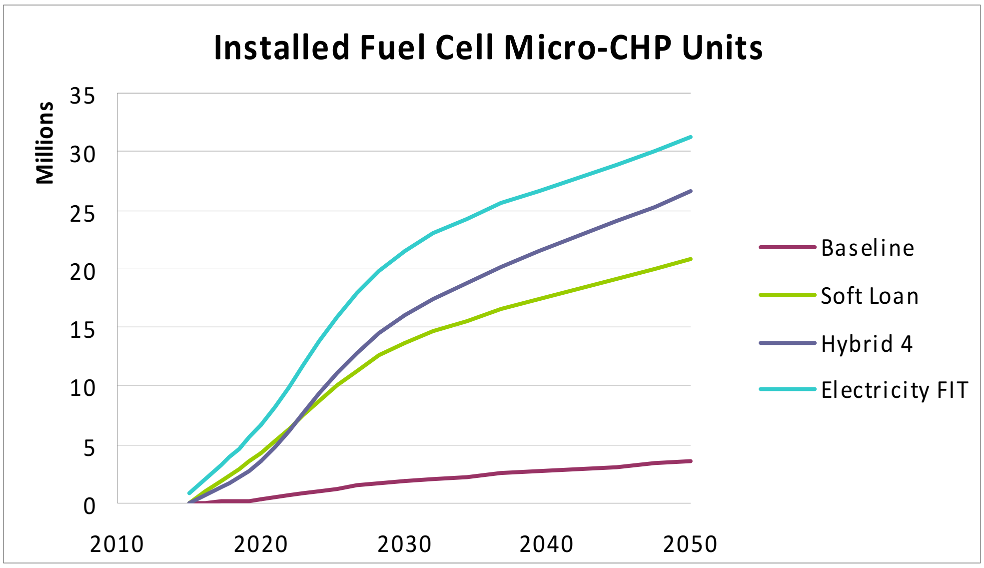
mCHP units are compatible with existing grid infrastructure. What is more, mCHP benefits security of supply because the electricity is generated at or near the point of use, and when it is needed. This obviates losses in transmission, reduces the demand for electricity from the grid and the need for investment in central generation and the transmission and distribution network, thus lessening the otherwise crippling cost of the energy strategy, highlighted by OFGEM. mCHP thus enhances protection against the risk of power cuts occurring after 2015, since the majority of the electricity needed by a typical home will be generated on site, and mCHP can support grid generation at times of peak demand.

mCHP can be deployed with built-in electronic brains capable of acting as a hub for a network of appliances with demand management controls. Deploying mCHP is a smart way of introducing millions of demand management products into homes.

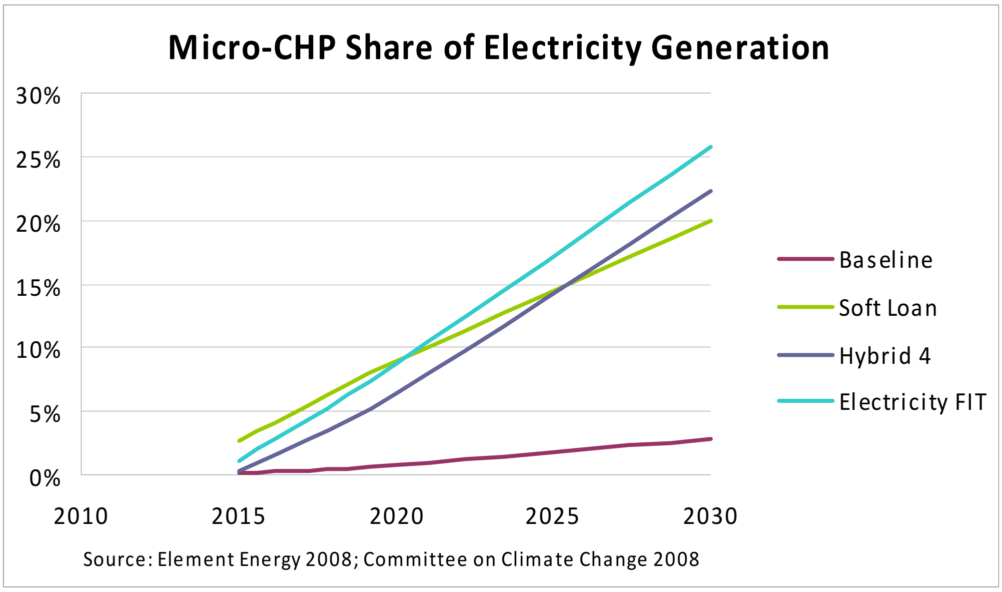
Significant reliance on fossil fuel capacity is dictated for decades to come to compensate for the intermittency of wind, and the slow modulation of nuclear (if indeed it can be financed and built in time to meet demand). It is this peaking and balancing fossil plant that mCHP displaces so delivering carbon savings. As long as there is fossil plant in the grid mCHP delivers carbon savings.

Fuel cell boilers deliver significant carbon savings, too. These boilers operate at up to 90% efficiency and will cut carbon emissions on an average property using oil by up to 50%. Combined with solar technology and insulation measures a fuel cell boiler should go a long way towards achieving the 80% emission targets that the UK Government is seeking by 2050. An independent study by Oxera (2009) of mCHP fuel cell boilers estimates that each one could deliver 1-1.5 tonnes of carbon saving annually at least to 2020.

An independent Element Energy study (2009) concluded that gas powered mCHP had "mass market potential". Projections of take up and electricity generation potential by BERR (The Growth Potential for microgeneration in England Wales and Scotland – 2008) are very impressive, especially as mCHP benefits from Feed in Tariffs. By 2050, BERR envisages mCHP could deliver over a quarter of UK electricity generation.



Installed Fuel Cell Micro-CHP Units				
Scenario	**2015**	**2020**	**2030**	**2050**
Baseline	6,400	395,000	1,910,000	3,580,000
Soft Loan	6,400	4,190,000	13,700,000	20,900,000
Hybrid 4	73,500	3,520,000	16,000,000	26,600,000
Electricity FIT	803,000	6,690,000	21,500,000	31,200,000



Micro-CHP Share of Electricity Generation			
Scenario	**2015**	**2020**	**2030**
Baseline	0.10%	0.79%	2.76%
Soft Loan	2.60%	8.92%	19.89%
Hybrid 4	0.32%	6.49%	22.37%
Electricity FIT	1.05%	8.77%	25.74%

mCHP units can be installed and serviced by engineers with existing skills. They do not require expensive adaptation to the home, are about the same size and dimension of existing boilers, and utilise standard boiler connections.

- **SOLVING THE RURAL PROBLEM**

Rural areas in Wales that cannot enjoy mains gas need a bespoke solution. Fuel poverty tends to concentrate in rural areas – incomes are higher in urban areas, the quality of the housing stock is harder to heat in rural areas, and rural areas tend to be more exposed and enjoy less referred heat than urban areas.

The housing stock in rural areas tends to be older, stone-built and often with solid walls and floors. This limits the range of low carbon technologies that can be employed. For instance, district heating would be a severe challenge in rural areas, and is not a cost-effective retrofit option. Building new properties in rural areas is relatively limited. So, reducing carbon emissions cost-effectively in rural housing will be predominantly about cutting carbon emissions from the standing housing stock. Much of the electricity in rural areas is single phase, limiting the power available for electric powered heating systems to approximately 3.5kW. In turn, this limits the applicability of ground source or air source heat pumps which suffer restricted output on single phase electricity.

Calor, investing with its UK partner Ceres Power, can provide the comparable solution in rural areas away from the gas main using fuel cell mCHP boilers running on LPG. LPG is the lowest emitter of carbon available in off-grid areas, including electricity generated from non-renewables. So, in both urban and rural areas, mCHP technology allows us to move much closer to the carbon output targets as it is a low-cost, close to market solution.

Since mCHP reduces domestic fuel bills, is a demonstrated technology, reduces demand on the grid, requires minimal subsidy, and benefits from the sunk costs in the gas transmission network. Westminster and WAG should model the cost of a 36 million household mCHP pathway and compare its costs with the alternatives. A solution to climate change targets and our electricity needs that places downward, rather than upward pressure on fuel poverty would be very attractive.