Visit to Goonhilly Wind Farm, Cury Crosslanes, Helston. TR12 7BA repower, 21st September, 2010 by George Jeans, Mere Division


Above Old and New wind electricity generators together. We were informed that usually the tower height is between 45 and 80 metres high, the rotor diameter would be 50 to 90 metres and the overall maximum height, being 125 metres.

# INTRODUCTION

Councillor Development is encouraged by Wiltshire Councillor. I have been in the electrical contracting and retailing industry all my life and being a Councillor, I am aware of the Government's commitment to raise the proportion of energy derived from renewable sources from 2.4 per cent early this year to 15 per cent by 2020. I saw an email requesting Councillors to attend a free seminar which I accepted the offer. I have used my own material mixed with that from the web. I have tried to present fact or information given to me only and not "I think or believe"

# THE SEMINAR

As can be seen from the photograph below, upon entering the site, it is quickly noticed the road is widened and strengthened beyond that needed for the original turbines. The seminar started light heartedly, we were in a darkened marquee and the lights and power were cut close to the beginning of the seminar, someone shouted out "the wind must have dropped!".


None of the turbines were working; I decided to hear the noise made by these new turbines. At the end of the seminar I travelled to Higher Treliever Farm House near Falmouth, to observe the new type of turbines working.

I have good hearing and from the Farmhouse I could not hear the turbines rotating on this occasion, this is not suggesting the turbines do not make any noise.

# Goonhilly wind turbines are replaced

All electricity will go into the local wires which serve the Lizard, Helston and the surrounding areas (Note the man looking out of the access port)

**Installation of the sixth and final new turbine to replace the 14 old models at Goonhilly Wind Farm has been completed.**

The new turbines are rated five times as powerful as the previous ones.

The first electricity from the new turbines will begin to power local homes this autumn.

## Goonhilly replaces wind turbines

Worth over £12m, the Goonhilly Greenpower Project will enable the whole of the Lizard to meet 100% of its domestic electricity supply from local wind power, making it the largest wind farm in Cornwall and the South West.

The repower with six new Vestas V80 2MW turbines is expected to triple the electricity generated at the former First World War airship station, with output forecast to average 29.2 gigawatt hours per year compared to an annual domestic electricity consumption of less than 27 gigawatt hours by the whole of the Lizard.

The last of the six replacement turbines are now in place

In full production, Goonhilly is forecast to power around 5,500* homes with green electricity from wind and estimated savings of over 12,000 tonnes of carbon dioxide (CO2) a year. That's the equivalent of 70,000 lorry loads of CO2, the main greenhouse gas, saved every year.

Cornwall Light & Power has spent around £1m upgrading the cables serving Mullion and the Lizard, improving the quality of power supply for the benefit of electricity consumers locally.

The Goonhilly Greenpower Project has attracted strong local interest and support and a

visit programme for local groups including schools, Scouts and community groups began this month to enable visitors to see the new turbines first hand and to learn more about wind energy.

**The number of households the repower could supply, calculated from the latest ( 2008) Digest of UK Energy Statistics (DUKES), is 5433.*

*The latest (2001) Census shows the Lizard Peninsula to have 3845 households.*

The site was originally an old antisubmarine airship base from the 1st World War. During construction of the site some old bombs had to be blown up.

The seminar started at 10-30 am, although I walked part of the site the day before. Local Councillor Pam Lyne was part of the top table in the afternoon session. I was sat with Steven Thorne who had been Head of Development Services at Salisbury and now is Head of Planning & Regeneration Services with Poole Borough.

Overview of planning policy was given by Brett Spiller, Chairman RTPI. An introduction to Planning for Small Wind Systems was given by Indre Vaizgelaite, Head of Small Systems, RenewableUK, and this included customer incentives. An overview of Regional activities was given by Cheryl Hiles, Director of Sustainable Energy Delivery, Regen SW.

Some points of information were as follows: -

1 The turbines are 107 metres to the top tip compared to the old that were 50 metres to the top tip.
2 The wind farm is capable of producing 100% of the electricity for The Lizard peninsula.
3 A comparison was made that in the 1990s we exported energy, now we import 50% of our gas.
4 It was explained that if the government pursue the idea of returning some of the non-domestic rates to the local area, a £100 000-00 a year would be available for return to The Lizard peninsula.
5 Generally the number of wind farm applications being approved by local authority regularity development committee was increasing compared to in the pass where many were forced to appeal.
6 Wales have taken the view they want their wind farms in clumps rather than more spread as in The UK.
7 Out of 1200 possible sites examined in the South West, only 40 are considered acceptable to possibly develop.
8 Lancashire is the only area so far to have drawn up wind sensitivity maps
9 Goonhilly repowering has been successful and local people have come to accept
10 Local Councillor Pam Lyne said, “People had become very aware of their rights but not their responsibilities”.
11 Goonhilly works with HMS Culdrose nearby with no problems, making reference to possible radar and radio wave interference.
12 For this point I will explain one kilowatt is a one bar electric fire in plain English, therefore a megawatt would be 1000 electric fires (for those of you with a desire to be really technical, electrical generator outputs are given in KVA and one kilowatt of dissipated power is equal to an output of 1 KVA when the power factor is one). Categories of wind systems. Above 50 megawatts section 36 of the Electricity Act applies, this would be 25 2 Megawatt Goonhilly generators. Below 50 megawatt the regularity planning system only applies. Then comes Small Wind Systems the first being small to medium installations which are 15 to 100 kilowatt, the next would be small which are 1.5 to 15Kw, finally micro 0 to 1.5Kw.
13 For large planning submissions such as wind farm development, especially if several applications are submitted in a close time frame, planning performance agreements can

be made to require the developer to finance extra planning officers for a period of time. This has been done in Cornwall.

14 UK as a country has “more wind” than any other European country.

15 The size of the Goonhilly wind farm project is limited for one reason by the existing local grid, which is not capable of taking a very large capacity.

Calculation of noise emission is taken down wind of each turbine, one cannot stand behind all of many turbines at once therefore the developer can claim the method used difficult to justify.

16 The turbines are not white as they appear at a distance; they are grey, which is a compromise colour to suit all lighting conditions.

17 The existing turbines are being refurbished and used again; they cannot be left here for one reason the grid does not have the capacity to take. The wind turbines have an elliptical footprint which they need not to impact on each other, however being of different heights I was told both types could have been used.

18 The Goonhilly turbines are monitored from over 100 miles away, i.e. if a gearbox overheats the affected turbine can be shut down remotely.

19 A higher noise level from wind turbines is allowable at night for the simple reason most people are indoors.

20 A maximum of 103db of noise can be generated at the nacelle (or comparable to a running chainsaw). The nacelle is the housing of a wind turbine that contains the key components of the turbine, including the gearbox, and the electrical generator. Service personnel may enter the nacelle from the tower of the turbine. The rotor blades and the hub are attached to the nacelle. At 500 metres the noise becomes less than 35db equal to whispering. Background noise effects perception of the noise.

21 Denmark is the largest provider of wind farms in Europe; Denmark’s wind turbines regularly provide 50% of their required electricity.

22 Wind turbines not producing electricity for example in Kent is often balanced by those in another area of the country that are generating electricity.

# New type wind turbine 107 feet tall approximately.

## Assembling a replacement wind turbine on the day before the seminar

## The following information was given under the heading “Myths”.

**Myth: Tens of thousands of wind turbines will be cluttering the British countryside□□**

**Fact:** To obtain 10% of our electricity from the wind would require constructing around 12,000 MW of wind energy capacity. Depending on the size of the turbines, they would extend over 80,000 to 120,000 hectares (0.3% to 0.5% of the UK land area). Less than 1% of this (800 to 1,200 hectares) would be used for foundations and access roads, the other 99% could still be used for productive farming. For comparison, between 288,000 to 360,000 hectares (1.2-1.5% of the UK land area) is covered by roads and some 18.5 million hectares (77%) are used for agriculture.

**Myth: Building a wind farm takes more energy than it ever makes**

**Fact:** The comparison of energy used in manufacture with the energy produced by a power station is known as the 'energy balance'. It can be expressed in terms of energy 'pay-back' time, i.e. as the time needed to generate the equivalent amount of energy used in manufacturing the wind turbine or power station.□The average wind farm in the UK will pay back the energy used in its manufacture within six to eight months. This compares favourably with coal or nuclear power stations, which take about six months.

**Myth: Wind farms are inefficient. They are only operational 30% of the time**

**Fact:** A modern wind turbine produces electricity 70-85% of the time, but it generates different outputs dependent on wind speed. Over the course of a year, it will typically generate from about 20% to more than 30% of its theoretical maximum output, depending on location. This is known as its load factor. The load factor of conventional power stations is on average 50%. A modern wind turbine will generate enough to meet the electricity demands of more than a thousand homes over the course of a year.

**Myth: Wind energy needs back-up to work**

**Fact:** All forms of power generation require back-up and no energy technology can be relied upon 100%. The UK's transmission system already operates with enough back-up to

manage the instantaneous loss of a large power station. Variations in the output from wind farms are barely noticeable over and above the normal fluctuation in supply and demand, seen when the nation's workforce goes home, or if lightning brings down a high-voltage transmission line. Therefore, at present, there is no need for additional back-up because of wind energy. □□Even for wind power to provide 10% of our nation's electricity needs, only a small amount of additional conventional back-up would be required - in the region of 300-500 MW. This would add only 0.2 pence per kilowatt hour to the generation cost of wind energy and would not in any way threaten the security of our grid. In fact, this is unlikely to become a significant issue until wind generates over 20% of total electricity supply.

**Myth: Wind power is expensive**

**Fact:** Wind energy is one of the cheapest of the renewable energy technologies. It is competitive with new clean coal fired power stations and cheaper than new nuclear power. The cost of wind energy varies according to many factors. An average for a new onshore wind farm in a good location is 3-4 pence per unit, competitive with new coal (2.5-4.5p) and cheaper than new nuclear (4-7p). Electricity from smaller wind farms can be more expensive.

**Myth: The UK should invest in other renewable energy technologies and energy efficiency instead of wind power**

**Fact:** Wind energy's role in combating climate change is not a matter of either-or. The UK will need a mix of new and existing renewable energy technologies and energy efficiency measures, and as quickly as possible. Significant amounts of investment have been allocated for wave and tidal energy development, and these technologies, along with solar and biomass energy, will have an important role in the UK's future energy mix. However, wind energy is the most cost effective renewable energy source available to generate clean electricity and help combat climate change right now. Furthermore, developing a strong wind industry will facilitate other renewable technologies which have not reached commercialisation yet, accumulating valuable experience in dealing with issues such as grid connection, supply chain and finance.

**Myth: Wind farms harm property prices**

**Fact:** There is currently no evidence in the UK showing that wind farms impact house prices. However, there is evidence following a comprehensive study by the Scottish Executive that those living nearest to wind farms are their strongest advocates.

**Myth: Wind farms kill birds**

**Fact:** The RSPB stated in its 2004 information leaflet Wind farms and birds, that "in the UK, we have not so far witnessed any major adverse effects on birds associated with wind farms". Wind farms are always subject to an Environmental Impact Assessment. BWEA members follow best practice guidelines and work closely with organisations such as English Nature and the RSPB to ensure that wind farm design and layout does not interfere with sensitive species or wildlife designated sites. Furthermore, a 2004 report published in the journal Nature confirmed that the greatest threat to bird populations in the UK is climate change.

## Critique of 'The Wind Farm Scam'

A key text for anti-wind campaigners, 'The Wind Farm Scam' contains many objections to wind power – the majority of which have little grounding. Professor John Twidell has produced a thorough critique of this work, discussing in technical detail the issues raised.

The photograph below is one of the old nacelles (generator etc), the new are somewhat larger.

The energy and climate change government department show that last year (2009) the average output (or "load factor") of Britain's offshore turbines was 26 per cent of their capacity.

If any figures I have put are contradictory or different regarding the same subject I apologise, however I was given and read varing figures on more than one occassion regarding the same issues, for instance above states the load factor of wind turbines to be 26%, under myths above it states" Over the course of a year, it will typically generate from about 20% to more than 30% of its theoretical maximum output, depending on location.". The myth statement appears to be true, as 26% would appear to be the average. I was told at Goonhilly that at one breif point in Scotland, 10% of the electricity requirement had been achieved by wind power, then another speaker made references to 5%, both I concede could be true depending on how the statistics are presented.

# Technical

The wind turbines are Danish, The manufacture being VESTAS (The largest manufacture in Europe) Model V80 giving an output of 2.00 Megawatts each.

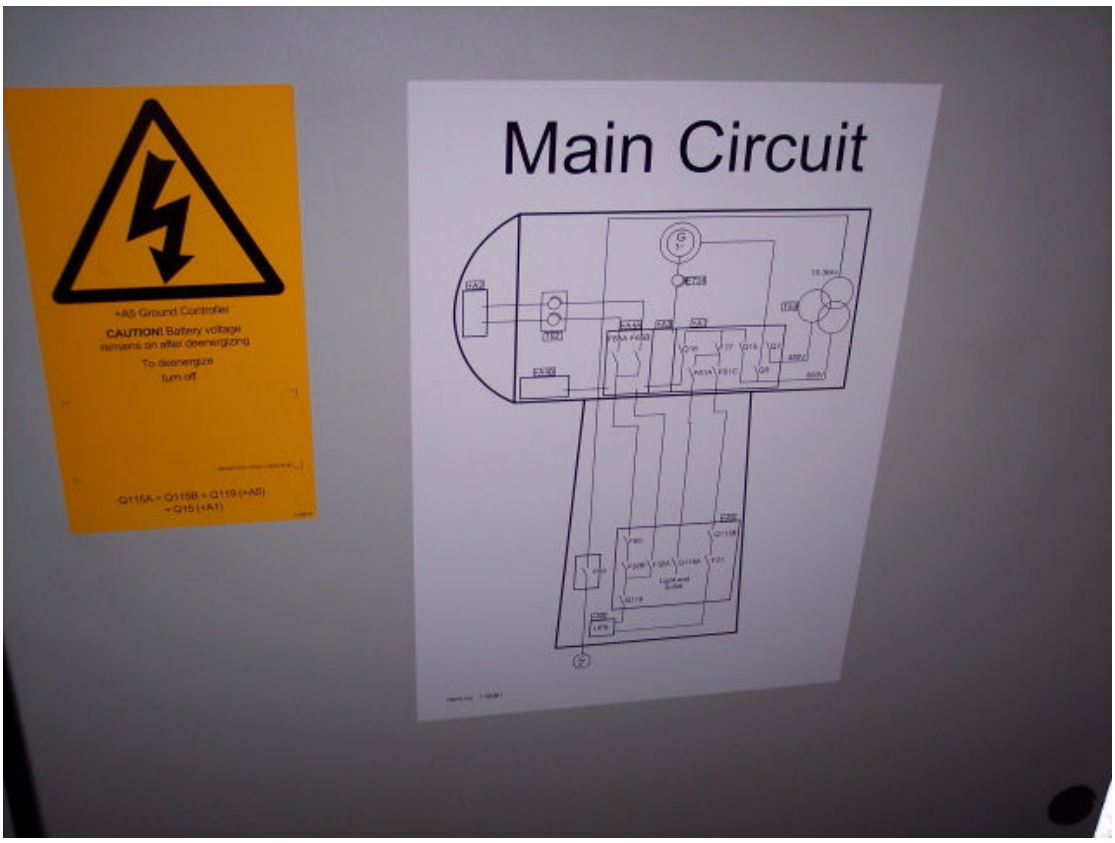
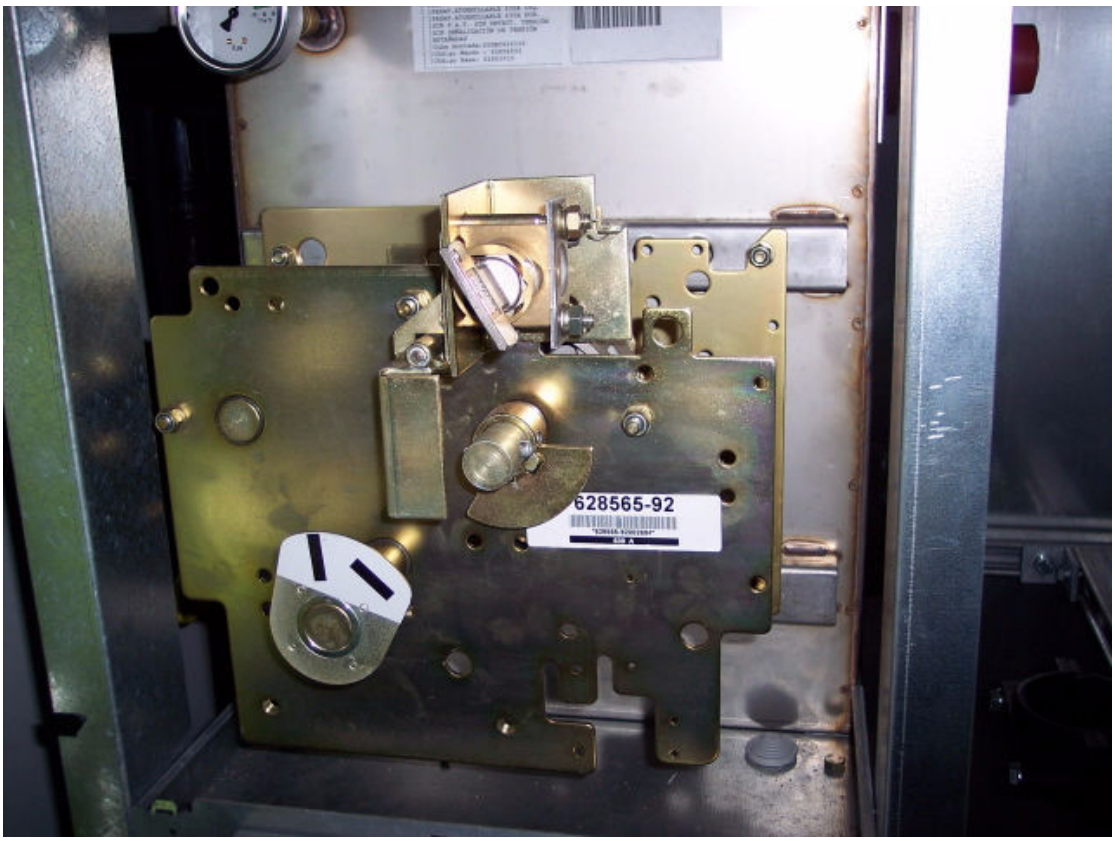



Diagram showing a 3 phase generator, inside the lower mast. No one on site could tell me if the electricity produced by the turbine generator was single or three phase, from the above it would appear 3 phase as would be expected to feed into the grid. The generator turn at 1500 rpm. The output of the turbines is expedential to the diameter of the blades. To enable the power to be sychronised and delivered to the grid at 50Hz the blades are pitched (feathered being another term), to control their speed of rotation. The new 100m plus turbines rotate a little smaller than the older smaller variety. Regarding carbon, the pay back is 7.7 months for a Vestas  V80. To enable its cost of construction in finantial terms this is several years. Voltage comes away from the generator at around 650 Volts this is transformed up before it is put on the grid to 33 000 Volts (33Kv).

For windspeeds between 4m per second and 25m per second the Vestas V80 will generate electricity, for wind speeds over 25m per second, the turbine has to be closed down.

The new towers are now made of less steel, the steel is now 25mm thick when previously it was much thicker, no holes can be drilled, therefore the internal ladders that take service personnel to the top are held on by magnets.

A question often asked is how to store the electrical energy produced on a large scale. One method is the production of Hydrogen, this is difficult because when hydrogen  is under pressure there is no known container that will trap the gas. Research into this problem is at present taking place. A more conventinal method is to pump water uphill, store it in a dam, then release the water to create hydroelectricity, I am told this is being done in Wales at the present time.




Above a gas filled isolation switch that is placed inside the bottom of the turbine mast, to cessate (cuts) the power when required.

**WIND FARM METEOROLOGICAL MASTS**

These give information on wind direction speed etc. The calibration mast is usually placed at the leading edge of the wind farm and provides data that can be used to assess farm output and turbine effectiveness.

Metrological information is used to turn the nacelle and rotor into the wind, usually picked up by each wind turbine.

# CONCLUSION

I would rather like the reader to draw his or her own conclusions. I do not imply this to mean I have formed an opinion against wind power, or an opinion in favour of wind power. I prefer to present the material presented to me in an unbiased manner, which I hope I have. I hope this report is kept on file in the Council for use of Regularity Planning etc., to draw upon when required.