

The truth about wind power and where it is effective
Lessons from the Warwick Wind Trials

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Agenda



- Introduction
- The truth about wind power
- Results of urban wind trials
- Conclusions and the future

Encraft



Encraft is a low carbon engineering and technology consultancy established to accelerate the creation of an accessible mass market for microgeneration technologies in the UK

Informed customers are the key

consultancy – software and design tools – project engineering

Independent and impartial

Engineers and physicists from a variety of industrial and academic backgrounds

The truth about wind power



commercial



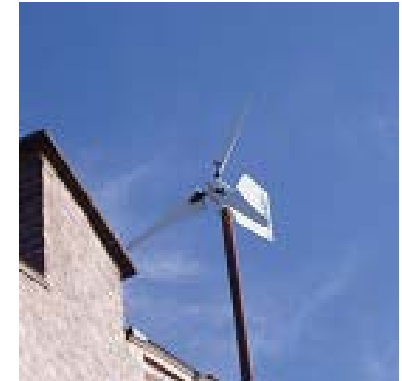
community

£320 000
6 years
820 000 kWh p.a.



small

£20 000
15-25 years
8000-15000 kWh p.a.

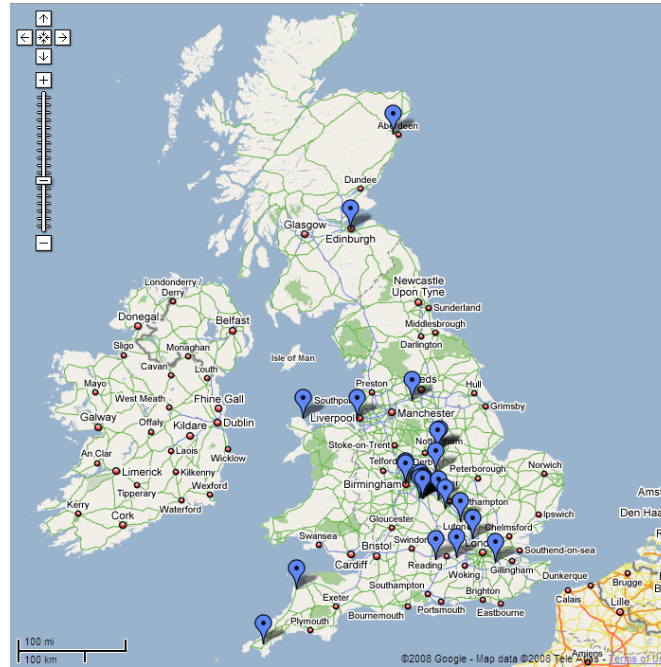


micro

£4 000
40-500 years
100-1000 kWh p.a.

Wind power is not a single technology
Performance is very sensitive to location, design and installation skill

We trialled turbines in the most challenging environments in the UK



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Five makes of commercially-available turbine were included in the trial



Ampair 600



StealthGen D400



Air Dolphin Z1000



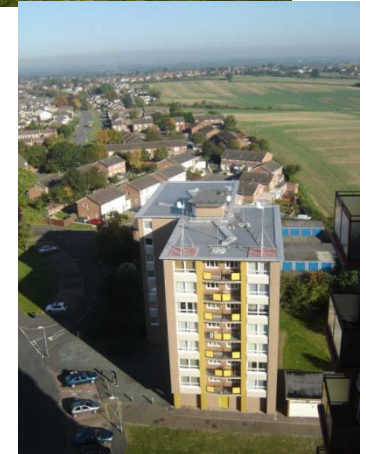
Windsave WS1200



Swift

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The sites were highly varied



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We found customers initially had no meaningful information on which to base purchasing decisions

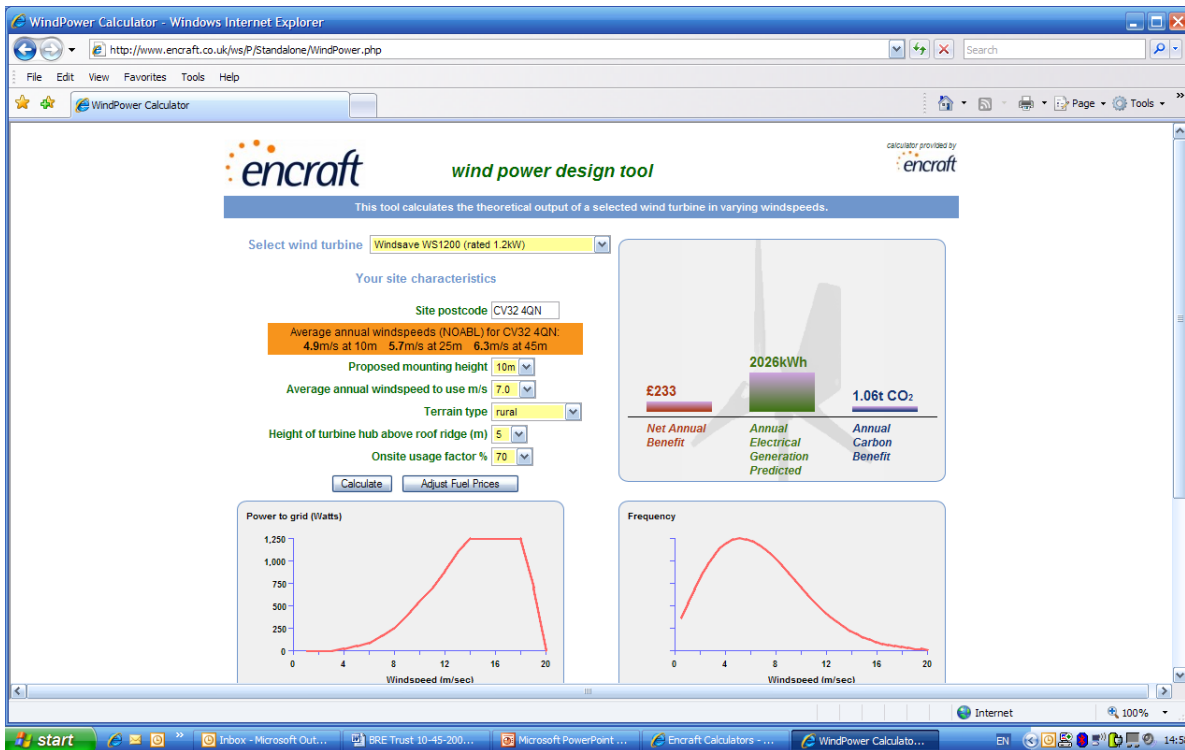


- Use of best available data, without modification, overestimates annual energy output by a factor of 15-17
- NOABL 40-75% overstating wind speed in urban areas
- Power curves are optimistic by factors of 1.7-3.4

| | | | |
|--------------------------------------------------------|----------------------|------------------------------------------------------|----|
| Energy output predictions based on power curves and... | NOABL | ... will overestimate by an approximate factor of... | 16 |
| | scaled NOABL | | 2 |
| | measured wind speeds | | 2 |

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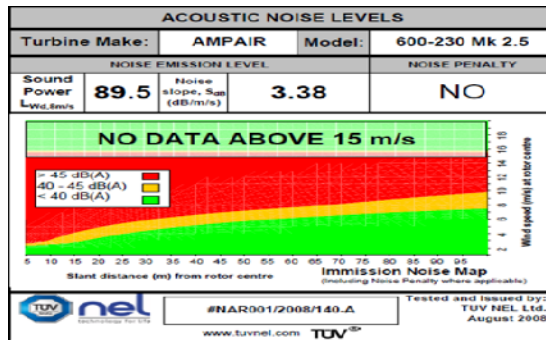
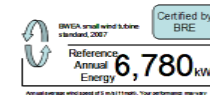
It is possible to do better with empirically-developed scaling factors



Free online calculators
at www.encraft.co.uk

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Agreed standards for power curves will also help



6.1 Durability Testing

The Ampair 600/230 Mk 2.5 has been designed as a class 1 turbine, and has physically been in operation, with data being logged, since May 15th 2008. In accordance with section 9.4.1 of BS 61400-2 the turbine has therefore achieved the following operational statistics as of 19th November (where V_{ref} = 10m/s):

| | |
|----------------------------------------------------------|--------------|
| Over 6 months of operation, | 188 days |
| Total number of hours of power production | 3,488hrs |
| Total number of hours in winds in excess of $1.2V_{ref}$ | 140hrs |
| Total number of hours in excess of 15m/s | 29hrs 50mins |
| Total number of hours in winds in excess of $1.8V_{ref}$ | 3hrs 20mins |

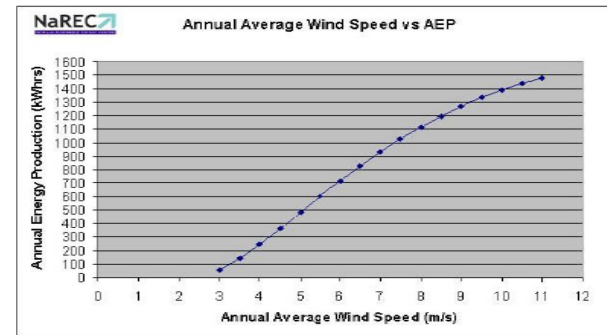
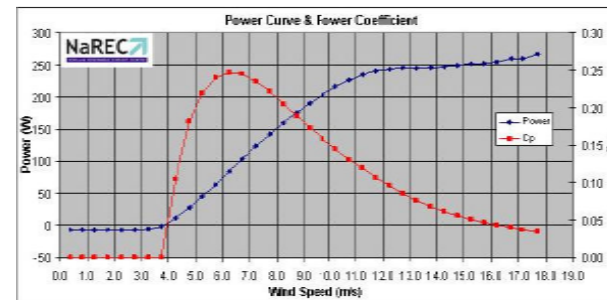
Whilst these results show that the turbine has not yet satisfied the requirements to claim Class 1 compliance, it has now achieved the requirements for a Class 2 turbine, i.e. where V_{ref} = 8.5m/s rather than 10m/s, total hours in excess of $1.2V_{ref}$ were 372.6 and total hours in excess of $1.8V_{ref}$ were 29.8.

6.2 Reliable Operation

In accordance with BS 61400-2 the turbine is deemed to be reliable if the operational time fraction O is greater than 90%. This is calculated from the following equation:

$$O = \frac{T_1 - T_2 - T_3 - T_4}{T_1 - T_2 - T_4} \times 100\%$$

From the foregoing calculation and accumulated data, the operational time fraction for this test was therefore 100% as the turbine had no component failure, and was always in its operational state.



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Conclusions and the future

Some rules of thumb



- When wind power is properly applied, it is a highly effective renewable technology
- **Always commission wind monitoring if in any doubt about wind speed**
- Building mounted wind is only likely to work (significantly) on tall buildings
 - Vertical axis and venturi-type machines are likely to have niche applications
 - Allow for doubling of project costs for building integration, especially on retrofit
- **Always ask to see in use field data from real sites, and certification for power and noise outputs**

More information

www.encraft.co.uk

www.warwickwindtrials.org.uk

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