

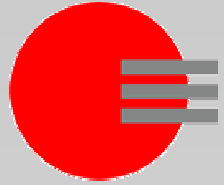
Small Scale Wind Power

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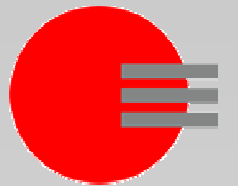
www.nef.org.uk



What this talk will cover

- What do wind turbines do?
- How do they work?
- Can they avoid Carbon Emissions?
- Financial aspects
- Planning
- Questions



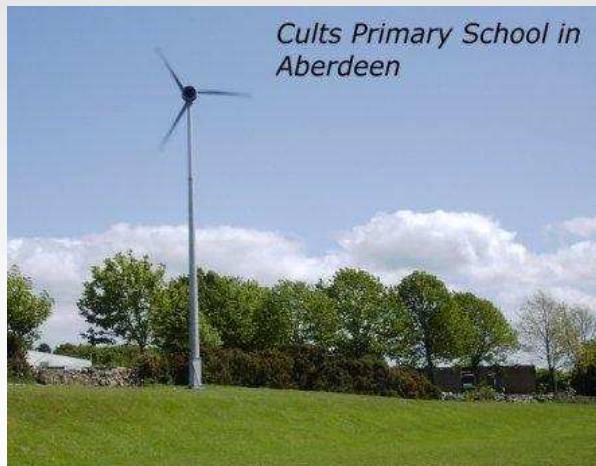


Sizes and Applications

- Micro: $\leq 1\text{kW}$
- Small: 1- 20kW
- Medium: 20 – 500kW
- Large: 500kW – 2MW+



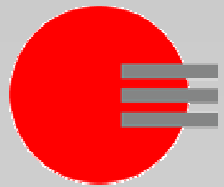
Rutland 910-3 200W



Iskra AT5-1 5kW



Vestas V66 2MW
Blyth Harbour
Northumberland



Small Wind: 1 – 20kW

- Homes / farms
- Designed for reliability and low maintenance
- Cut-in speed: 3 – 4ms⁻¹
- Cost: £1500 - £4000/kW



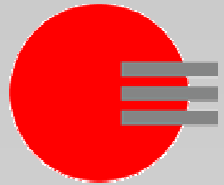
WES5 2.5kW



Iskra AT5-1 5kW



Proven 15kW



What resource so we need?

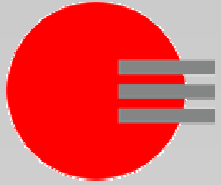
Wind!

Parameter	Wind speed	Effects of wind on land
'Cut-in' speed	4ms ⁻¹ (9mph)	Small twigs in constant motion. Light flags extended.
Rated speed	12ms ⁻¹ (27mph)	Large branches move. Whistling in phone wires. Difficult to use umbrellas.
Shut down	> 25ms ⁻¹ (56mph)	Trees uprooted. Structural damage.

So, we want an exposed site (free from trees, buildings...)

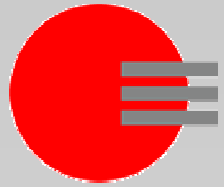
Source: *Wind turbine manufacturers, BBC website.*





Electrical Connection

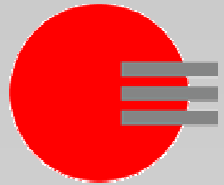
- Stand-alone
 - Very small machines for battery charging, for farms, caravans & boats.
 - Power for lighting, pumps, electric fencing
- Grid connected
 - Directly connected to mains electricity
 - Allows operator to claim ROCs
 - Electricity company will require high standard and may limit amount size of turbine.



How much energy?

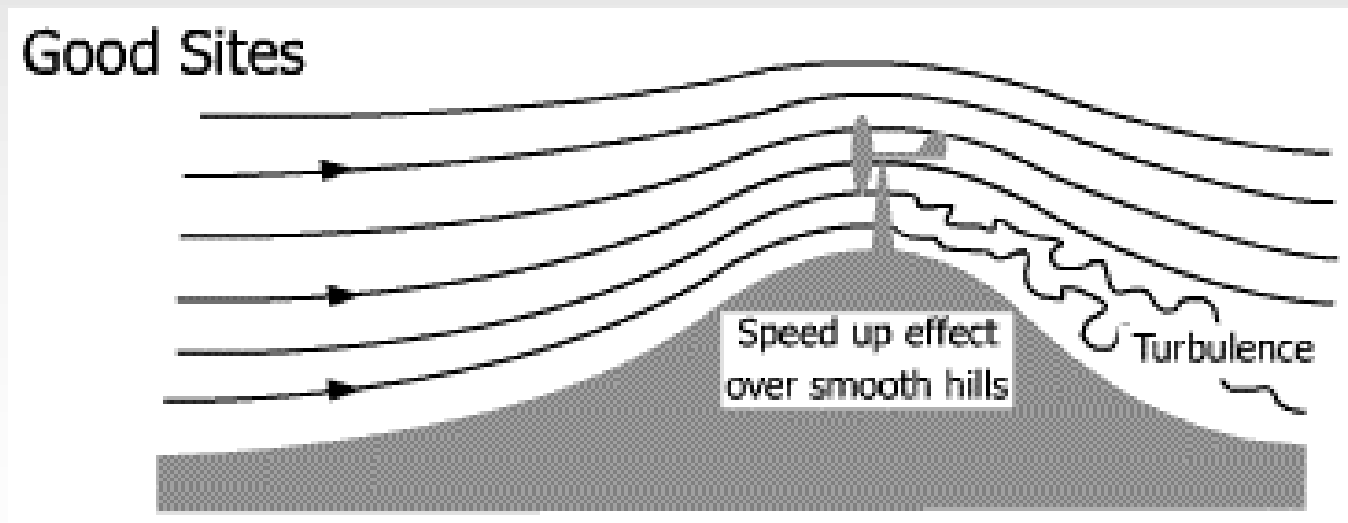
- Accurate wind data is key:
 - Ideally measure with a mast.
 - A small increase in wind speed can result in a big increase in power generated.
- For small wind, usually desk based:
 - BERR (formerly DTI) wind speed database – gives mean wind speeds for every 1km grid square.





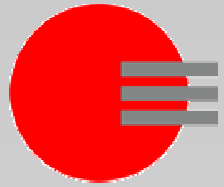
Good Wind Sites

- Clear of obstructions
- As high as possible



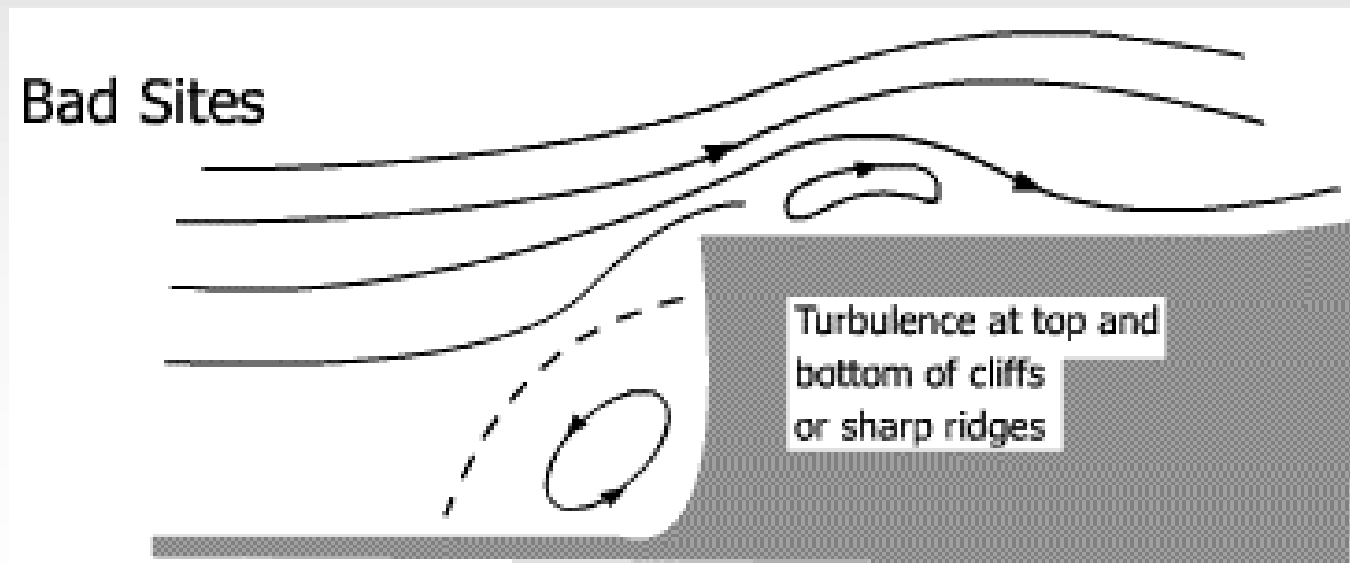
Source: BWEA





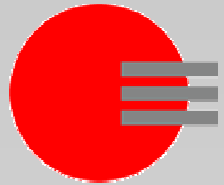
Bad Sites for Turbines

- Air flow becomes turbulent near 'sharp' edges:
 - Causes excessive fatigue damage.



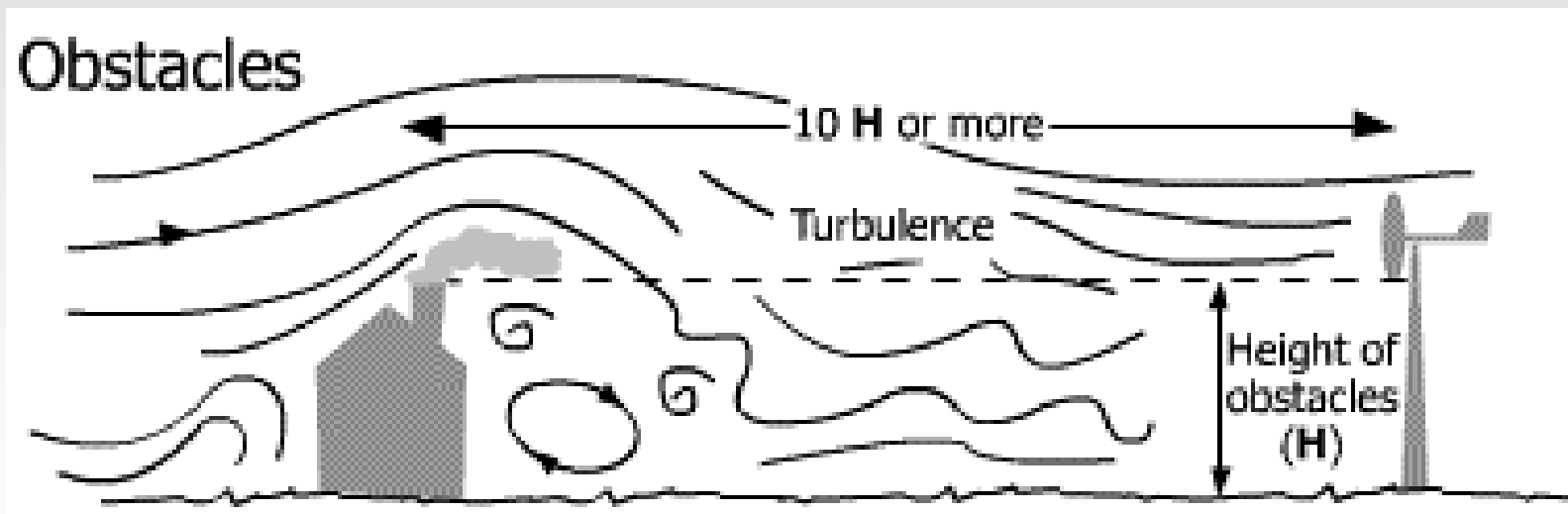
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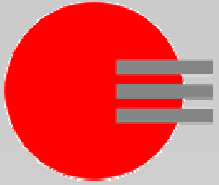
Wind Turbines and Obstacles

- Site turbine at least $10H$ away from obstructions

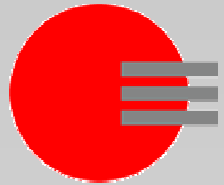


Source: BWEA





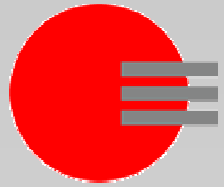
- Take example from Warwick Wind Trials



Small wind - future

- Small wind may increase substantially:
 - If competition between suppliers reduces prices.
 - Increasing cost of grid supplied electricity.
 - Simplified planning procedures.
- Small wind can make a useful contribution to reducing CO₂ emissions.
- Small wind sector largely limited by a marginal economic case.

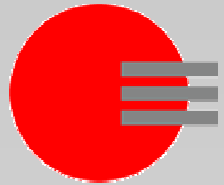




Key Points

- Wind turbines...
 - Convert energy in the wind into electricity.
 - Output is strongly related to mean wind speed.
 - A small increase in wind speed can give a lot more power.

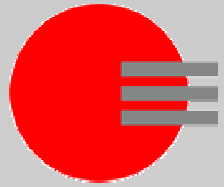




Summary

- Growing number of products becoming available
 - Increasing choice.
 - Should lead to lower costs.
- Electricity companies required to offer realistic grid connection terms.
- UK has best opportunity in Europe for small wind.
- Wind is no 'magic bullet' but may form part of the solution.





Thank you for listening



Quietrevolution QR5 (5kW)

Any questions?

