

MAKING MONEY FROM WIND



by Mark Newton FRICS

MAIN TOPICS

- Why we need renewable energy
- Government requirements
- Problems of meeting targets
- Building the windfarm site
- Single turbines



UFO landing?!



WHY WIND?

Global and Government Action

- Kyoto Protocol, December 1997
- 2002 Renewables Obligation
- 2003 Energy White Paper – Our Energy Future
- Stern Review 2006
- Bali Conference 2007

RENEWABLE ENERGY – THE NEED

Climate change

- Atmospheric concentrations of CO₂ have increased by 31% since 1750
- Global mean temperatures are projected to increase by between 1.4 and 5.8°C (2.5 to 10°F)
- Arctic ice cap 20% smaller than in the 1960's

STERN REVIEW – OCTOBER 2006

If we fail to tackle climate change the following will happen ...

12 metres

the rise in sea levels if the Greenland or West Antarctic ice sheets melt

250,000

the number of additional children who will die in the Third World every year by 2100

10°C

the increase in temperature by 2100 if emissions remain at the current level

£45

the cost of the damage caused by each tonne of CO₂ that we emit

4 million km²

the amount of land which will be threatened by rising sea levels – home to 5% of the world's population

30%

the proportion of the world's land mass that will be ravaged by 'extreme drought'

... climate change could shrink the global economy by 20%, but taking action now would cost just 1% of global gross domestic product

RENEWABLE ENERGY – THE NEED

Pressure on fossil fuel supplies

- Average US citizen uses 23.4 barrels/year
- Average European Citizen uses 13.8 barrels/year
- Estimated worldwide oil reserves at the beginning of 2004 = 34 cubic miles (American Petroleum Institute)
- 32 years of oil supplies left
- We do not want to be dependent on Russia for our energy supplies

RENEWABLE ENERGY IN THE UK

Pressure on fossil fuel supplies

- Large renewable energy resource – wind tidal and wave
- 40% of the European Wind Resource

THE STATE OF UK POWER PRODUCTION

- One third of the UK's electricity generation will be closed in the next ten years
- 6 out of 19 coal powered stations closed by 2015
- Average age of coal power station – 41 years old
- All nuclear power stations to close – takes 10-15 years to build new ones
- £200 billion investment required in the energy infrastructure over the next 10 years (Ofgen, October 2009)

CURRENT SOURCES OF RENEWABLES

4.5% of electricity from renewables

made up of:

3% non-wind renewables

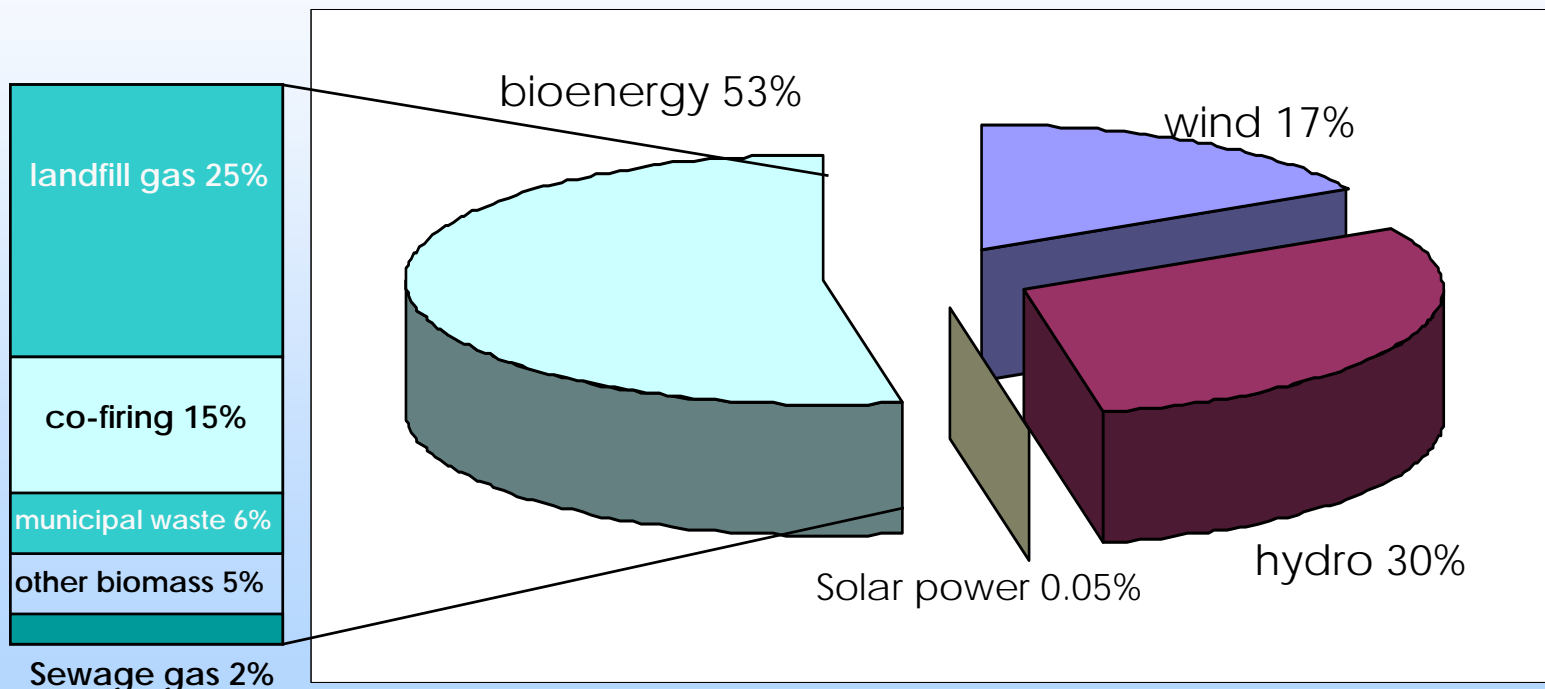
1.5% on and off shore wind

TYPES OF RENEWABLES

- Deployment of renewables
 - Onshore wind – offshore wind farms are much more expensive
 - Biomass – co-firing
 - Wave and tidal at prototype stages
 - Solar PV

UK RENEWABLE ELECTRICITY GENERATION

This chart shows the different sources which make up this contribution of 4.5% of UK electricity in 2008



Source: DTI Digest of UK Energy Statistics Table 7.4, 2005 data

GOVERNMENT TARGETS

10% renewable electricity by 2010

20% renewable electricity by 2020 – England

50% renewable electricity by 2020 – Scotland

Sweden currently has 50% renewable electricity

CURRENT POSITION OF PROJECTS – OCT 2009

- 248 projects built (2381 turbines 3290 MW)
- 240 on shore built (2724 MW)
- 8 off shore built (566 MW)
- 35 wind farms under construction
- 167 consented but not built
- 268 projects in planning

(BWEA website))

PROJECT SOURCES OF RENEWABLES BY 2010

Need a further 5.5%

- 4% non wind renewables
- 1.5% off shore wind
- 4.5% on shore wind =
 - 6,000 MW installed capacity
 - 3,600 turbines
 - twice as many as currently built

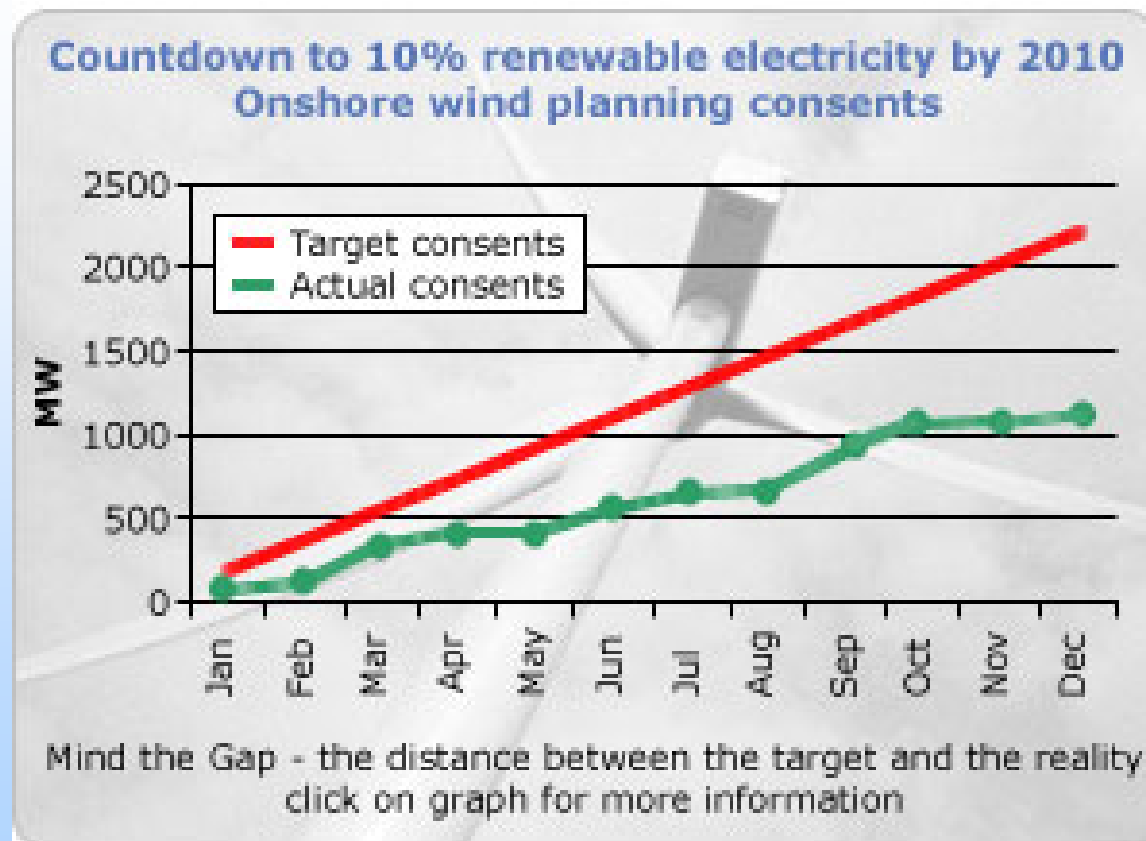
ON SHORE WIND FARM PLANNING PROBLEMS

- Lack of planning resources
- Misinformation
- Local opposition

PLANNING DELAYS

- Only 5% of wind farms dealt with in statutory 16-week period
- Compared to 70% of other major developments
- 2/3 wind farm planning applications are refused, but more successful at appeal
- Average wind farm planning appeal is one year, but up to 90% success rate

PLANNING DELAYS



SITE SELECTION

Finding the right site is not easy!

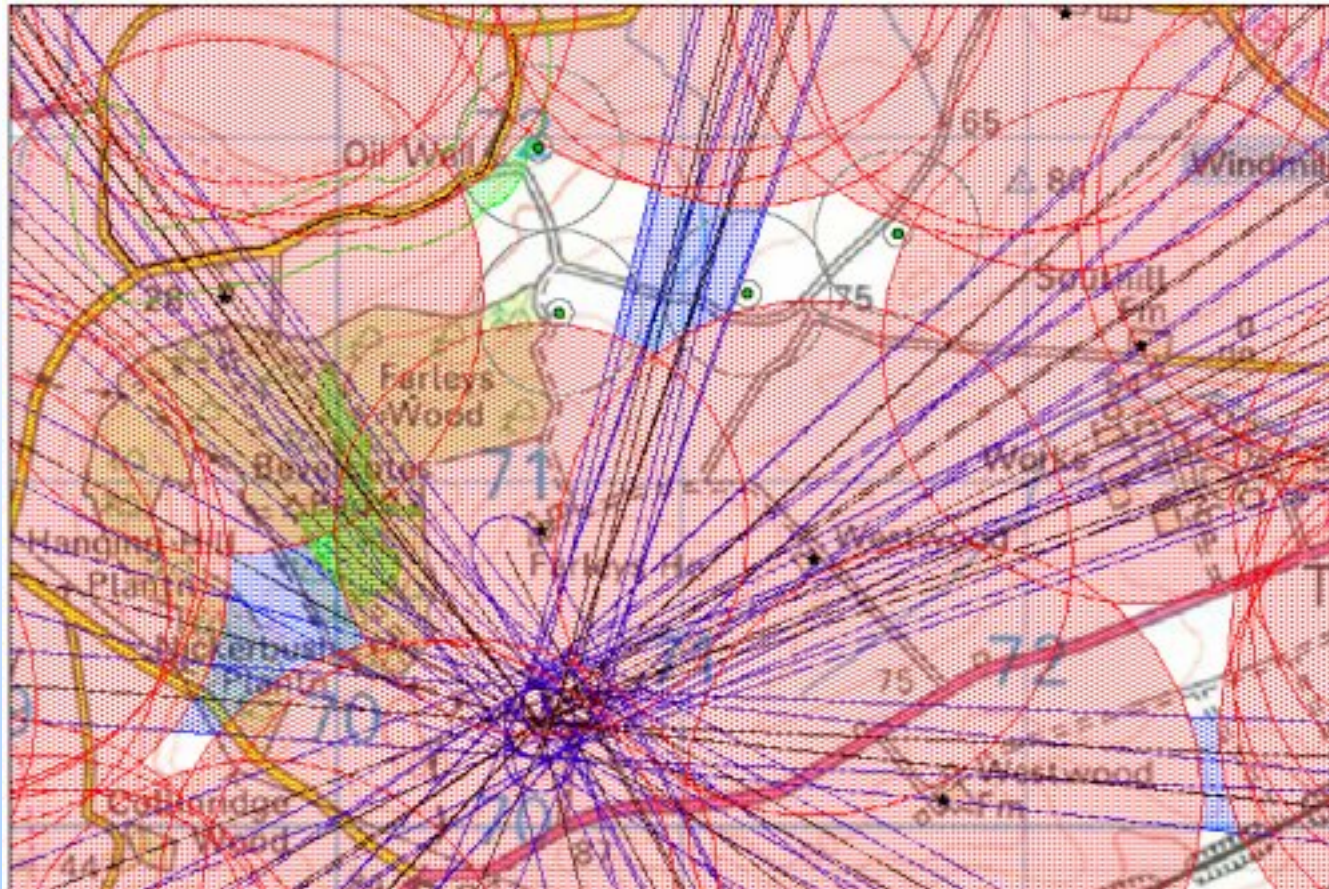
- Constraints
 - Wind speed (ideally 7m per second over 20 years) at 45m above ground level
 - Proximity to housing (400-800m from residential dwellings), background noise not to exceed 5db)
 - Radar and airports
 - microwave links from telecom sites
 - Land designations
 - Grid capacity and length of connection
 - Need room for 4-5 turbines for 10MW project

RADAR AND AIRPORTS



MICROWAVE LINKS

Far Leys Farm



FACTS ABOUT WIND FARMS

- A 2 mw turbine will supply electricity for 1,000 local homes
- A wind farm will only take up approximately 2% of the farm area
- The energy used to build a turbine is 'paid back' in 6 months
- Financial payback is 10-15 years
- Wind farms are not subsidised, but sell electricity at about 4.5p kw/hr, and Renewable Obligation Certificates at about 4.5p kw/hr

COST OF ON SHORE AND OFF SHORE

- On shore £1.3-£1.5 million per MW, so each 2MW turbine costs £2.6-2.0 million
- Off shore £2.5-£3.0 million per MW
- Government announced 2007 for 7,000 off shore wind turbines by 2020, two every mile of coastline
- Problems with off shore turbines

THE RUSH TO BUILD ON SHORE vs OFFSHORE

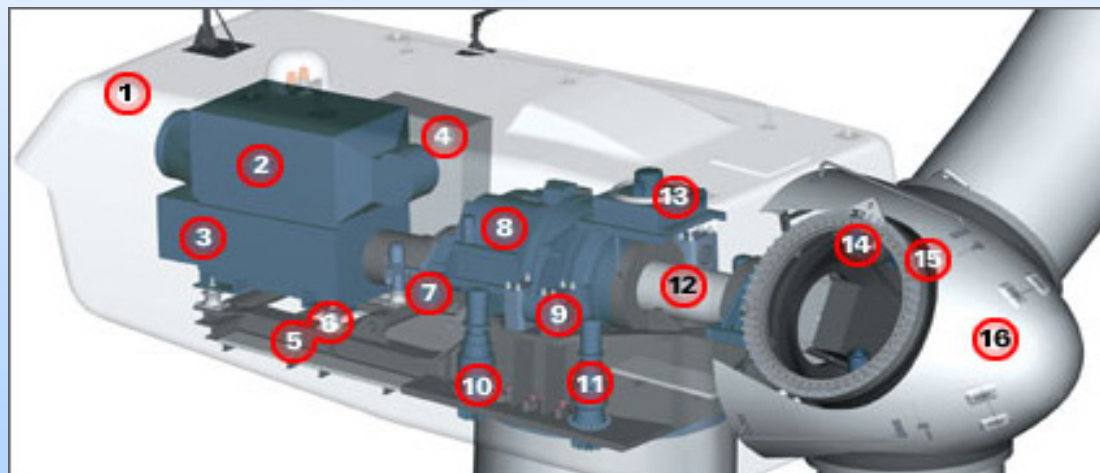
- Currently one ROC for on shore and one ROC off shore
- April 2009 one ROC for on shore and 1.5 ROC off shore
- On shore half the cost to build compared to off shore
- On shore does not have the same problems as off shore in terms of maintenance, salt corrosion and accessibility in bad weather

COST OF A WIND FARM



Cost of 10 mw on shore wind farm
– say 5 x 2 mw turbines:

£13-15 million

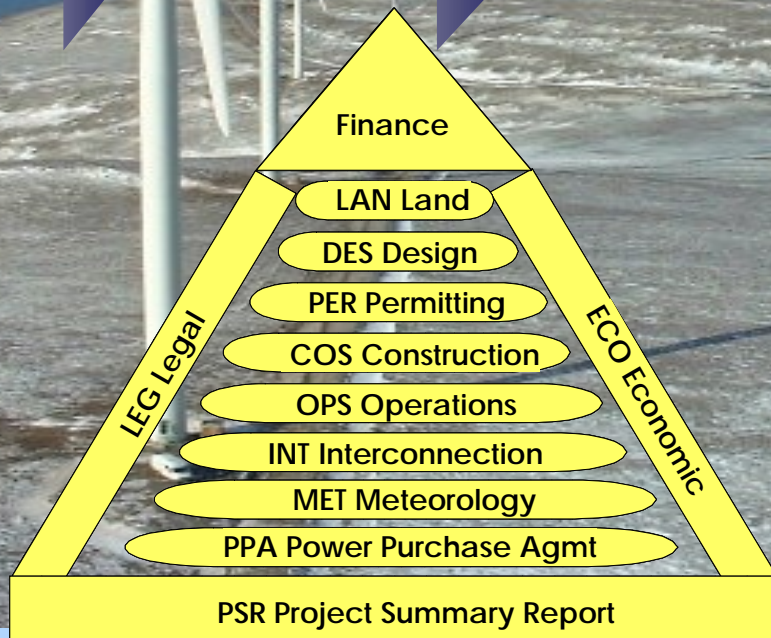


1. Nacelle
2. Impact Noise Reduction
3. Main Frame
4. Generator
5. Control Panel
6. Hydraulic Parking Brake
7. Gearbox
8. Impact Noise Reduction
9. Oil Cooler
10. Rotor Shaft
11. Yaw Drive
12. Pitch Drive
13. Rotor Hub
14. Nose Cone

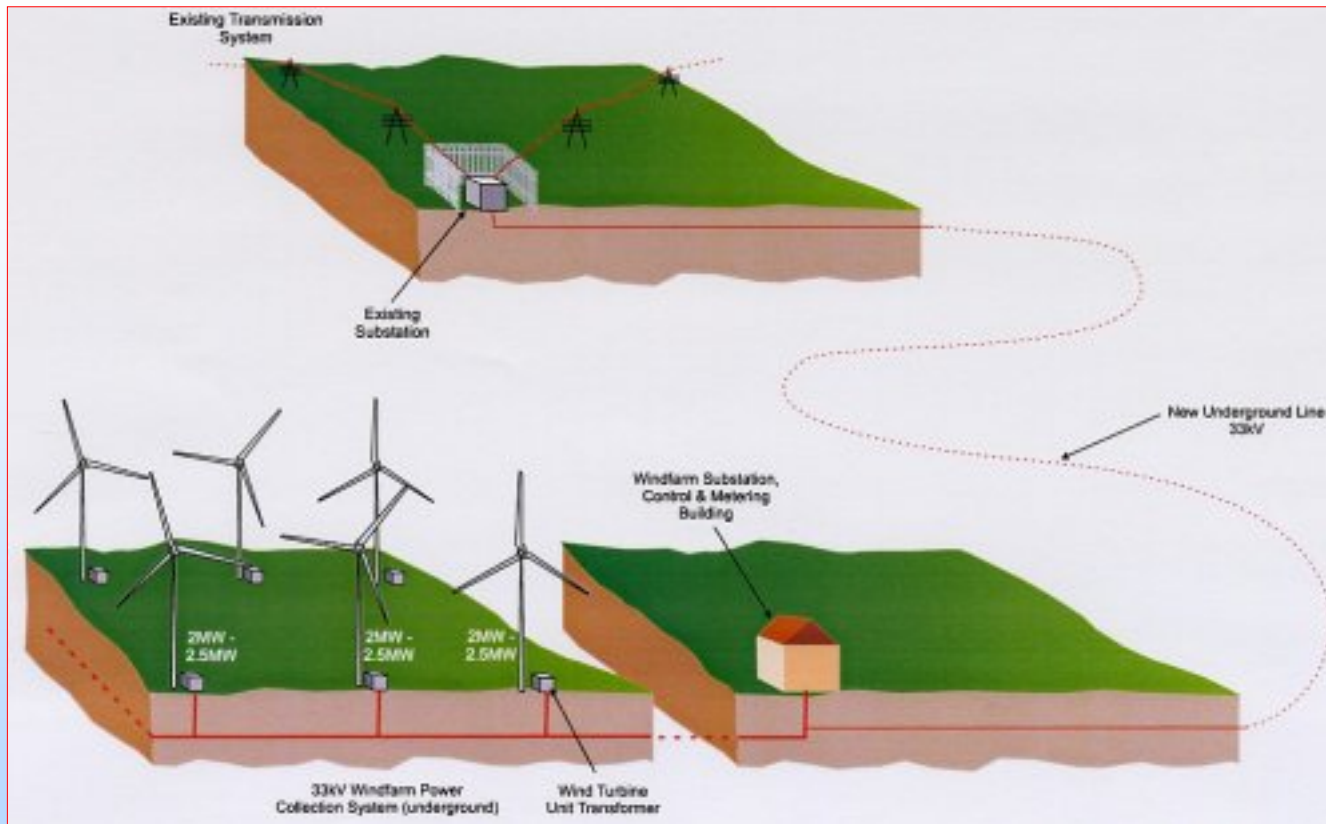
RENEWABLES PHASE MODEL

5 Project Phases

screening development finance implementation operation



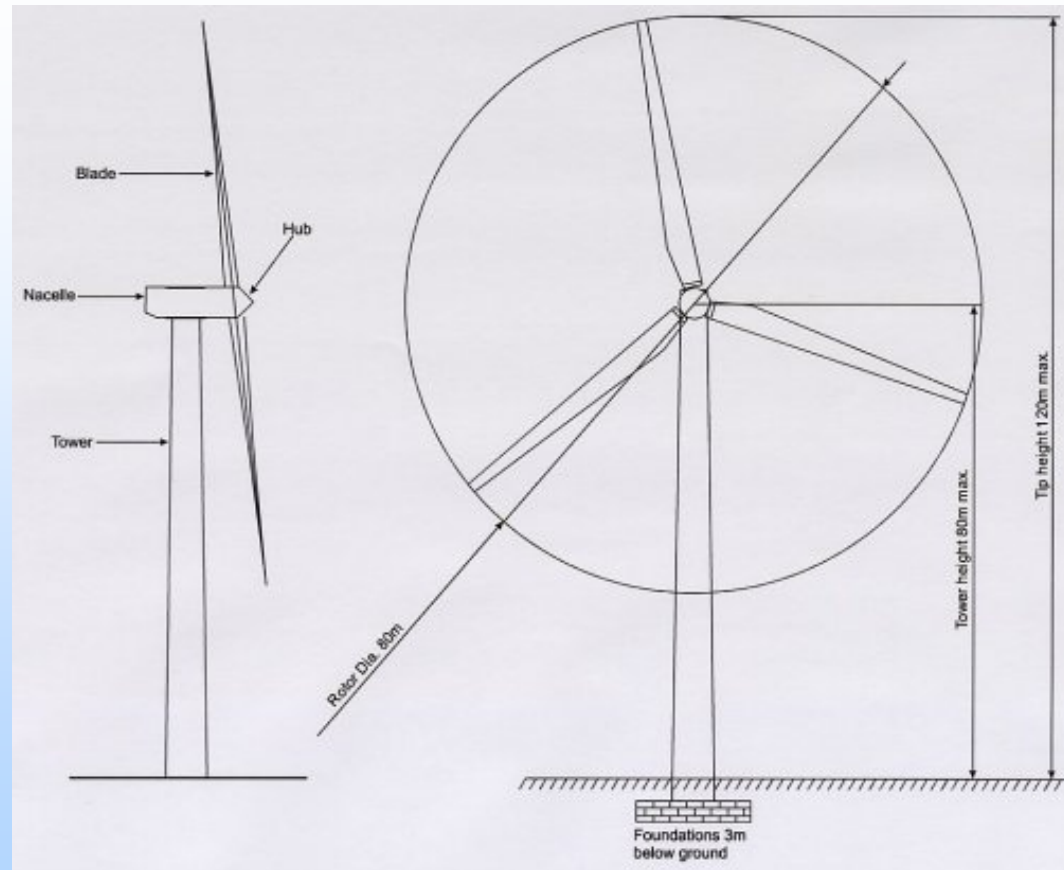
WIND FARM SCHEMATIC



10 mw for scheme to be viable (ie 5 No. 2mw turbines)

Distance between turbines depends on size – typically 350-450m between turbines and 250-400m deep

TYPICAL WIND TURBINE



Height to hub: 80m
Height to top blade: 125m

DEVELOPMENT ACTIVITIES

- Commencement of development activities
 - Investigate grid capacity
 - Prepare environmental statement
 - Public consultation
 - Finalise site layout

ENVIRONMENTAL IMPACT ASSESSMENT

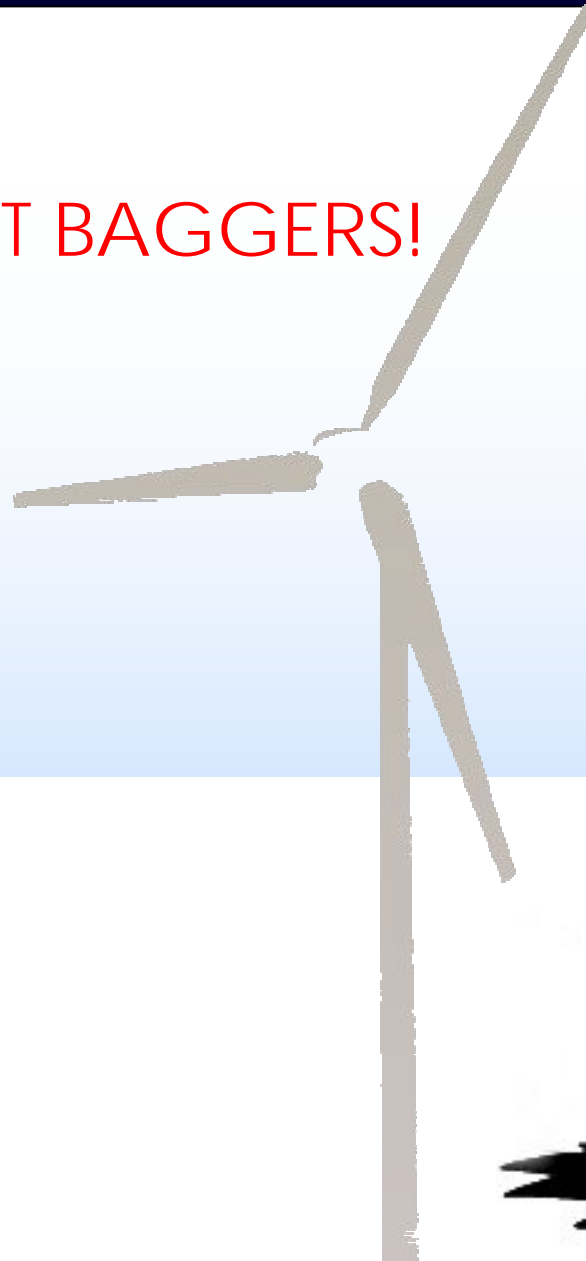
Consultation and survey work results required

- Ecology and ornithology surveys
- Landscape and visual assessments
- Noise assessments
- Highways and access to the site
- Cultural heritage
- Geology and hydrology
- Air safeguarding – clearance from CAA and MoD
- Public access, safety
- Planning permission for 25 years only

WHAT'S IN IT FOR LANDOWNERS?

- Strong annual revenue stream
- Enhancement of capital values, but can devalue residential property
- RICS survey in Cornwall showed no depreciation in residential property values
- Farm diversification
- Very low land take, < 2%
- Improved access arrangements

BEWARE CARPET BAGGERS!



SITE ASSEMBLY

- One owner or multiple owners
- Solicitors
- Surveyors

COMMERCIAL TERMS

- Letter of interest – 6-12 months
- Option agreement – 3-7 years
- Lease – 25 years:
 - Minimum rental per MW
 - Or the higher of % of gross output or
 - Payment per MW/hour
 - Disturbance payment per turbine
 - Electricity substation and ananometer mast
 - Payments lower in first 10 years, then higher in years 11-25

PLANNING AND APPEAL COSTS

- Planning application £150-250,000
- Appeal £150-250,000
- Total cost £300-500,000

You can sell the project with planning permission for £200-300,000 per MW – so 10 MW project = £2-3 million

REPOWERING EXISTING WIND FARMS

- Early wind farms (1993-1998), turbines only
0.4 – 0.6 MW
- Old rental typically £2,000 pa per turbine
- Wind farm companies replace with modern
2.0 – 3.0 MW turbines
- Increases energy output of the site by up to
double
- Opportunity for landowners to have new
lease on much more favourable commercial
terms

SINGLE TURBINES

Financials

For a turbine over 50kw, used to get:

'brown' electricity price = 4.5p kw/hr
+ 1 ROC = 4.5p kw/hr

Total 9p+ kw/hr

Not financially viable



SINGLE TURBINES

Proposed 'Feed in Tariffs'

For new projects from April 2010 for 20 years

50 – 250 kw = 18p kw/hr

250 – 500 kw = 16p kw/hr

over 500 kw = 4.5p kw/hr

This is cumulative, not per turbine

Warning – if you get grant funding to build the project then you may not get feed in tariffs



SINGLE TURBINES

Selling electricity off site

Say 250 kw turbine	= 18p kw/hr
+ 'brown' price	= 4.5p kw/hr
Total	= 22.5p kw/hr

Payback now 4 – 5 years, depending on wind speed



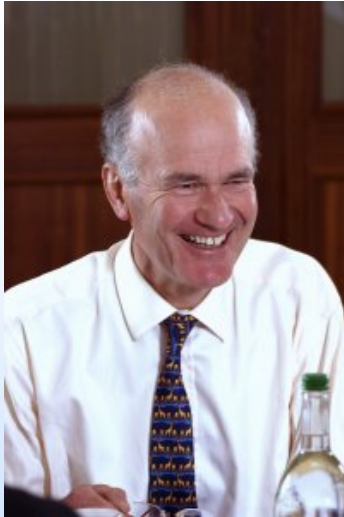
SINGLE TURBINES

Using electricity on site

Currently paying	= 10 - 12p kw/hr
+ feed in tariff payment	= 18p kw/hr
Total saving	= 28 - 30p kw/hr







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