WICO – Wind of the coast

WP3 Exchange of experiences and best practices

Workshop 2 – Market

Southampton, 16th June 2010

marine south east

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Terminology Used Here

Small Wind up to 100 kW unit size

Small wind systems				
	Power (kW)	Annual energy production (kWh)	Total height (m)	Total installed cost (£k)
Micro wind	0 – 1.5	Up to 1,000	10 – 18	0.5 – 5
Small wind	1.5 – 15	Up to 50,000	12 – 25	2 – 50
Small-medium wind	15 – 100	Up to 200,000	15 – 50	50 – 250

This terminology is that used by RenewableUK (formerly BWEA) which is the best available source of UK market information. It has therefore been adopted for this presentation but with “Small Wind” or “Small Wind Turbine” also used as all-embracing terms.

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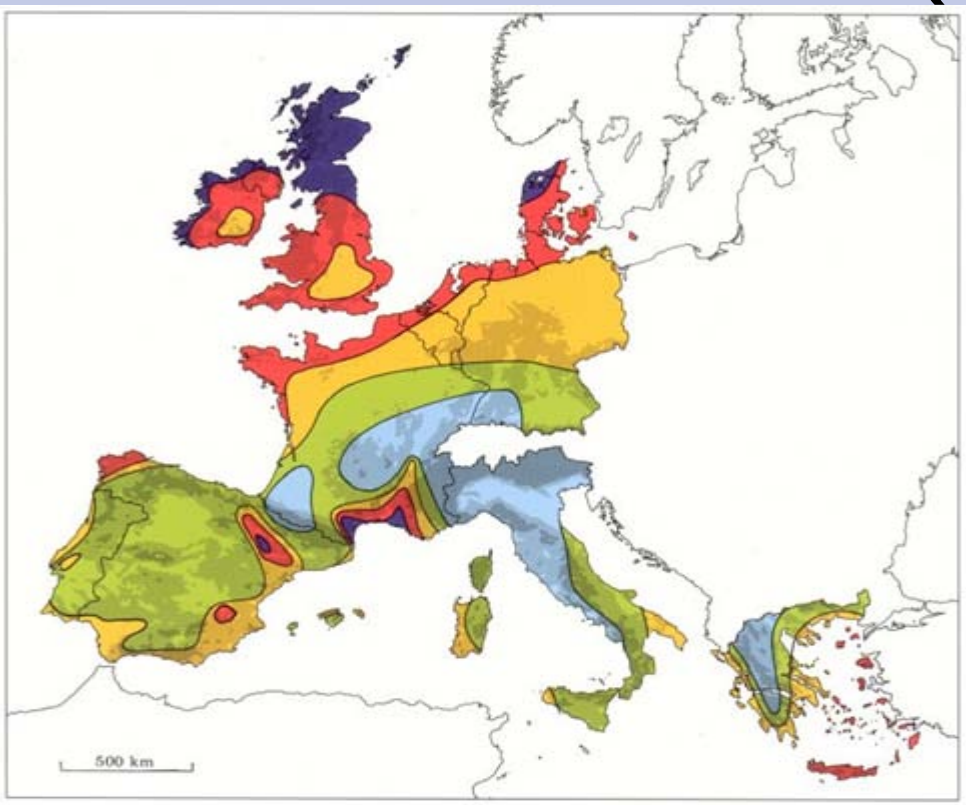
Topics

- UK Wind Resource
- UK installed capacity, deployment & predictions
- Employment Levels
- UK Incentives & Feed-In tariffs
- Economic viability factors:
    - Risks
    - Opportunities
    - Other issues – i.e. noise & competing technologies
    - Examples

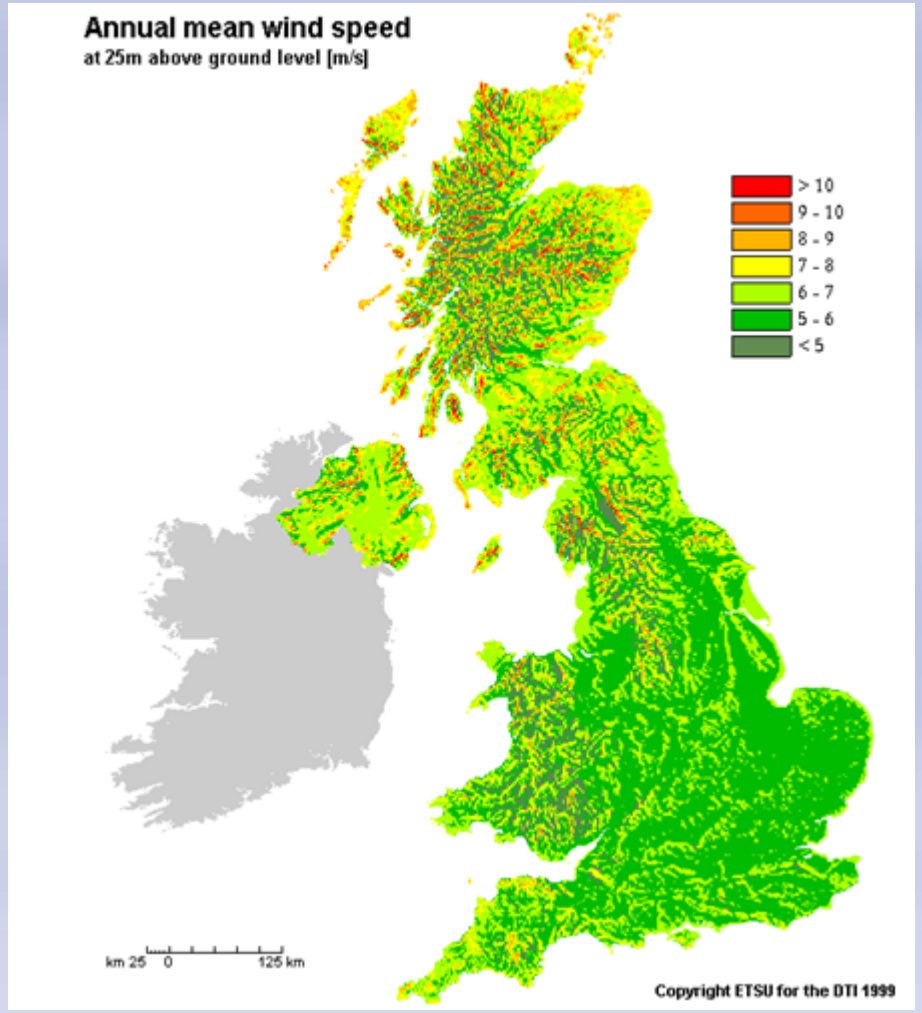
UK Wind Resource (1)



Wind resources[1] at 50 metres above ground level for five different topographic conditions

	Sheltered terrain[2]		Open plain[3]		At a sea coast[4]		Open sea[5]		Hills and ridges[6]	
	$m\,s^{-1}$	Wm^{-2}	$m\,s^{-1}$	Wm^{-2}	$m\,s^{-1}$	Wm^{-2}	$m\,s^{-1}$	Wm^{-2}	$m\,s^{-1}$	Wm^{-2}
	> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
	5.0-6.0	150-250	6.5-7.5	300-500	7.0-8.5	400-700	8.0-9.0	600-800	10.0-11.5	1200-1800
	4.5-5.0	100-150	5.5-6.5	200-300	6.0-7.0	250-400	7.0-8.0	400-600	8.5-10.0	700-1200
	3.5-4.5	50-100	4.5-5.5	100-200	5.0-6.0	150-250	5.5-7.0	200-400	7.0- 8.5	400- 700
	< 3.5	< 50	< 4.5	< 100	< 5.0	< 150	< 5.5	< 200	< 7.0	< 400

UK Wind Resource (2)



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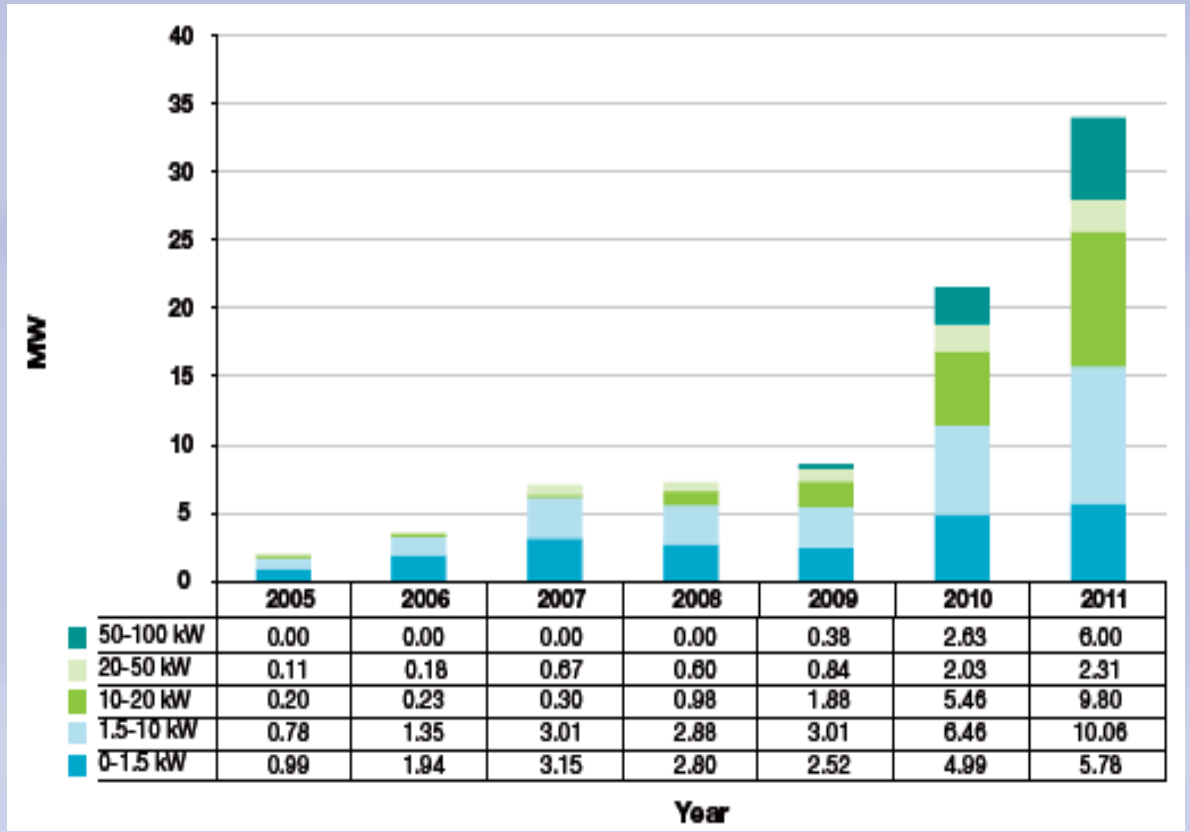
UK grid deployed capacity & predictions

Note that the appearance and growth of the 50 kW to 100 kW range is attributed to the April 2010 introduction of the FIT programme

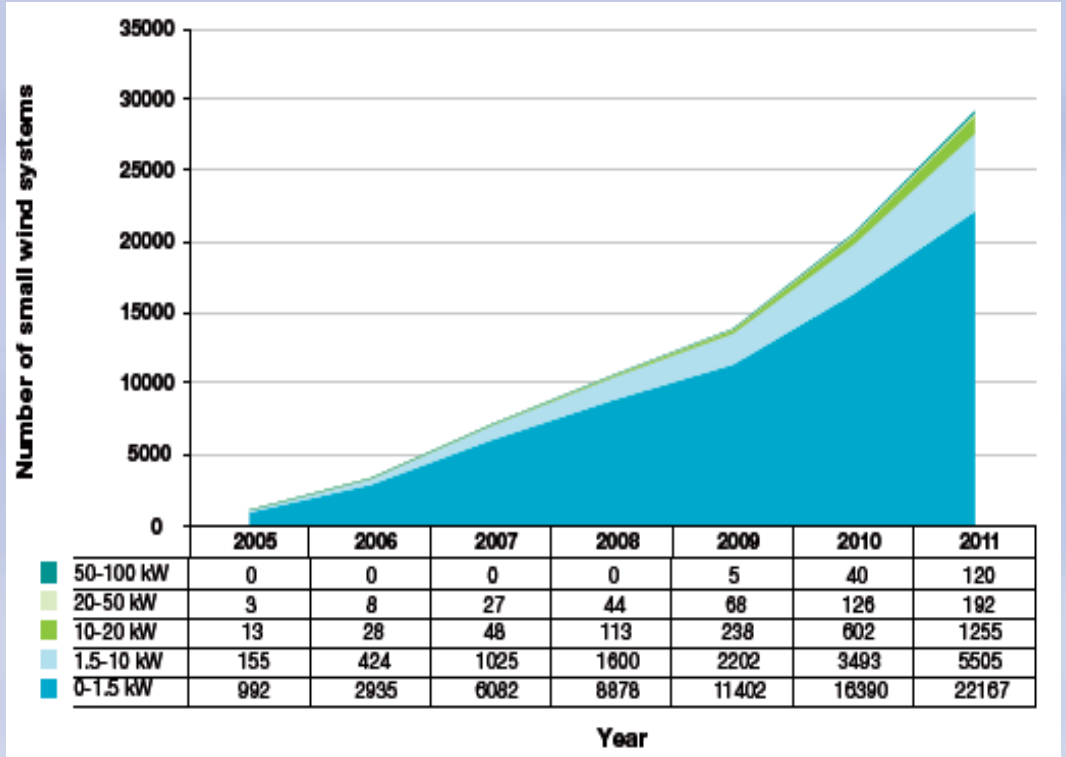


	2005	2006	2007	2008	2009	2010	2011
50-100 kW	0.00	0.00	0.00	0.00	0.38	2.63	6.00
20-50 kW	0.11	0.18	0.67	0.60	0.84	2.03	2.31
10-20 kW	0.20	0.23	0.30	0.98	1.88	5.46	9.80
1.5-10 kW	0.78	1.35	3.01	2.88	3.01	6.46	10.06
0-1.5 kW	0.99	1.94	3.15	2.80	2.52	4.99	5.78

RenewableUK data & prediction

UK cumulative number of installed small wind systems

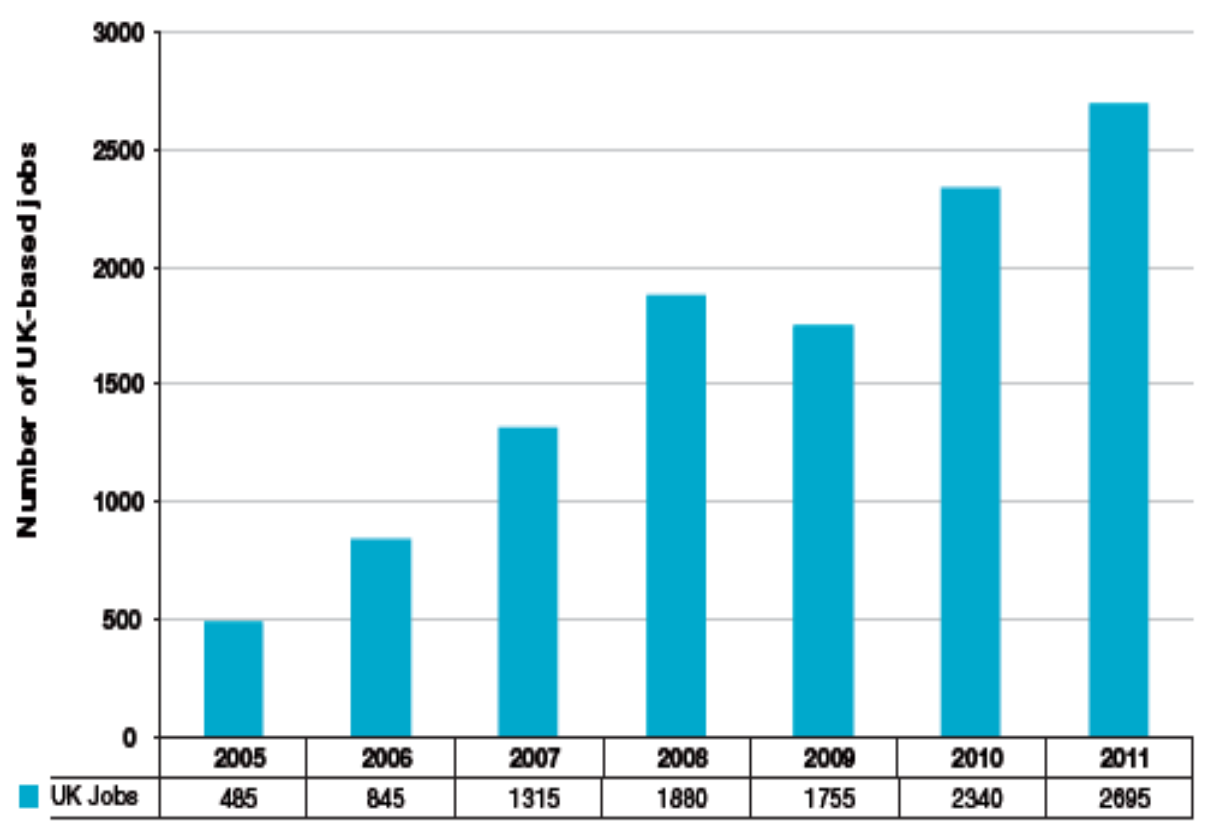
According to RenewableUK more than half of SWT installations are offline (esp. marine leisure & industrial users). Their April 2010 report shows this across all sizes



	2005	2006	2007	2008	2009	2010	2011
50-100 kW	0	0	0	0	5	40	120
20-50 kW	3	8	27	44	68	126	192
10-20 kW	13	28	48	113	238	602	1255
1.5-10 kW	155	424	1025	1600	2202	3493	5505
0-1.5 kW	992	2935	6082	8878	11402	16390	22167

RenewableUK data & prediction

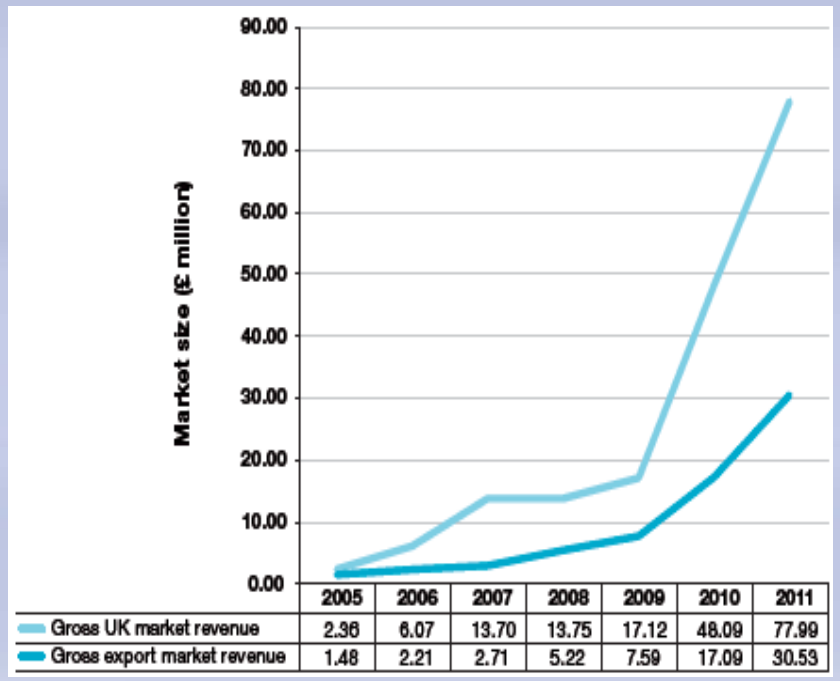
UK Jobs small wind systems sector



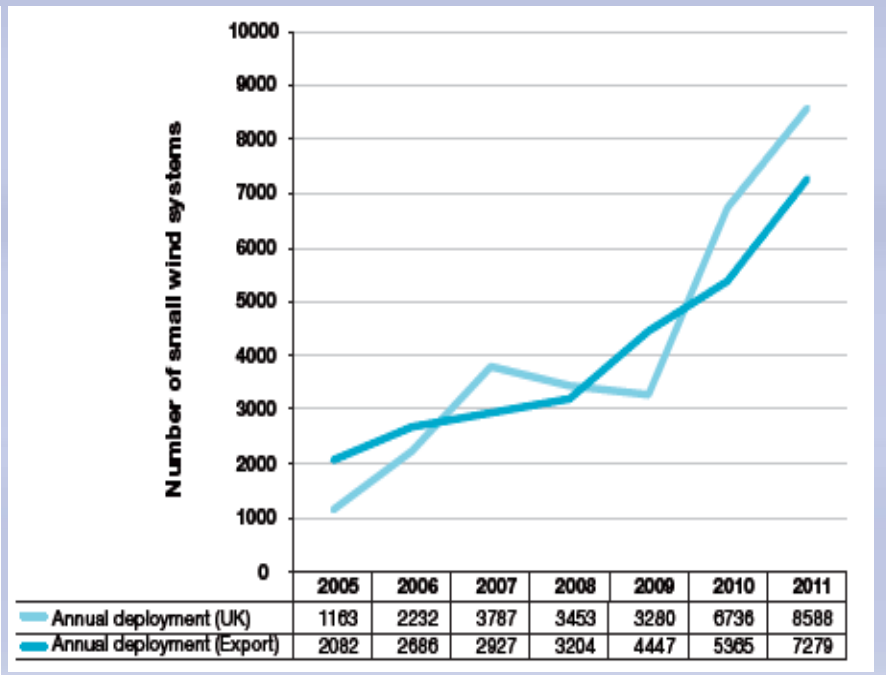
Year on year number according to RenewableUK

Export Markets

According to RenewableUK, April 2010



	2005	2006	2007	2008	2009	2010	2011
Gross UK market revenue	2.36	6.07	13.70	13.75	17.12	48.09	77.99
Gross export market revenue	1.48	2.21	2.71	5.22	7.59	17.09	30.53



	2005	2006	2007	2008	2009	2010	2011
Annual deployment (UK)	1163	2232	3787	3453	3280	6736	8588
Annual deployment (Export)	2082	2686	2927	3204	4447	5365	7279

Year by year Export and UK revenue values

Year by year Export and UK SW systems deployed

UK “market” rising faster than “numbers” in relative terms

UK Incentives & Feed-In tariffs

Table of tariffs up to 2013

Technology	Scale	Tariff level for new installations in period (p/kWh) [NB tariffs will be inflated annually]			Tariff lifetime (years)
		Year 1: 1/4/10 – 31/3/11	Year 2: 1/4/11 – 31/3/12	Year 3: 1/4/12 – 31/3/13	
Anaerobic digestion	≤500kW	11.5	11.5	11.5	20
Anaerobic digestion	>500kW	9.0	9.0	9.0	20
Hydro	≤15 kW	19.9	19.9	19.9	20
Hydro	>15-100 kW	17.8	17.8	17.8	20
Hydro	>100 kW-2 MW	11.0	11.0	11.0	20
Hydro	>2 MW – 5 MW	4.5	4.5	4.5	20
MicroCHP pilot*	<2 kW*	10*	10*	10*	10*
PV	≤4 kW (new build)	36.1	36.1	33.0	25
PV	≤4 kW (retrofit)	41.3	41.3	37.8	25
PV	>4-10 kW	36.1	36.1	33.0	25
PV	>10-100 kW	31.4	31.4	28.7	25
PV	>100kW-5MW	29.3	29.3	26.8	25
PV	Stand alone system	29.3	29.3	26.8	25
Wind	≤1.5kW	34.5	34.5	32.6	20
Wind	>1.5-15kW	26.7	26.7	25.5	20
Wind	>15-100kW	24.1	24.1	23.0	20
Wind	>100-500kW	18.8	18.8	18.8	20
Wind	>500kW-1.5MW	9.4	9.4	9.4	20
Wind	>1.5MW-5MW	4.5	4.5	4.5	20
Existing microgenerators transferred from the RO		9	9.0	9.0	to 2027

Renewable Energy Obligation Certificates are effectively outmoded for wind installations of about 1.5 MW and above. Thus SW relies now on FIT entirely

FITs are designed to put all qualifying technologies on an equal economic footing returning about 8% p.a. on capital plus export payment before tax

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Metering for Feed-In Tariffs

FIT payments require a **generation meter**.

Some UK Electricity suppliers will buy exported electricity at an agreed price, typically 3.5p per kWh

Exported electricity must be metered for systems larger than 30kW

Exported electricity may be metered or “deemed” to be 50% of total power generated until smart meters are enforced

General Permitted Development Orders (GDPO) 1

GPDO introduced 6 April 2008 gave permitted development status to some microgeneration schemes such as PV, solar thermal ground/water heat pumps, biomass and CHP

GPDO not yet granted to SWT but consultation has taken place as is likely lead to GPDO for wind.

GPDOs have location limits – typically exclude AONB, Conservation Areas, Listed Buildings, other sensitive areas

General Permitted Development Orders (GDPO) 2

UKAS approved standards will be mandated to moderate objections to the GPDO. These may include MCS and MIS. Noise levels in particular have not been agreed and attitudes to noise vary widely throughout UK Local Authorities.

Department for Communities and Local Government has issued recommendations for a staged introduction of GPDO for wind. RenewableUK believe this will accelerate deployment of qualifying installations and help realise market potential

General Permitted Development Orders (GDPO) 3

Likely key limiting features:
Free Standing:15m hub HAWT/15m total VAWT, max 6m blade HAWT or 28m^2 other, 100m from next turbine.
Roof Mounted: total height max 3m above roof high point, 2,5m blade dia or 5m^2. **Both Types**: UKAS Scheme

Interim GPDO awaiting UKAS scheme:
+ 100m separation from neighbour windows, max ref Sound Level 40dB(A), no overhang to public space, radar clearance (>11m), 3 Hz max

Source Iskra

Economic viability factors

- Risks

  Poor wind (local wind defect) - disrepute and losses
  Poor installation - disrepute and losses
  Unreliable/degradation – annoyance, lost production, cost

- Opportunities

  Rural investors (good sites, easier planning, bigger)
  Industrial/commercial sites (good sites, bigger) FIT

- Other issues

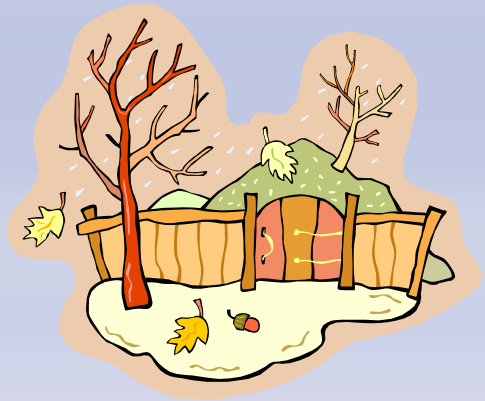
  Planning Consent
  Connection Cost
  Loans, interest rate, ROI
  Availability, Reliability & Maintenance
  Cost of Turbine Model Accreditation

Risk factors (1)

Poor Wind Assessment

Wind charts indicate statistical wind speeds at say 25m in unobstructed locations. Local topography may create highly significant reduction. Problem in urban areas especially but also in rural and industrial settings where immediate landscape, and nearby building or vegetation impact

Wind sampling is statistically limited by duration and errors may be large or biased



Risk factors (2)

Poor Installation

Mounting & site cause visual, vibration or audible nuisance or damage.

Bad workmanship leading to degradation & reduced life.

Mismatched components could lead to underperformance and excess cost.

Wrongly specified equipment mail fail

Unreliable or difficult to service, repair or replace components - frustration, production & financial losses, 20+yrs!

Competing Technology – Non Wind

FIT scheme levels the playing field yet matching the user and microgeneration technology is essential.

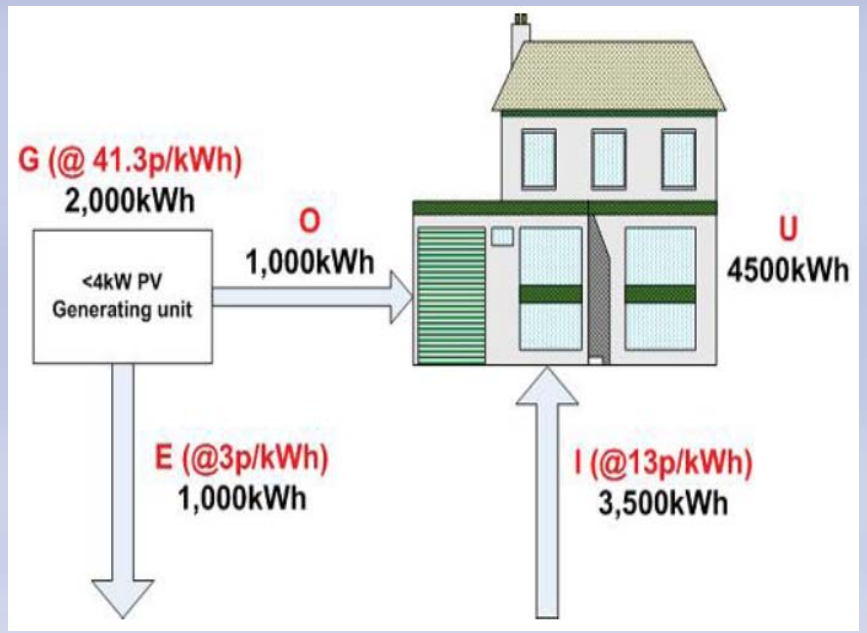
Anaerobic Digestion – Logistics of digestible material inputs, manpower, use for by-products, … **Likely users**:- Farmers, Local Authorities, Industry …

Hydro – Access to flowing water, **Likely users**:- Farmers, Landowners, Local Authorities …

Photo Voltaic – ~south facing installation**, Likely sites**:- Urban houses, commercial & horticultural premises. Maybe combined with other technologies on remote sites & standalone installations...

Example 1 - PV

PV rate for system size of 2000kWh x 41.3p = £826



Export for the 1000kWh exported

1000kWh x 3p = £30

Total: £856

Imported cost

3500kWh x 13p = £455

Saved imports

1000kWh x 13p = £130

The total benefit

£856 + £130 = **£986**

Competing Technology – SWT

Small Wind – “Good” Wind, non-sensitive (civilly acceptable) location, **Likely Users**:- Anybody with open space or tall building.

In reality, wind is unlikely to be “Good” in urban settings and acceptability by neighbours is precarious. GDPO review recommends turbines very limited in height and to be sited at least 100m from residential windows of buildings outside the curtilige of the development site.

Example 2: Community wind turbine

A 33 metre rotor diameter, 50 metre tower with a rated capacity of 330 kW.
Including planning, installation and connection will cost around £700,000 (refurbished turbines are cheaper but not eligible for FIT income!).
Installed in an exposed location with strong wind speeds outputs 700,000 kWh per year.
All the electricity is exported to the grid; the generation tariff for wind power at this scale is 18.8 pence per kWh. The community can expect to receive:

Generation tariff: 700,000kWh x £0.188/kWh = £131,600
Export tariff: 700,000kWh x £0.03/kWh = £21,000

Less annual maintenance expense (5% of capital cost)- £35,000

Total annual income£117,600

The turbine will have paid off its cost in less than 6 years, and will generate profits of around £1,6 million over a 20-year lifespan.

Summary

Valuable UK industry set to employ many people on systems for both home and export markets

The introduction of FITs has created an ambiance of financial confidence and rapid growth forecasts but some barriers and risks remain,

- Industry Reputation Risk from poor site assessment
- Individual financial risk due to poor wind estimation
- Planning is subject to local decisions. GPDO will cover only a limited range of sizes and locations, if and when it is introduced

Acknowledgements (1)

Discussions at RenewableUK's International Small Wind Conference 2010

Renewable UK (BWEA) – UK Market Report 2010

Department for Communities and Local Government (Entec UK Limited), Small-scale renewables and Low-carbon technology - Non-domestic permitted development review, November 2009

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Acknowledgements (2)

Image of Wind Turbine by a Welsh Village A 300 kW wind turbine, with a diameter of 28 m, situated on a hilltop overlooking a village in Carmarthen Bay, Wales, site of the Wind Energy Demonstration Centre. See www.corbisimages.com/Enlargement/EC002836.html

Example of calculation from
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