

Energy Farming



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7Y Energy 

Why Now?

Carrots (may be short-lived)

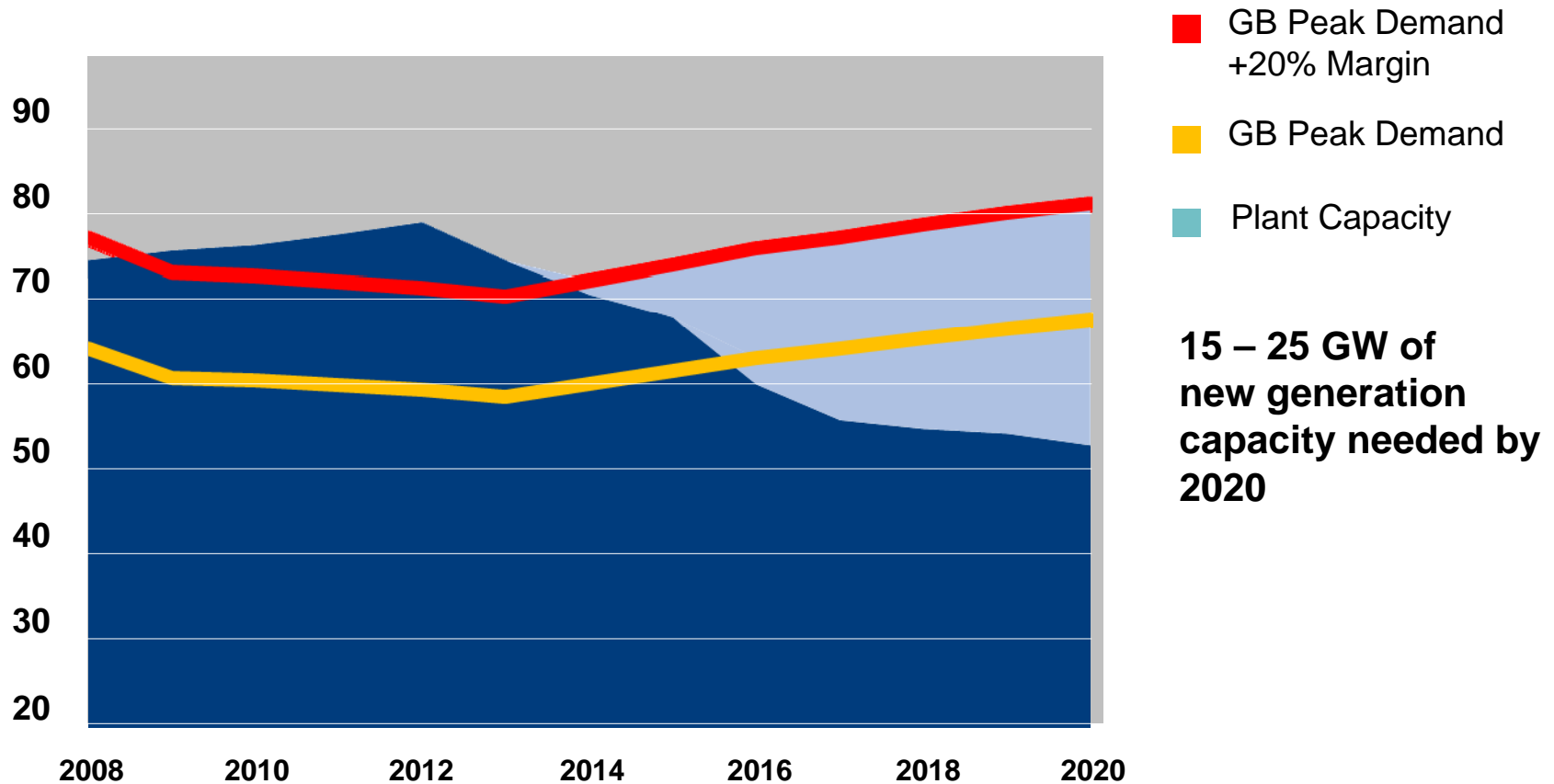
- Feed In Tariffs
- Renewable Heat Incentive (RHI) from late 2011?
- Tax breaks
- Soft loans

Sticks (getting bigger)

- Single Farm Payment review 2013
- Foresight report Jan 2011
- EU Emissions Trading Scheme
- Carbon Accounting
- Energy rationing?

Why Now?

Great Britain Generation Capacity Development (GW)



Source: Npower 2010

Why Now?

Crude Oil Price – 2004 to Now



Solar PV – Too good to be true?

- An investment that typically returns a guaranteed income of approx 12% for 25 years
- Majority of income linked to RPI
- Returns get better as electricity prices rise
- Low risk
- Low maintenance



Solar PV – Requirements (roof systems)

1. Roof – 8 -10m² per kWp of installed panels
2. Good Roof – less than 10 years old, strong
3. No shade on the roof
4. Pitch – between 10° and 40°
5. Orientation - South East to South West best
6. 3 Phase electricity supply (for systems > 15kWp)
7. Funds – 40kWp - £110,000
10 kWp - £30,000

Solar Feed-in Tariff Update

- Proposed changes to Solar Feed-in Tariff aiming at 1st August 2011
- Government must announce confirmed pricing and banding by 9th June 2011
- Likely that over 50kW systems will receive severely reduced Feed-in Tariff payment
- Further 'comprehensive FIT review' taking place with a view to reviewing tariffs for all technologies from 1 April 2012

Our key points for Solar PV

- Roof Condition and Strength
- Roof Fixing Method
- Quality Equipment
- Installer Experience

Fibre Cement Roof Frames



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Profile Tin Fixing Frame



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Aspect and Inclination

Orientation - Compass bearing

		West		SW		South		SE		East				
		270°	255°	240°	225°	210°	195°	180°	165°	150°	135°	120°	105°	90°
Vertical	90°	56	60	64	67	69	71	71	71	71	69	65	62	58
	80°	63	68	72	75	77	79	80	80	79	77	74	69	65
Roof Pitch (Degrees)	70°	69	74	78	82	85	86	87	87	86	84	80	76	70
	60°	74	79	84	87	90	91	93	93	92	89	86	81	76
	50°	78	84	88	92	95	96	97	97	96	93	89	85	80
	40°	82	86	90	95	97	99	100	99	98	96	92	88	84
	30°	86	89	93	96	98	99	100	100	98	96	94	90	86
	20°	87	90	93	96	97	98	98	98	97	96	94	91	88
	10°	89	91	92	94	95	95	96	95	95	94	93	91	90
Horiz.	0°	90	90	90	90	90	90	90	90	90	90	90	90	90

Percentage of potential radiation depending on aspect and pitch

Solar PV – 50kW

50kW Solar PV Array Capital Cost = £125,000

Feed-in Tariff of 32.9p/kWh

Export Tariff of 3.1p/kWh

Daytime Electricity Tariff of 10p/kWh

Expected Electricity Output per Year: 40,000 kWh

50% of the electricity used on site (20,000 kWh/year) and 50% exported to the National Grid (20,000 kWh/year)

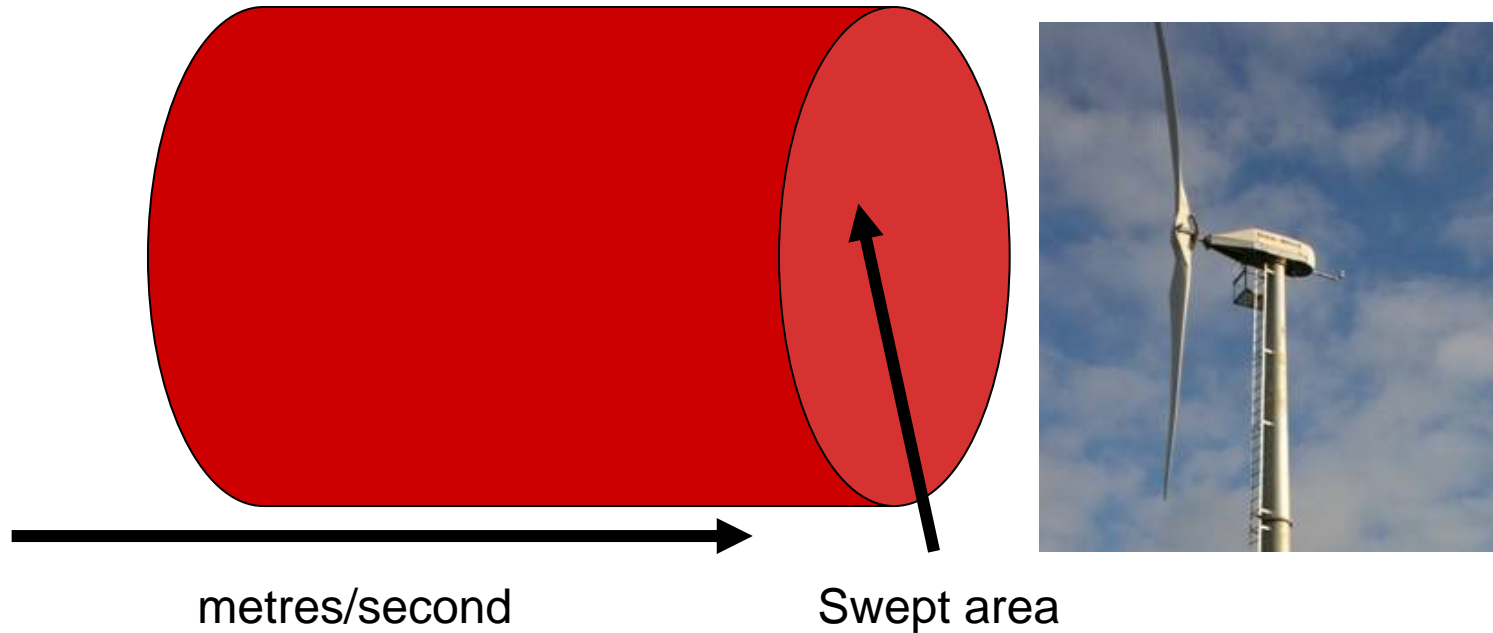
Total Income per year:	£15,780
Simple Return on Investment	7.9 years / 12.6 %

Wind Power

- A trickier proposition
- Do we have enough wind?
- Are wind speeds falling?
- Planning and neighbours



Wind as a Energy Source



- Energy is proportional to swept area and windspeed³
- Betz Law states that the fraction of the maximum power that can be extracted from wind is 59.3%

Wind Speeds

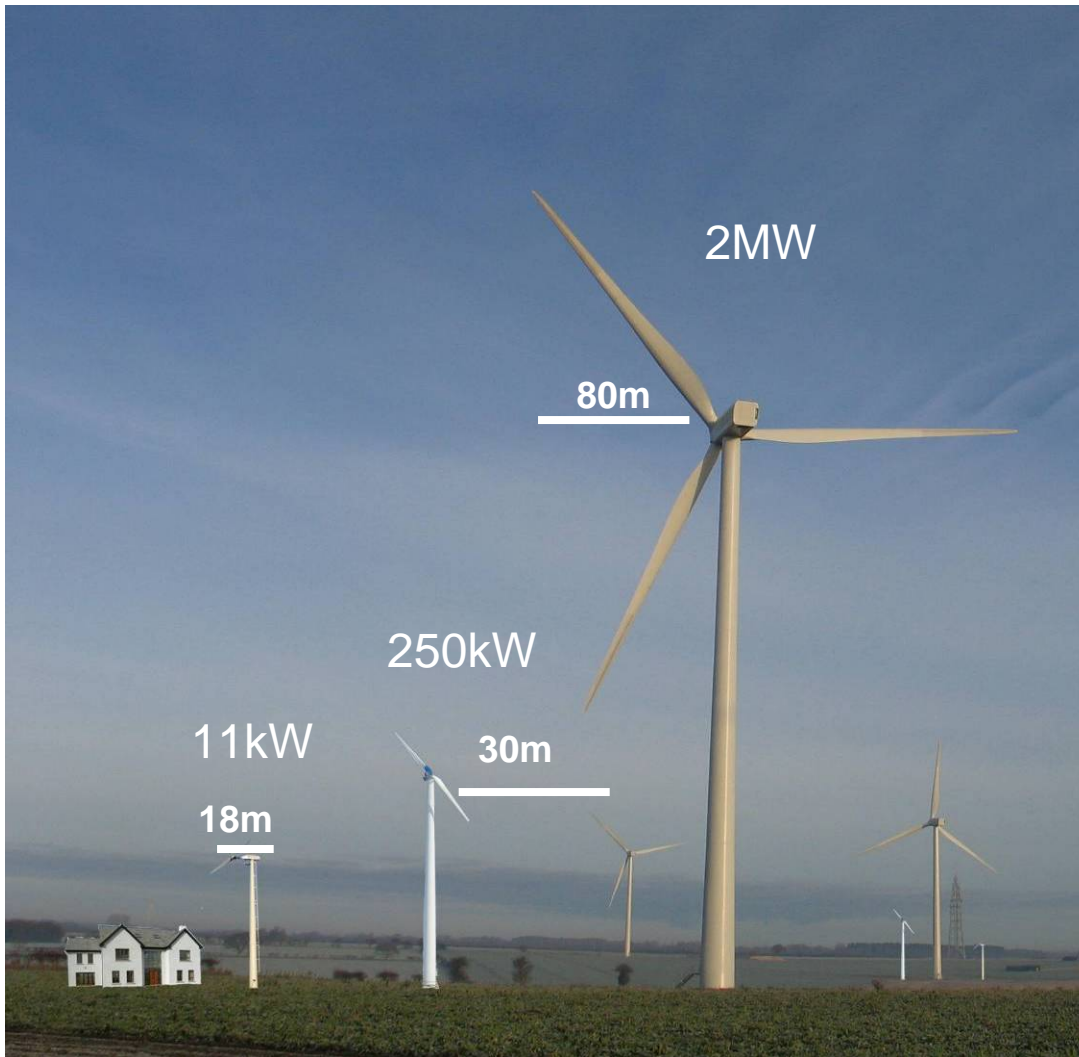
Metres/ Second (m/s)	Beaufort Scale	Miles per hour (mph)	Visible Affects
3	2	6-7	Leaves rustle, wind vane moves
4	3	8 -9	Leaves constantly moving, flags slightly extended
5	3	11-12	Leaves constantly moving, flags slightly extended
6	4	13-14	Small branches begin to move
10	6	22	Large branches moving, umbrellas difficult to use
25	9 - 10	55-56	Branches blow off trees

Wind Speed Estimation

Results for HR8 1HT (Leadon Court)

	Carbon Trust	NOABL
45m agl	6.7 m/s	6.8 m/s
25m agl	6 m/s	6.4 m/s
10m agl	4.9 m/s	5.6 m/s

Turbine Sizes



2MW £2m

250kW £500,000

50kW £250,000

11kW £65,000

5kW £25,000

The Wind Market – Farmer Choices

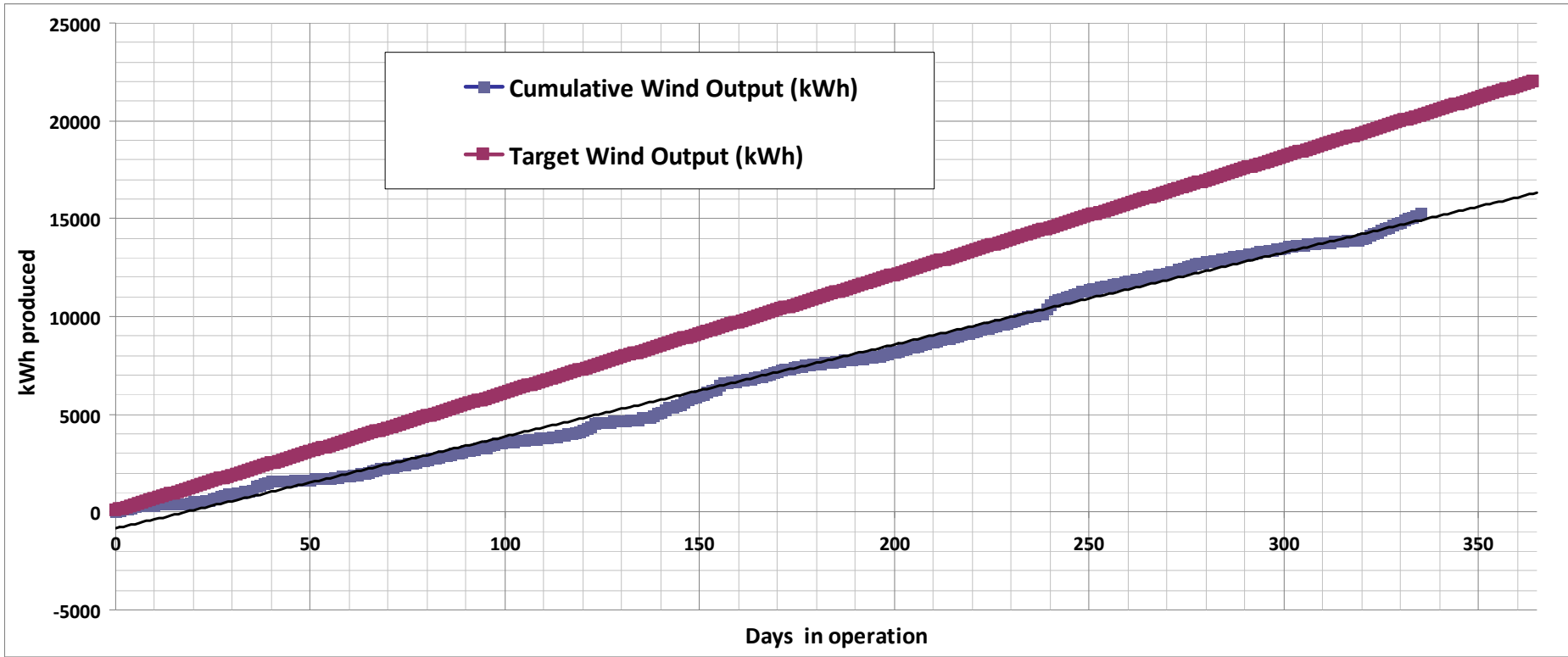
Small Single Turbine	<ul style="list-style-type: none">▪ Investment sub £100k▪ Planning achievable▪ No change in electricity supply (single or three phase)▪ ROCE 10-15%
Single Medium Turbine	<ul style="list-style-type: none">▪ Investment sub £750,000▪ Significant up-front planning costs▪ Electricity supply may need upgrade or be prohibitive▪ ROCE 15 – 20%
Onshore wind farm	<ul style="list-style-type: none">▪ Investment £10m- £20m▪ Funding: own resources, JV, developer (lease)▪ Planning difficult▪ Very location specific

Leadon Court Project Economics – 11kW

Leadon Court Expenditure:

Turbine	£46,673
Cabling	£6,197
Ground works	£7,500
Other	£2,500
Total Cost	£62,870

Turbine Performance



Current Generation: 15,267kWh (11/05/11)
Target: 22,000kWh (10/06/11)

Project Economics - Budget

Estimated Annual Generation: 22,000 kWh

FIT Income	26.7p/kWh	100%	£5,874
Own Use (Displaced Income)	10p/kWh	60%	£1,320
Deemed Export Income	3p/kWh	50%	£330
Total Income			£7194
Annual Costs/Maintenance			-£500
Net Annual Income			£6,694
ROC			11%

Project Economics – Actual 12 months to June 2011

Estimated Annual Generation: 16,000 kWh

FIT Income	26.7p/kWh	100%	£4,272
Own Use (Displaced Income)	10p/kWh	60%	£960
Deemed Export Income	3p/kWh	50%	£240
Total Income			£5,472
Annual Costs/Maintenance			-£500
Net Annual Income			£4,972
ROC			8%

Biomass Heating

- Wood Chip boilers
- Batch Log boilers
- Wood pellet boilers
- Straw, Miscanthus, SRC
- RHI
- Do you have your own woodland?



Boilers and System Parts



WOOD CHIP

Why use?

- Longer refuelling interval – more automation
- Relatively easy to produce fuel yourself



Why not?

- Size of fuel loading hopper and chip storage area required

Boiler and System Parts



LOGS

Why use?

- Cost effective
- No fuel preparation

Why not?

- Manual loading
- Large fuel storage area required

Boilers and System Parts



WOOD PELLET

Why use?

- Automation of fuel loading and supply
- Reduced fuel storage area
- Close substitute for fossil fuel system

Why not?

- Less cost effective
- Fuel will track oil price

Renewable Heat Incentive (RHI)

- Firm details announced March 2011
- Tariff payments for commercial installations commence Summer 2011
- Payments for domestic systems expected October 2012
- One off grant payments for domestic systems (Premium Heat Payments)
- Government funded – limited pot of money

Output and Income

65kW Wood Chip Boiler Installation
Heating Main House and Farm Cottage
Capital Cost = £ 50,000 (Equipment £25k)

Fuel Cost (Chip @ £90/t) = £3,150 per year

Fuel Savings (Oil) = £5,000 per year

RHI Income = £6,491 per year
(65kW x 1,314 hours x 7.6p)

Annual Benefit = £8,341 (5.9 years / 16.6%)

Other Renewable Technologies

Anaerobic digestion

- Need a waste stream
- Ethics of energy crops?
- What to do with the heat
- Model may change



Other Renewable Technologies

Heat pumps

- Ground, water and air sourced
- Amplify electrical energy
- Good for heating new buildings
- Pig and poultry applications



Other Renewable Technologies

Solar Thermal (hot water)

- Expensive
- RHI may or may not apply?
- PV probably better option now
- Good for new build
- Dairy hot water applications



Other Renewable Technologies

Biomass CHP

- Not commercialised on small or medium scale
- Emerging technology for poultry litter burning
- Smaller scale technology being developed



Other Renewable Technologies

Hydro

- Very site specific
- Need good head and flow
- Can convert old water wheels
- Long and complex projects



Any Questions?

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