



carbon free group

Renewables in Context

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Legal and Policy Context

- Change!
- Movement towards localism in planning.
- Code for sustainable homes Level 5-6 may be out?
- An altered code level 4 may be the new target with the UK calling a 56% carbon reduction “Zero Carbon”!
 - This may include provisions for allocated off site energy production.
- **Zero Carbon Hub** recommendations are that the “built performance” emissions from new homes should not exceed:
 - 10 kg CO_{2(eq)} /m²/year for detached houses
 - 11 kg CO_{2(eq)} /m²/year for other houses
 - 14 kg CO_{2(eq)} /m²/year for low rise apartment blocks

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A key element of the Group’s recommendations is to ensure that the potential gap between “as designed” and “as built” standards is closed.



Barriers and Opportunities for Builders

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Barriers

- Changing goal posts (e.g. FITs, RHIs, Code's, Targets etc.)
- Increased variability in the requirements on builders within/ between Districts and Boroughs and Counties
- There is still a genuine lack of skills in sustainable construction across all sectors
- Planning
- There is a greater need for valuing quality in sustainable buildings!

Opportunities

- Sustainable construction is becoming much more common
- FITs, RHIs and other financial incentives
- Some Local Authorities are requiring higher quality construction
- There is a new UK standard for sustainable construction skills being developed and high quality courses are now available see www.greengaugetrust.org
- Increasing oil costs will drive this agenda (THIS IS NOT GOING AWAY)

Cost Benefit Assessment

Current primary financial drivers in England for **renewable electricity**:

• Feed In Tariffs (FITs)

Renewed Tariffs from April 1st 2011 after 4.8% RPI Inflation is included

Energy Source	Scale	Generation Tariff (p/kWh) ^[A]	Duration (years)
Anaerobic digestion	≤500kW	14	19
Anaerobic digestion	>500kW	13	19
Hydro	≤15 kW	20.9	19
Hydro	>15 - 100kW	18.7	19
Hydro	>100kW - 2MW	11.5	19
Hydro	>2kW - 5MW	4.7	19
Micro-CHP ^[B]	<2 kW	10.5	19
Solar PV	≤4 kW new ^[C]	37.8	24
Solar PV	≤4 kW retrofit ^[C]	43.3	24
Solar PV	>4-10kW	37.8	24
Solar PV	>10 – 50 kW	32.9	24
Solar PV	>50 kW – 150 kW	19	24
Solar PV	150 kW-250 kW	15	24
Solar PV	250 kW-5 MW	8.5	24
Wind	≤1.5kW	36.2	19
Wind	>1.5 - 15kW	28	19
Wind	>15 - 100kW	25.3	19
Wind	>100 - 500kW	19.7	19
Wind	>500kW - 1.5MW	9.9	19
Wind	>1.5MW - 5MW	4.7	19
Existing generators transferred from RO		9.4	to 2020

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Export Tariff 3.1p/kWh

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Cost Benefit Assessment

Current primary financial drivers in England for **renewable heat**:

- **Renewable Heat Incentives (RHIs)**
- **2011 Tariffs are for industry, businesses and large organisations**
- **2012 Tariffs will include the domestic sector**

Levels of support					
Tariff name	Eligible technology	Eligible sizes	Tariff rate (pence/kWh)	Tariff duration (Years)	Support calculation
Small biomass	Solid biomass; Municipal Solid Waste (incl. CHP)	Less than 200 kWth	Tier 1: 7.6 Tier 2: 1.9	20	Metering. Tier 1 applies annually up to the Tier Break, Tier 2 above the Tier Break. The Tier Break is: installed capacity x 1,314 peak load hours, i.e.: kWth x 1,314
Medium biomass		200 kWth and above; less than 1000 kWth	Tier 1: 4.7 Tier 2: 1.9		
Large biomass		1000 kWth and above	2.6		
Small ground source	Ground-source heat pumps; Water-source heat pumps; deep geothermal	Less than 100 kWth	4.3	20	Metering
Large ground source		100 kWth and above	3		
Solar thermal	Solar thermal	Less than 200 kWth	8.5	20	Metering
Biomethane	Biomethane injection and biogas combustion, except from landfill gas	Biomethane all scales, biogas combustion less than 200 kWth	6.5	20	Metering

Reduce the Need

Fabric First Approach

- It is always best to make a building as efficient as possible so that the need for heating, cooling and electricity is minimised
- U values and air tightness
- However there is a line of diminishing returns
- Remember that roughly a maximum of 50-60% of the total carbon emissions are related to heating, the rest comes from electricity
- **This is where electricity generation is key**



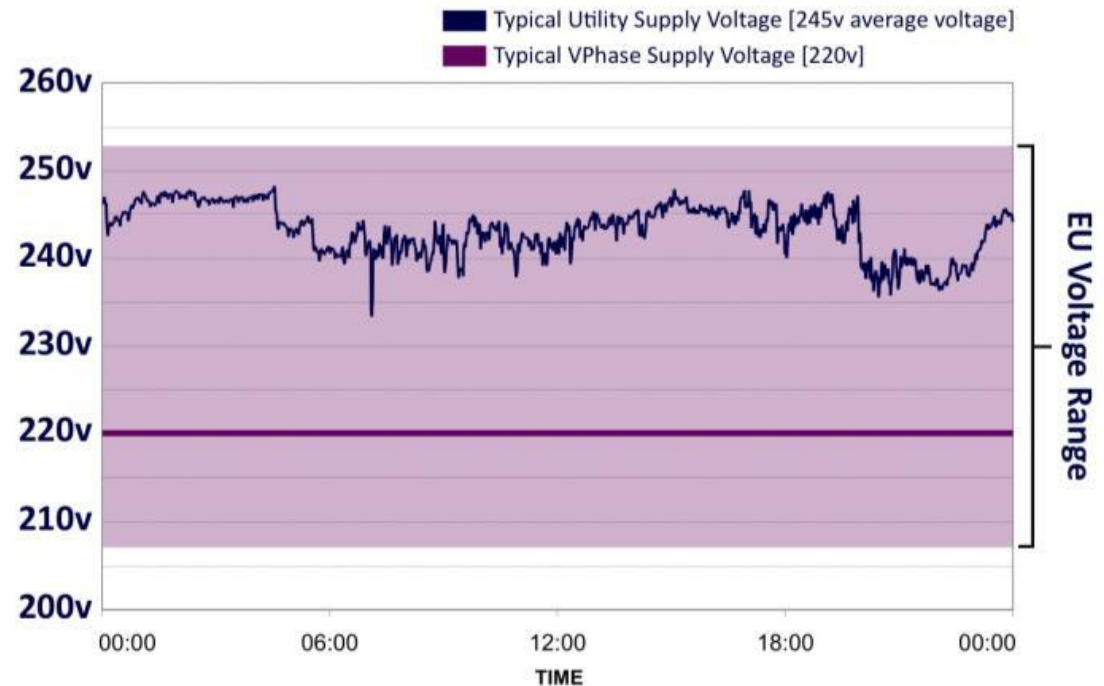
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Domestic Voltage Optimisation

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- EU appliance voltage limits (CE Mark) are 207V to 253V (230V+/- 10%)
- Appliances are designed to operate over this complete voltage range
- UK properties often fluctuate between 240V and 250V
- Voltages provided at the higher end of legal limits can result in inefficiencies in appliances



Domestic Voltage Optimisation

- Up to a 12% reduction in electricity consumption!
- Yearly saving of between £75-£135 at these properties
- Typical cost £299 plus VAT and installation (1 hour electrician)



ROI 20-25% Pay Back Period 4-5 years

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CASE STUDY

- Mr & Mrs H
- 5 bedroom detached house
- Family of 5
- Gas central heating, gas hob and electric oven
- Typical Voltage Reduction of 8.9%

VPHASE SAVES £75 PER ANNUM



CASE STUDY

- Mr & Mrs S
- 4 bedroom detached house
- Family of 5
- Gas central heating, gas hob and electric oven
- Typical Voltage Reduction of 7.1%

VPHASE SAVES £82 PER ANNUM



CASE STUDY

- Mr & Mrs B
- 4 bedroom detached house
- Family of 5
- Gas central heating and electric oven
- Typical Voltage Reduction of 10.3%

VPHASE SAVES £135 PER ANNUM



Photo Voltaic-Thermal (PVT)

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- **Hybrid technology** that combines, monocrystalline photovoltaics and a high efficiency solar thermal collector **simple low cost**, low maintenance energy solution able to facilitate the governments zero-carbon strategy
- **Higher output** a 28 M² PV-T system has the same outputs as a conventional 38 M² PV and a 8 M² SHW system (UK)

Average ROI 7-10% Pay Back Period 10-13 years

***WITH RHI** ROI 11-12% Pay Back period 8-9 years

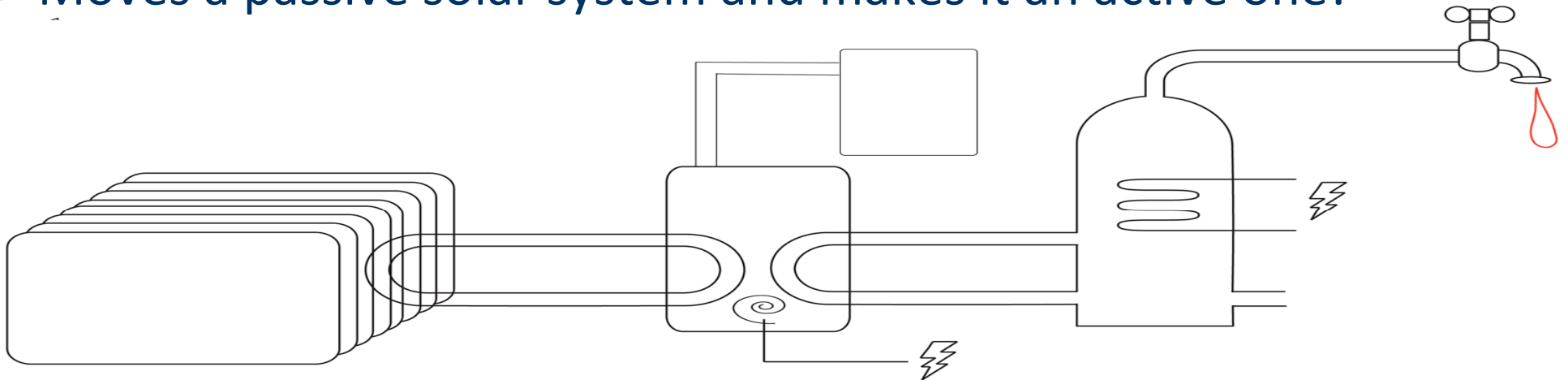


- **The Visual Aesthetic** is more consistent as a single panel is used to produce both heat and electricity

New Product – Hybrid Solar Solution (HSS)

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- Actively cooled PV-T system, in combination with a unique water-water heat pump to provide year round heating, domestic hot water and with optional ammonia cycle cooling for summer cooling
- The PVT produces all the annual electricity needed to run the system. A net zero-carbon Heating/DHW with cooling potential
- Moves a passive solar system and makes it an active one!



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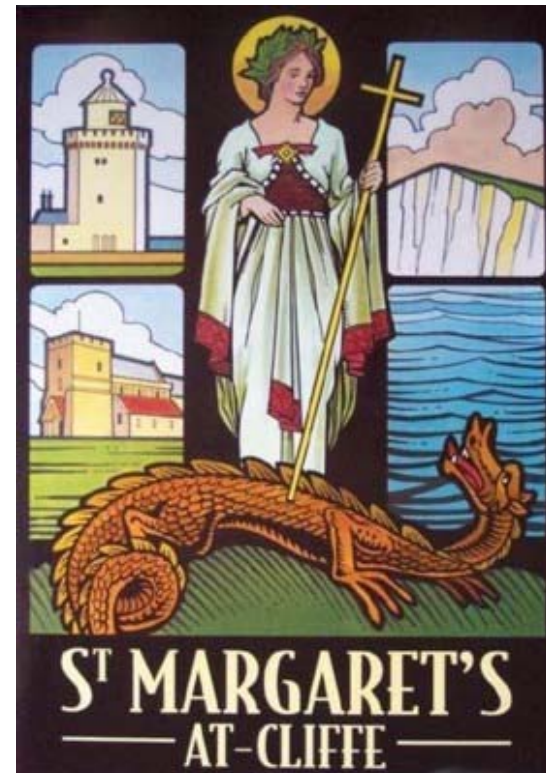
Transition Power Community Energy Strategies

Overview of St Margaret's at Cliffe

-St Margaret's is a seaside village set on the White Cliffs of Dover in Kent; it is located 3 miles from the city of Dover

-The village has approximately **3000 permanent residents with around 1370 households**

-The estimated total electricity consumption for the St Margaret's Bay community is **8,300,000 kWh/yr**



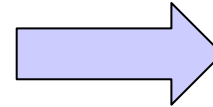
Large Scale Wind

**4 E48 800 KW turbines
mounted on 50 meter masts:**

- Total cost **£4 million**
- Annual Revenue **£710,000**
- Payback Period **5.7 years**
- Return on Investment **17.5%**

- Cost per household: **£2920**
- Annual Income per household:
£519

E48 800 kW
turbine
mounted on 76
Meter mast



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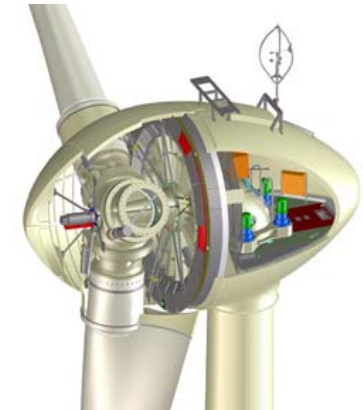


E 70 2.3 MW
Turbine
mounted on
113 meter
mast

**2 E70 2.3 MW turbines
mounted on 64 meter masts:**

- Total cost **£4.6 million**
- Annual Revenue **£982,000**
- Payback Period **4.7 years**
- Return on Investment **21%**

- Cost per household: **£3358**
- Annual Income per household:
£717



Bio-Mass

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4.5 MW WID Bio-Mass system

- With fuel price of £30/Tonne
- Total cost £16-17 million
- Annual Revenue £3,548,913
- Payback Period 4.5 years
- Return on Investment 22%
- 16 Permanent Jobs Created
- Offset over 16,000 Tonnes of CO₂/yr



Anaerobic Digestion (AD)

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100 KW AD System

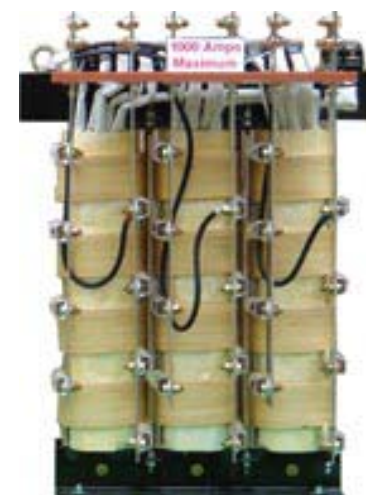
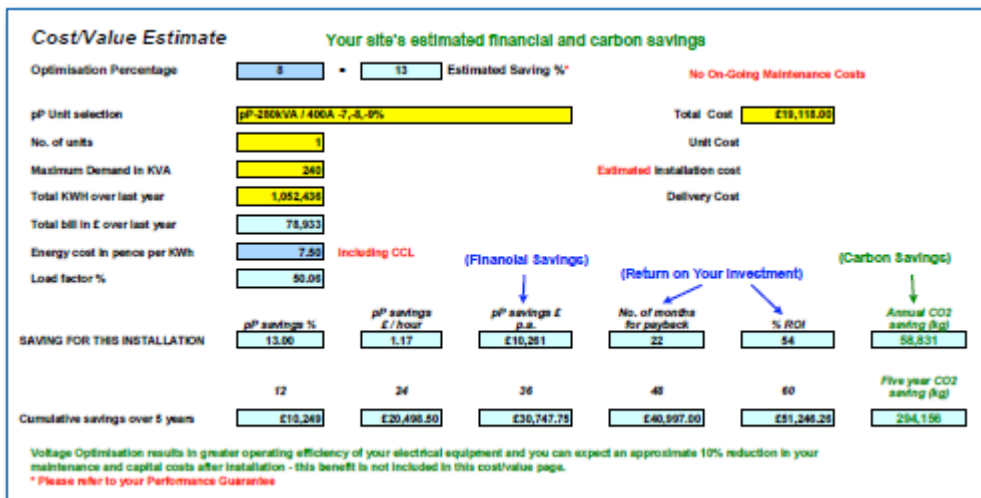
- Total cost £540,000
- Annual Revenue £83,450
- Payback Period 6.5 years
- Return on Investment 15.5%

- Cost per household: £395
- Annual Income per household:
£61



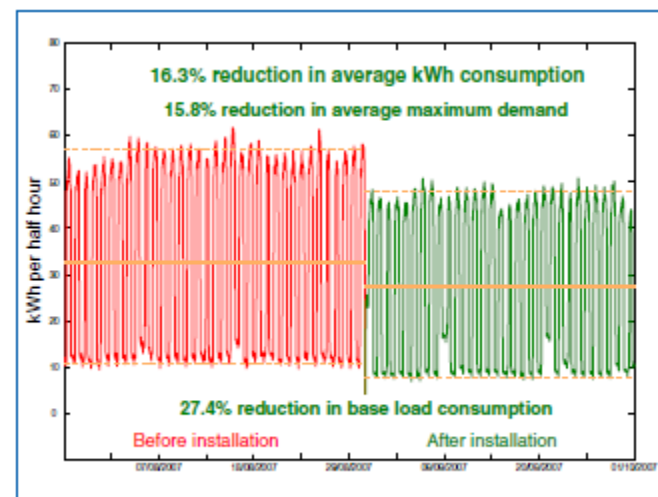
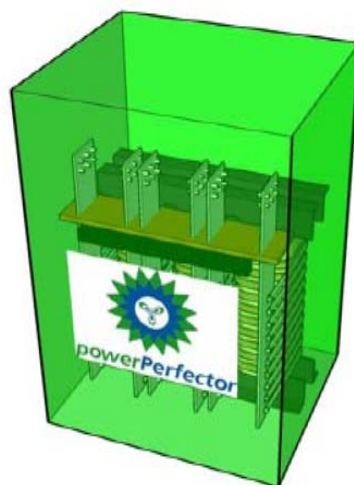
Voltage Optimisation

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Voltage Optimisation

- Total cost £365,000
- Annual Savings £93,000
- Payback Period 4 years
- Return on Investment 25%
- Cost per household: £266
- Annual Income per household: £66



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**2 WES30 250 KW turbines
mounted on 30 meter masts:**

- Total cost £1.175 million**
- Annual Revenue £271,000**
- Payback Period 4.32 years**
- Return on Investment 23%**
- Carbon Offset 629 Tonnes/yr**





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Sustainability my definition:



Thank you

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