ENERGY STATEMENT

Replacement Dwelling at Holly Farm, High Peak

Project No: **7/4806**

Date: **12/08/2013**

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Report Origin

Revision	Date	Revision Description		Name	Signature
PS1	12th August 2013	Original	Prepared	G.Hirst	GFHirst
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			Approved	G.Hirst	GFHirst

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Associate

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1 EXECUTIVE SUMMARY

This statement is for a replacement dwelling at Holly Farm, Briargrove Road, High Peak, Derbyshire.

High Peak Borough Council expects 10% of the predicted energy demand of major developments to be generated on site by renewable means. While this development is not classed as a major development it is expected that this development will **exceed 15% onsite renewables.**

High Peak Borough Council expects new homes in the borough to meet the three star level of the Code for Sustainable Homes. The proposed development will meet a **five star** code level.

It is proposed to use a progressive level of fabric performance, low carbon and renewable technologies to meet the requirement for energy to meet the mandatory requirement of code level 5. The dwelling will need **less than 46 kWh/m^2** of energy for heating and cooling per annum.

The proposed replacement dwelling will reduce and offset 100% of the regulated carbon emissions by utilising ground source and air source heating as well as generating on site electricity from **10kWp photovoltaic** (PV) array.

The PV will also help contribute towards decentralised generation targets that the Government has set.

The dwelling will utilise **grey water recovery** system along with low water usage fittings to meet the mandatory requirements of internal water usage for code level 5.

Water will also be collected from the sedum roof and re-used for water the gardens and maintaining moisture levels of the sedum.

2 TERMS OF REFERENCE

Clancy Consulting have been requested to prepare an Energy Statement to identify the clients approach to achieve a more sustainable development.

The Government is committed to see a reduction of CO2 emissions by 60% from the current levels by 2050 and to see 10% of UK electricity requirements being met be renewable sources by 2010

High Peak Borough Council expects 10% of the predicted energy demand of major developments to be generated on site by renewable means. While this development is not classed as a major development it is expected that this development will exceed 15% onsite renewables.

High Peak Borough Council expects new homes in the borough to meet the three star level of the Code for Sustainable Homes. The proposed development will meet code level 5.

3 INTRODUCTION

This statement is for a replacement dwelling at Holly Farm, Briargrove Road, High Peak, Derbyshire.

Calculations have been based on the proposed dwelling to ascertain the likely building fabric and services performance needed for the project. This, therefore, provides targets and principles which will influence the early stages of design to create a building which maintains a high level of sustainability

3.1 Energy for Code for Sustainable Homes

High Peak expects new homes to meet a Code for Sustainable Homes level 3. However, the proposal of this site is to exceed this requirement by meeting code level 5

To support meeting code level 5 a completed SAP calculation has been carried out on the dwelling. Code level 5 has mandatory requirements for the building's fabric, carbon emissions and internal water usage.

The requirement for carbon emissions is that all regulated carbon (ie. Carbon associated with lighting, heating, cooling, domestic hot water and auxiliary energy) is reduced and offset by 100%. The fabric performance and indoor water usage requirements are shown below,

Carbon Emissions (ENE 1)

Criteria		
% Improvement 2010 DER/TER*[1]	Credits*[2]	Mandatory Requirements
≥ 8%	1	
≥ 16%	2	
≥ 25%	**3**	**Level 4**
≥ 36%	4	
≥ 47%	5	
≥ 59%	6	
≥ 72%	7	
≥ 85%	8	
≥ 100%	**9**	**Level 5**
Zero *Net CO_2 Emissions*	**10**	**Level 6**

Fabric Energy Efficiency (FEE) (ENE2)

Criteria			
Dwelling Type*1		Credits*2	Mandatory Levels
Apartment Blocks, Mid-Terrace	End Terrace, Semi-Detached & Detached		
Fabric Energy Efficiency kWh/m²/year			
≤ 48	≤ 60	3	
≤ 45	≤ 55	4	
≤ 43	≤ 52	5*3	
≤ 41	≤ 49	6	
≤ 39	**≤ 46**	**7**	**Levels 5 & 6**
≤ 35	≤ 42	8	
≤ 32	≤ 38	9	

Indoor Water Use (WAT1)

Criteria		
Water consumption (litres/person/day)	Credits	Mandatory Levels
≤ 120 l/p/day	1	Levels 1 and 2
≤ 110 l/p/day	2	
≤ 105 l/p/day	3	Levels 3 and 4
≤ 90 l/p/day	4	
≤ 80 l/p/day	5	Levels 5 and 6

4 PRINCIPLES FOR MEETING CARBON EMISSION REQUIREMENTS OF CODE FOR SUSTAINABLE HOMES LEVEL 5

The following principles will be used when meeting building regulation requirements:

4.1 Building Fabric

The building fabric is the energy efficient measure which usually has the longest impact on energy efficiency. While building services system can be change and upgraded approximately every 15 years; upgrading building fabric (once built) can be costly and impractical. The thermal performance of the chosen building fabric is therefore progressive, maximising the future proofing of the design. The following fabric performance is an example of performance required for code 5 which achieves the 46 kWh/m^2/year

Fabric Performance		
Element		**Performance Code 5**
Fabric U-values ($W/m^2.K$)	Roof	0.10
	Wall	0.15
	Ground floor	0.10
	Window	0.9
	Roof Light	1.3
	Doors	1.3
Thermal Bridging Y-value ($W/m^2.K$)	Junctions	0.06
Air permeability	(m^3/hr per m^2)	3.0

Table 1: Fabric Performance

5 RENEWABLE TECHNOLOGY

Summary of the Low Carbon and Renewable Energy Options Appraisal

In this section the technical feasibility of each of the low carbon and renewable energy technologies for the site have been assessed in order to rule out unfeasible options.

Technology	Generation		Benefits	Issues Surrounding Technology Considered by this Report	Note
	Thermal	Electricity			
Wind (independent mounted)		✓	▪ Low maintenance/ongoing costs ▪ Excess electricity can be exported to Grid	▪ The Energy Saving Trust Wind Speed prediction tool estimates the average wind speed to be 3.9 m/s for a domestic wind turbine. ▪ Turbulence from local obstructions requires consideration ▪ Noise needs considering ▪ Additional cost of private wire system required	✗ *(Inadequate wind speed)*
Solar PV		✓	▪ Low maintenance as no moving parts ▪ Easily integrated into building ▪ No on-going costs ▪ Excess electricity can be exported to Grid	▪ Expensive technology to install ▪ Any overshadowing of panel effects output performance ▪ East and west pitched roof reduces performance below optimum but can increase available roof area to mount PV's ▪ Feed in Tariffs available on compliant installations	✓
Solar Thermal	✓		▪ Low maintenance ▪ Low capital costs ▪ No on-going costs ▪ Tested technology	▪ Must be sized on the hot water requirements of building ▪ Ideal for developments with high year-round domestic hot water loads ▪ East and west pitched roof reduces performance below optimum. ▪ Minimal carbon reduction when paired with biomass heating	✓ ✗ (for where biomass heating is used)
Biomass Heating	✓		▪ Stable long term running costs ▪ Supports the local community ▪ Reduces fuel poverty for properties off gas network	▪ Space required for storage of fuel and plant (inc hot water buffer storage etc) ▪ Reliable fuel supply chain required ▪ Regular maintenance required/ash disposal ▪ Due to space requirements wood chip is less viable than wood pellets (wood chips require 3 times volume for same energy output). Energy costs for pellets is slightly higher than that for gas (approx. 6-	✗ (space issues for store and concerns of delivery access in winter)

				10% more) ▪ Could be eligible for Renewable Heat Incentive but price will be applicable to installation date.	
Ground Source Heating	✓		▪ High energy output per energy input ▪ Unobtrusive technology ▪ Minimal maintenance	▪ Large area required for horizontal pipes ▪ Full ground survey must be carried out ▪ Low temperature water heating circulation required for optimum performance ▪ Areas of permeable car parking surface recommended to maintain ground moisture conditions ▪ High capital costs	✓
Ground Source Cooling	✓		▪ High energy output per energy input ▪ Unobtrusive technology ▪ Minimal maintenance	▪ As for ground source heating, except suitable cooling distribution system required ▪ Restores ground temperature when used in conjunction with ground source heating	?
CHP (Non-renewable: LPG fuelled)	✓	✓	▪ Efficient use of fuel (approx 80%) ▪ Excess electricity can be exported to grid	▪ Sized to year-round base load heating or hot water requirement of development ▪ Fuelled by gas or diesel ▪ Regular maintenance required	? (to be considered within detailed design)
Ground/ coupling using air/ ground water Cooling / surface water cooling	✓		▪ Use of existing ground / ground water or adjacent water body to deal with small cooling loads	▪ Ground water cooling and surface water cooling require licence from the Environment Agency and/or British Waterways. ▪ These methods of cooling cannot provide close control of temperatures	✗

Note: √ = Considered a Viable Option for this site

x = Not Considered Viable

? = Detailed Study Required, Border Line Option for this site.

5.1 Renewable Technology initial proposal

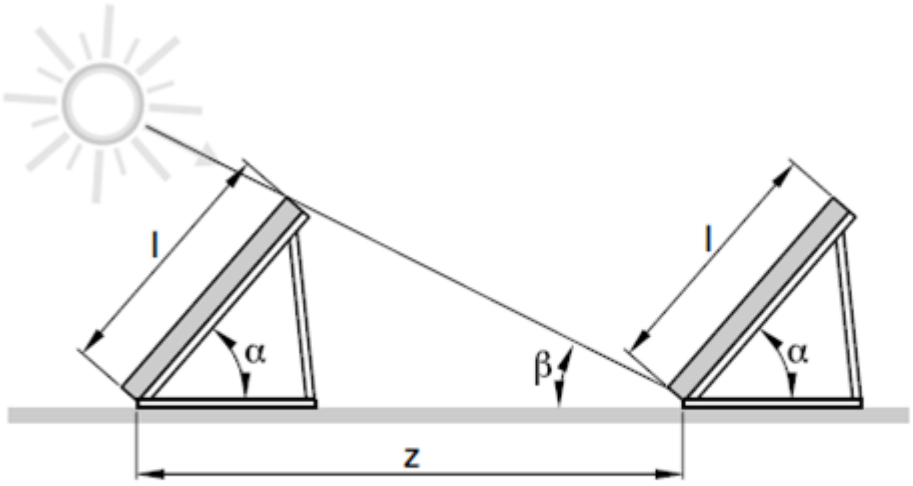
Based on the above assessment, it is proposed at this stage to utilise the following low and zero carbon technologies

- Ground Source heat pump
- Air Source heat pump
- Photovoltaic Panels (10kWp)

A 10kWp equates to a PV panel area of 73m^2. Based on a panel inclination (tilt) of 20 degrees the amout of ground area to locate the panels would be as follows:

- approximately **14.5m x 13.5m (196 sqm)** for panels laid in **portrait** (4 rows)
- approximately **15.5m x 13.5m (209 sqm**) for panels laid in **landscape** (8 rows)

[Note: The panel area has been increased to account for a loss of performance (4%) for SE/SW orientation at 20 degrees. Ground areas include 750mm margin for access]



z = Panel row distance
l = Panel height
α = Angle of panel inclination
β = Angle of the sun

While solar thermal may be an option, the location of the panels would be more ideal close to the plant room. As it is intended for all solar collectors to be positioned remote from the building then solar thermal has not been included at this stage, as there would be increased thermal losses and pumping requirements. The solar thermal option may be further considered in the detailed design.

Cooling has been included within the SAPs calculations and the associated carbon emissions offset via the selected renewable technology.

5.2 Building Services Systems to meet code level 5.

All building services shall be energy efficient to minimise carbon emissions from their operation.

Table 2 shows the current proposal to meet code level 5 of the Code for Sustainable Homes. It is anticipated that the actual solution will likely deviate from the performances stated, however by considering the strategy at an early stage allows the design team to accommodate proposed solutions maximising available options to provide the most sustainable development possible.

Any renewable solutions used within properties will meet the requirements of the micro generation certification scheme (MCS) or equivalent so that a successful and efficient system is installed, which is also eligible for Feed in Tariff and Renewable Heat Incentive, where applicable.

It is imperative that all of the buildings, their engineering services and renewable energy systems are properly and accurately commissioned to ensure that their performance meet the design expectations.

Description	Details
Main Heating System (50%)	Ground Source Heat Pump
Main Heating System (50%)	Air source Heat Pump
Ventilation Method	MVHR
Ductwork type	Rigid
Specific Fan Power (W/l/s)	0.7
Heat Recovery Efficiency (%)	88
Energy Efficienct Lighting (%)	100
Photovoltaics	Yes
PV Peak Power	10kWp
PV Orienatation	Southwest or South East
PV tilt	30°

Table 2: Proposed Building Services Solutions to Meet Code level 5

Key:
MVHR – Mechanical Ventilation with Heat Recovery.
Kwp – Kilowatt Peak

The above proposal for building services along with the fabric performance shown in section 4.1 provides the following credit scores as evaluated by SAP calculations (see appendix A:

Ene 1: 9 credits
Ene 2: 7.1 credits
Ene 7: 2 credits

The SAP calculation is the government's official Standard Assessment Procedure (SAP) for demonstrating carbon emissions for building regulation purposes. This is also the basis for the Code for Sustainable Homes Assessment

6 INITIAL CODE FOR SUSTAINABLE HOMES ASSESSMENT (TECHNICAL GUIDE NOV 2010)

This initial code assessment is based on the proposed building services and fabric solution indicated in the previous sections. The assessment gives an indication of the design team's initial intent for meeting code level 5. It is likely that the approach to meeting code level 5 will develop throughout the design stages but the client understands that to meet such a progressive level of the code, an early inception is required.

ENERGY & CARBON DIOXIDE EMISSIONS

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Ene 1	Dwelling Emission Rate	10	9		10.57	100% Improvement in DER/TER
Ene 2	Fabric Energy Efficiency	9	7.1		8.34	Less than 46 kWh/m2/Year
Ene 3	Energy Display Devices	2	2		2.35	Full compliant Device to be included
Ene 4	Drying Space	1	1		1.17	Provision of Drying Space
Ene 5	Energy Labelled White Goods	2	2		2.35	Energy efficient white goods to be provided under the contract
Ene 6	External Lighting	2	2	1.17	2.35	Energy efficient lighting with energy saving controls
Ene 7	Low or Zero Carbon Technologies	2	2		2.35	PV Panels/ Ground and air source provide >15% renewables
Ene 8	Cycle Storage	2	2		2.35	Maximum storage for cycles provided
Ene 9	Home Office	1	1		1.17	Sufficient space and services in a suitable quiet area provided for working in an home office
Totals For Energy Section			91%		32.99	

WATER

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Wat 1	Indoor Water Use	5	5	1.5	7.5	Water usage ≤ 80 l/p/day using low water usage fittings and grey water harvesting
Wat 2	External Water Use	1	1		1.5	Dwelling to have 200 litre storage for watering main garden area
Totals For Water Section			100%		9.00	

MATERIALS

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Mat 1	Environmental Impact of Materials	15	12		3.6	Use of Green Guide products to A/A+ products
Mat 2	Responsible Sourcing of Materials- Basic Building Elements	6	4	0.3	1.2	100% FSC Timber for frame, upper floors, roof timbers and internal walls. Concrete and roof tiles to be EMS certified for key processes
Mat 3	Responsible Sourcing of Materials- Finishing Elements	3	2		0.6	100% FSC Windows , doors and skirting boards and other finishing elements as required
Total For Materials Section			75%		5.40	

SURFACE WATER RUN-OFF

<u>Mandatory requirements:</u> Peak & volume runoff into water courses to be no greater for developed site than it was for pre-developed site Additional volume runoff caused by new development to be reduced by infiltration/ soakaways

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Sur 1	Management of Surface Water Run-off from Developments	2	2	0.55	1.1	SUDS incorporated to ensure no discharge with 5mm of rainfall. Runoff from hard surfaces treated
Sur 2	Flood Risk	2	2		1.1	Low flood Risk Area
Totals For Surface Water Section			100%		2.20	

WASTE

Mandatory requirements: Adequate external space provided for waste storage

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Was 1	Storage of Non-recyclable Waste and Recyclable Household Waste	4	4	0.80	3.20	Adequate internal and external storage
Was 2	Construction Site Waste Management	3	3		2.40	Site Waste Management Plan in place diverting at least 85% from landfill
Was 3	Composting	1	1		0.80	Individual composting to be provided
Totals For Waste Section			100%		6.40	

POLUTION

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Pol 1	Global Warming Potential Of Insulants	1	1	0.7	0.7	All insulating materials have GWP <5
Pol 2	NOx Emissions	3	0		0	Credits not available for heat pumps
Totals For Pollution Section			25%		0.70	

HEALTH & WELLBEING

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Hea 1	Daylighting	3	1	1.17	1.17	Dining Room, Lounge, study to achieve a daylight factor of 1.5%
Hea 2	Sound Insulation	4	4		4.67	Detached Property
Hea 3	Private Space	1	1		1.17	Private space provided by gardens
Hea 4	Lifetime Homes	4	4		4.67	Lifetimes homes requirements to be met
Totals For Health & Wellbeing Section			83%		11.67	

MANAGEMENT

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Man 1	Home User Guide	3	3	1.11	3.33	Guide to enable occupants to understand and operate the home efficiently and make best use of local facilities to meet a low carbon lifestyle
Man 2	Considerate Constructors Scheme	2	2		2.22	Contractor is significantly beyond best practice requirements
Man 3	Construction Site Impacts	2	2		2.22	4 or more site procedures set up by contractor
Man 4	Security	2	2		2.22	Crime prevention design advisor (CPDA) to be consulted at the design stage
Totals For Management Section			100%		10.00	

ECOLOGY

CAT	CREDIT DESCRIPTION	CREDITS AVAILABLE	CREDITS TARGETED	WEIGHTED VALUE PER CREDIT	POINTS ACHIEVED	COMMENTS
Eco 1	Ecological Value Of Site	1	0	1.33	0.00	Credit not available
Eco 2	Ecological Enhancement	1	1		1.33	Qualified Ecologist employed and design adopts their recommendations
Eco 3	Protection Of Ecological Features	1	1		1.33	All existing ecological features to be kept
Eco 4	Change Of Ecological Value Of Site	4	3		4.00	Ecological features to be added to provide a minor enhancement to the ecology value of the site.
Eco 5	Building Footprint	2	0		0.00	Not available
Totals For Ecology Section			56%		6.67	

TOTALS	POINTS ACHIEVED	COMMENTS
Total Score	85.03	84 Points required for code level 5
Total Score (Estimated Best Case)	85.03	

7 INDOOR WATER USAGE TO MEET CODE LEVEL 5

Water saving measures will be incorporated into the design to utilise low water usage fittings to achieve a maximum of 80 litres per person per day as required by the mandatory requirements of code level 5. The following measures indicate likely performances required by sanitary appliances and fittings to meet this requirement.

- Taps – 4 litre/min
- Baths – 195 litre and 230 litre capacity to overflow *[water collected for grey water harvesting]*
- Showers – 9 litre/min *[water collected for grey water harvesting]*
- Dishwasher– 1litre per place setting(provided under contract)
- Washing machine – fed from grey water harvesting
- W.C's - fed from grey water harvesting
- Kitchen – 7 litres/min
- No waste disposal unit
- No water softener
- Grey water harvesting

Note: We have not included rainwater recovery in the proposals due to the use of the sedum roof which turns the water yellowish. The water from the roof will; however, be collected and used for either watering the roof and/or used for watering the garden.

9 SUMMARY

It is proposed to use a progressive level of fabric performance, low carbon and renewable technologies to meet the requirement for energy to meet the mandatory requirement of code level 5.

The proposed dwelling will meet an overall code level 5 against Code for Sustainable Homes assessment method.

The proposed replacement dwelling will reduce and offset 100% of the regulated carbon emissions by utilising ground source and air source heating as well as generating on site electricity from 10kWp photovoltaic (PV) array.

The PV will also help contribute towards decentralised generation targets that the government has set recognising that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions.

The dwelling will utilise grey water recovery system along with low water usage fittings to meet the mandatory requirements of internal water usage for code level 5.

Water will also be collected from the sedum roof and re-used for water the gardens and maintaining moisture levels of the sedum.

10 APPENDIX A (SAP RESULTS)

CODE FOR SUSTAINABLE HOMES - CfSH November 2010

Property Reference: 000002
Survey Reference: 005 Holly Farm+Fab+MVHR+ ac
Property: Holly Farm

Issued on Date: 31.Jul.2013
Prop Type Ref: New Build

SAP Rating: 101 **ACO2 Emissions (t/year):** -0.41 **DER:** -0.28 Pass **Reduction:** 101.1% **FEE:** 45.6 **ZC8:** 6.68
Environmental: 101 **AGeneral Requirements Compliance:** Pass **TER:** 25.08 **HLP:** 0.96 **Energy cost:** £ -81

CfSH Results **Version:** CfSH November 2010 **ENE1 Credits:** 9.0 **ENE2 Credits:** 7.1 **ENE7 Credits:** 2 **CfSH Level:** 5

Surveyor: Ian Owen, Tel: 0161 613 6300 Surveyor ID: C580-0001
Address:
Client:

Software Version: Elmhurst Energy Systems SAP2009 Calculator (Design System) version 4.01r01
SAP version: SAP 2009, Regs Region: England and Wales (Part L1A 2010), Calculation Type: New Dwelling As Designed

ENE 1 calculation

Total floor area	626.3 m2
DER	-0.28 kgCO2/yr/m2
TER	25.08 kgCO2/yr/m2
CO2 emissions offset from additional allowable electricity generation	0.00 kgCO2/yr/m2 (ZC7)
Residual CO2 emissions offset from biofuel CHP	0.00 kgCO2/yr/m2 (ZC5)
Total CO2 emissions offset from SAP Section 16 allowances	0.00 kgCO2/yr/m2
DER accounting for SAP Section 16 allowances	-0.28 kgCO2/yr/m2
% reduction DER/TER	101.12 %
CfSH ENE1 credits achieved	9.0
CfSH ENE1 level achieved	5

ENE 2 calculation

Dwelling type	Detached house
Fabric energy efficiency (F.E.E.)	45.6
CfSH ENE2 credits achieved	7.1
CfSH ENE1 and 2 overall level achieved	5

ENE 7 calculation

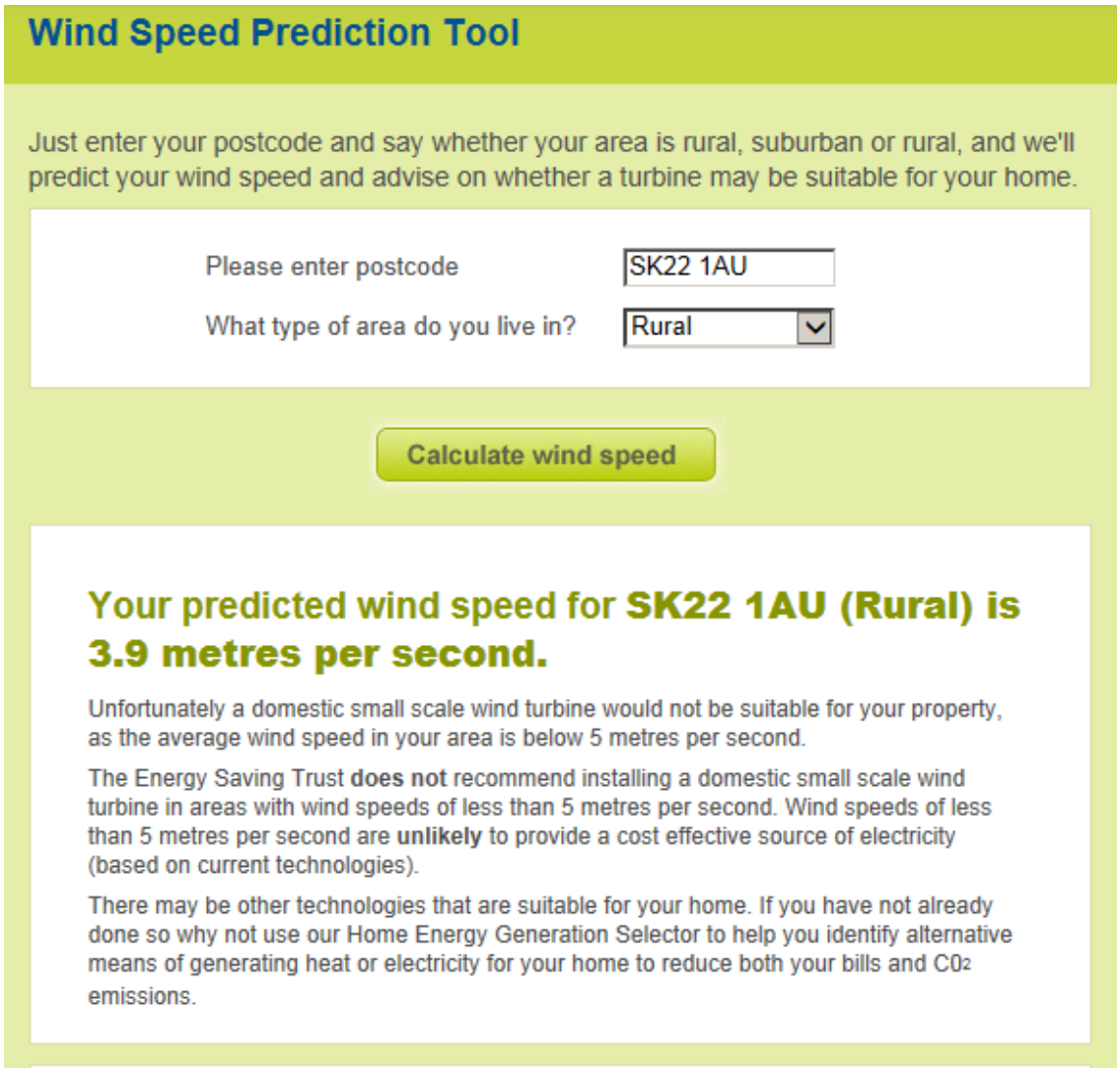
Standard case CO2 emissions

Total floor area	626.3 m2	
DER	9.60 kgCO2/yr/m2	
CO2 emissions from electrical appliances	6.64 kgCO2/yr/m2	(ZC2)
CO2 emissions from cooking	0.33 kgCO2/yr/m2	(ZC3)
Standard case total CO2 emissions	16.56 kgCO2/yr/m2	(ZC4)
Net Standard case CO2 emissions	16.56 kgCO2/yr/m2	(ZC8)

Actual case CO2 emissions

DER	2.66 kgCO2/yr/m2	
CO2 emissions from electrical appliances	6.64 kgCO2/yr/m2	(ZC2)
CO2 emissions from cooking	0.33 kgCO2/yr/m2	(ZC3)
Actual case total CO2 emissions	9.62 kgCO2/yr/m2	(ZC4)
CO2 emissions from Biomass	0.00 kgCO2/yr/m2	(ZC5)
CO2 reduction from additional allowable electricity generation	0.00 kgCO2/yr/m2	(ZC7)
Net Actual case CO2 emissions	9.62 kgCO2/yr/m2	(ZC8)
% improvement in net actual/net standard case CO2 emissions	42 %	
ENE7 credits achieved	2	

11 APPENDIX B (WIND SPEED PREDICTION RESULTS)



Wind Speed Prediction Tool

Just enter your postcode and say whether your area is rural, suburban or rural, and we'll predict your wind speed and advise on whether a turbine may be suitable for your home.

Please enter postcode: SK22 1AU

What type of area do you live in?: Rural

Calculate wind speed

Your predicted wind speed for SK22 1AU (Rural) is 3.9 metres per second.

Unfortunately a domestic small scale wind turbine would not be suitable for your property, as the average wind speed in your area is below 5 metres per second.

The Energy Saving Trust **does not** recommend installing a domestic small scale wind turbine in areas with wind speeds of less than 5 metres per second. Wind speeds of less than 5 metres per second are **unlikely** to provide a cost effective source of electricity (based on current technologies).

There may be other technologies that are suitable for your home. If you have not already done so why not use our Home Energy Generation Selector to help you identify alternative means of generating heat or electricity for your home to reduce both your bills and $C0_2$ emissions.

12 APPENDIX C (FLOOD RISKS AREAS FOR CREDIT SUR 2)