

Small Scale Energy production

Once energy demand has been reduced, it can then be possible for the building to supply its own energy without the need to rely on fossil fuels and nuclear energy.

There are various options that can be used to suit different buildings and uses.

Energy production: ZED specification

1. Electrical generation:

PV Solar Panels:

Typically generate 850 kWh/kWp/annum in the UK. This equates to a carbon saving of 0.425 TonnesCO₂/kWp/Annum or £85/kwp/annum.

Micro Wind Turbines:

At low wind speeds (avg 4-5m/s) in urban areas a well designed micro wind turbine could expect to harvest up to 1500 kWh/annum. This saves 0.75 Tonnes of CO₂ per annum or £150 of electricity. Wind focusing can lead to a further 10-15% increase in efficiency.

2. Thermal generation:

Passive Solar Gain:

Sunspaces oriented to the south maximise solar gain and reduce heating loads.

Evacuated Solar Collectors:

Solar thermal typically yields 500kWh/m²/annum, but depends on local conditions and thermal storage capacity. This equates to around 0.1 TonnesCO₂/m²/annum. A Solar thermal array can generally meet summer hot water demand but not winter

Biomass Boiler:

Carbon neutral logs or wood pellets work as a complimentary technology with Solar Thermal, which are less effective in winter.

What is ZEDfabric?

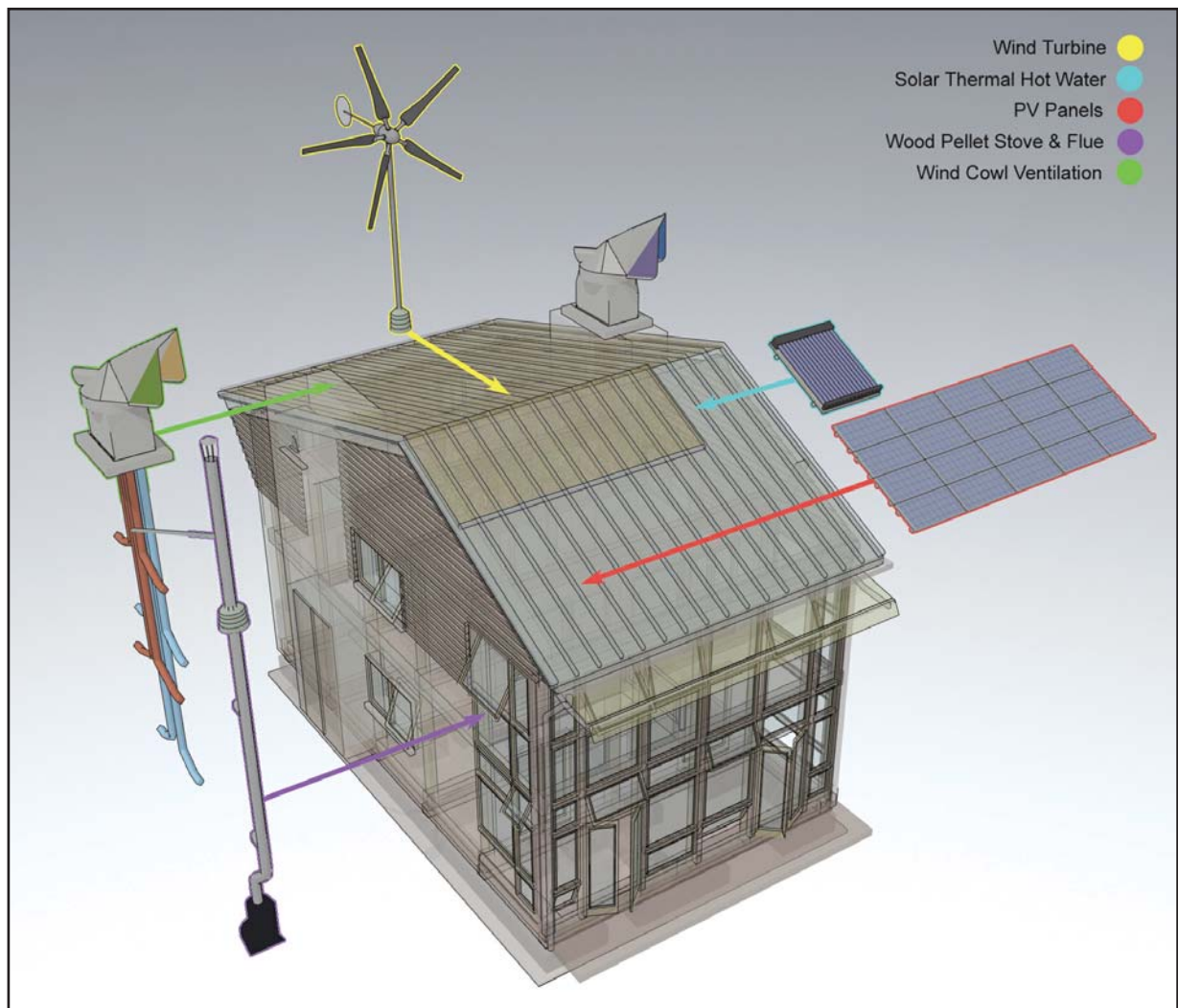
ZEDfabric was set up in 2003 to develop a supply chain of specialised ZED components and renewable energy products to reduce the build costs of ZED construction. It is committed to developing a new generation of building materials and components to compliment the ZED specification and assist the reduction of CO2 emissions from buildings in general.

After being approached by Chinese developers keen to utilise the expertise of ZED factory in their own buildings, we identified an opportunity to link the manufacturing needs of components for ZED projects in China and the UK. By doing this we can achieve the economies of scale to set up an affordable supply chain for UK projects whilst simultaneously assisting the Chinese building industry in developing a low carbon building industry.

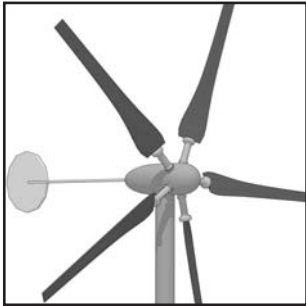
ZEDfabric has sourced and developed a range of innovative high quality and low priced ZEDproducts. It achieves this through drawing on our experience in building ZEDs, carrying out extensive R&D, value engineering and identifying cost-effective ways of manufacturing.

Our products achieve ZEDstandard performance criteria, and challenge the performance standard and supply costs currently available on the UK and Chinese markets.

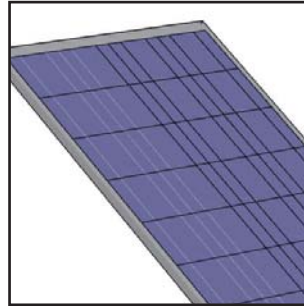
We supply a growing range of zero carbon components to both reduce the energy demand of buildings and generate energy from renewable sources. This booklet will outline the ZED building strategies and the components we are developing to assist both individuals and the building industry in general to meeting their low carbon aspirations.



Microgeneration - equipment



Wind Turbine 2.3 m



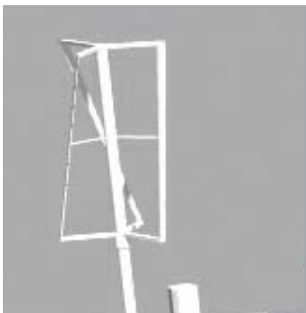
Wind Turbine 2.3 m



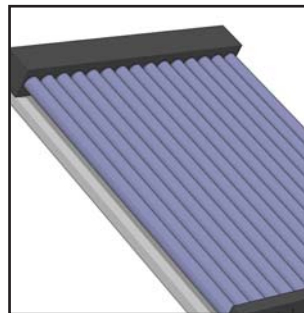
Wind Turbine 2.7 m



Glass Laminate PV

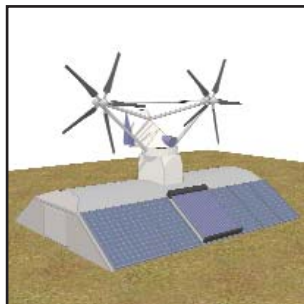


Vertical Axis Turbine



Solar Thermal

Wind Cowl integrated with wind turbine and PV



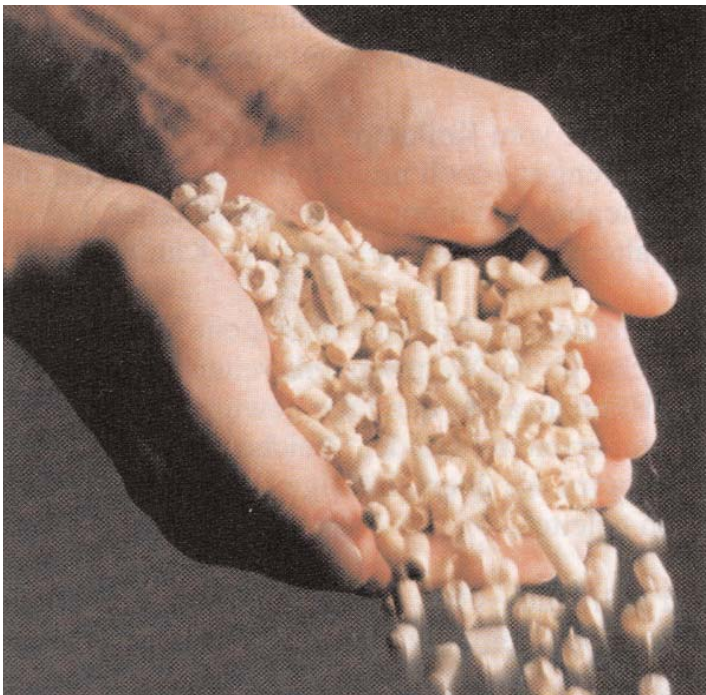
Wood pellet boiler



Ashwell ZED-Tech Wood Pellet Boiler Space & Water heating

The Ashwell Green-tec domestic boiler unit is a highly efficient automatic boiler with self cleaning underfeed stoker. The small but efficient automatically controlled fire bed burns just the right amount of fuel to keep the water in the boiler at the desired temperature chosen by the user. The 15kw domestic wood pellet boiler has an efficient turn-down to 4kw output at times of less demand.

ZEDfabric recommend the use of both biomass boilers and solar thermal as complimentary technologies; with solar thermal meeting demand in the summer and biomass in the winter. Please refer to the Zero Carbon Water Heating Package for more information.



Technical Information

The 15kW wood pellet boiler has the following features:

- Automatic ignition
- Auto-control panel with 7 day timer and control thermostat
- Integrated fuel hopper (manual fill)
- Ash collection tray for easy emptying approximately once per week on full load output
- Mini kindle facility, to enable boiler to automatically relight when heat is required
- Anti burn back protection to prevent any possibility of fire "creep back"

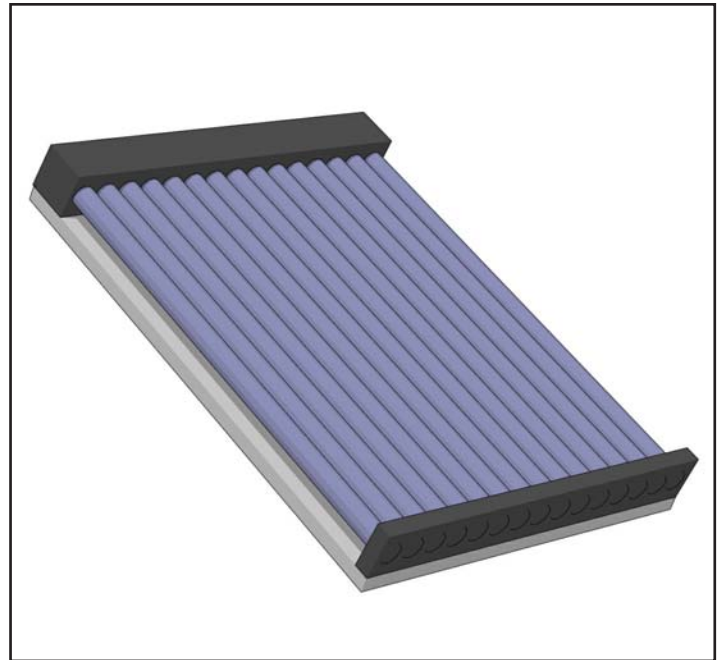
Dimensions: 980 x 375 x 1300mm

SOLAR THERMAL Evacuated Tubes Water Heating

Solar Thermal Collectors use sunlight to heat water. Evacuated tubes have been developed particularly for northern European climates where outdoor air temperatures are low.

The term Evacuated Tube refers to the glass tubes that seal a vacuum around the collector tube. This glass tube transmits the sun's rays to warm the collectors and the vacuum virtually stops the heat from escaping from the tubes.

The closed-loop solar collector systems use electric pumps, valves, and controllers to circulate a glycol-water antifreeze mixture through the collectors and into a hot water storage tank.



Technical Information

Collector	
Collecting area:	2.2m ²
Gross area:	2.82m ²
Aperture area:	1.71m ²
Absorber area:	1.23m ²
Weight empty:	64kg
Fluid content:	2.92L
Number of covers:	1
Cover of materials:	Borosilicate glass
Cover thickness:	1.8mm
Number of tubes:	18
Tube length:	1.8m
Tube diameter:	58mm
Heat transfer medium:	Water-Glycol
Thermal insulation thickness:	Average 20mm
Insulation material:	Polyurethane
Gross dimensions:	1.935m*1.462m
Aperture dimensions:	18*0.0544m*1.750m
Sealing material:	silicon tuber

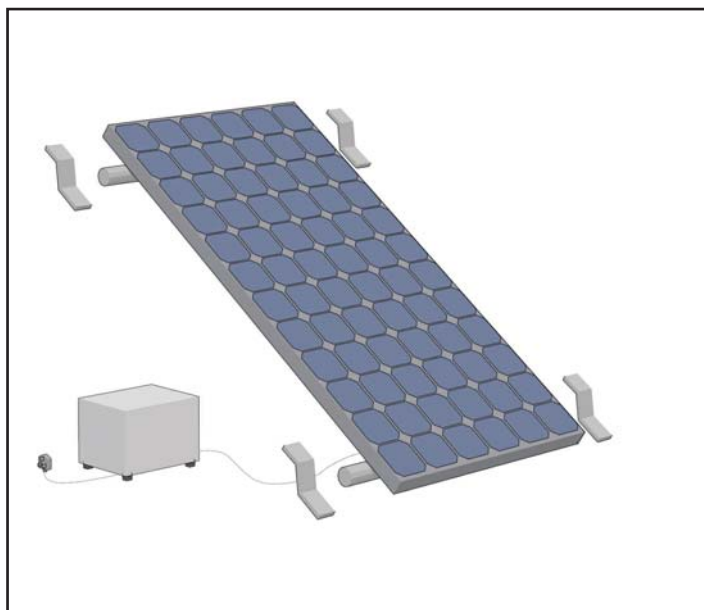
Limitations:	
Maximum operation temp.:	250°C
Maximum operation pressure:	6 bar

Roof mounted Photovoltaic

ZEDfabric supplies 180Wp monocrystalline silicon cell PV panels at 1581 x 809 x 50mm dimension. 10 panels providing a sum total of 1800Wp will supply half the annual electricity demand of a ZED home.

We are working with supplier in China to develop building integrated glass laminate PV.

The laminated cells are them mounted in an anodised Aluminium frame. On the rear of the module is a water-proof junction box with connection cables.



Kit components

PV panels are supplied with grid inverter and fixings to standard roof finishes.

Technical information

Item no:	HG180(34)D
Maximum power:	180Wp
Maximum power voltage (V):	36.31
Maximum power current (A):	4.98
Open circuit voltage (V):	44.97
Short circuit current (A):	5.23
Number of cells (Pcs):	72
Size of module (mm):	1581x809x50mm (125x125 mm cell)
Maximum system voltage:	1000
Temperature coefficients of Isc (%)	+ 0.1/ °C
Temperature coefficients of Voc (%)	-0.38/ °C
Temperature coefficients of Pm (%)	-0.47/ °C
Temperature coefficients of Im (%)	+0.1/ °C
Temperature coefficients of Vm (%)	-0.38/ °C
Temperature range:	-40°C to +80°C
Tolerance Wattage	(e.g. +/-3°C): +/-5°C
Surface Maximum	
Load Capacity:	60m/s(200kg/sqm)
Available Hail Load:	steel ball fall down from 1m height
Weight per piece (kg):	16.3
Junction Box Type:	PV-RH0301 (TUV)
Length of cables (mm):	900mm
Cell Efficiency:	>15.2%
Module Efficiency:	>15%
Output tolerance:	+/-5%
Frame (Materials, corners, etc):	Aluminium
Standard Test Conditions:	AM1.5 100mW/cm ² 25°C
Warranty:	2 years product warranty and 20 years
	80% of powerFF (%)>72%

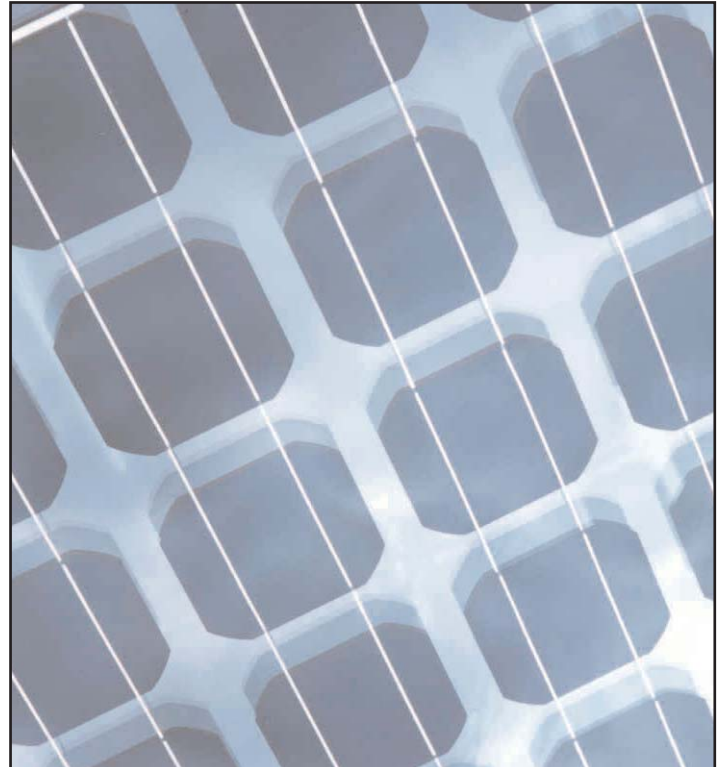
BUILDING INTEGRATED PHOTO-VOLTAICS (BIPV) Glass - Glass Laminates

We are also working with suppliers in China to develop our own building integrated glass laminate PV panes.

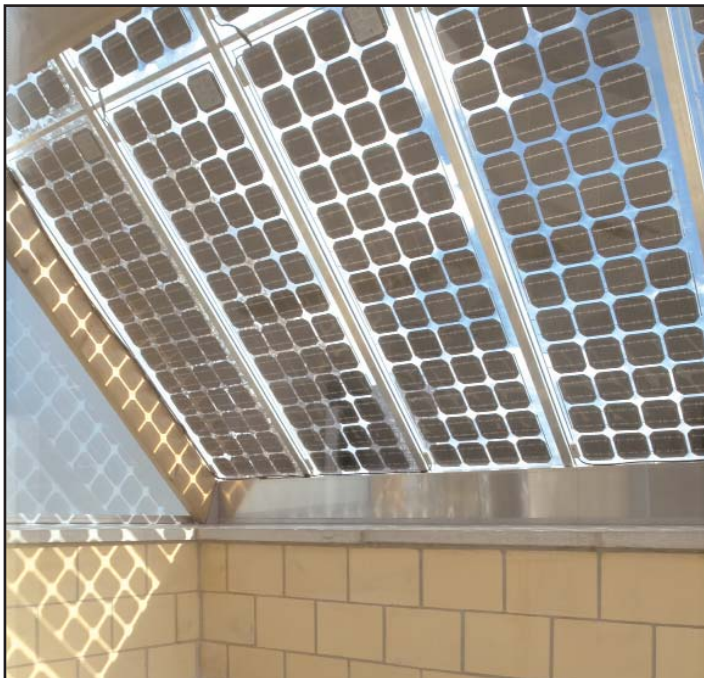
These consist of an array of Monocrystalline cells laminated between 2 panes of glass.

The panes will come in some standard units or be available made to measure.

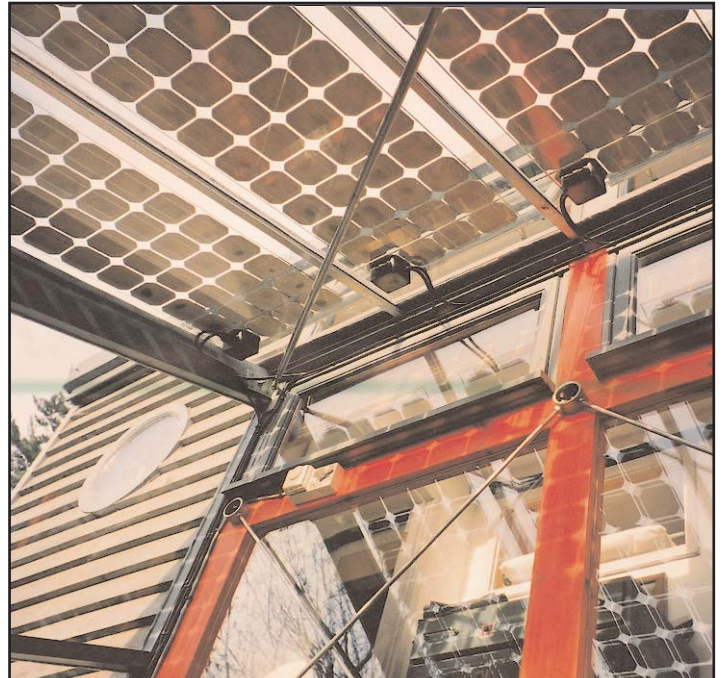
As well as generating electricity and casting striking shadows across living spaces, these panes also assist solar shading. This is seen as a highly desirable premium product that is currently very difficult to acquire. Watch this space.



Close up of laminates at BedZED



Installation at BowZED



Hope House

Wind Turbines

ZEDfabric's 2.7m diameter turbines have low startup speed and produce high annual output at low wind-speed. These turbines are specially designed for use in turbulent wind condition of cities like London, generating over 400W power at 6m/s windspeed. The turbine supplies half the annual electricity demand of a ZED home.

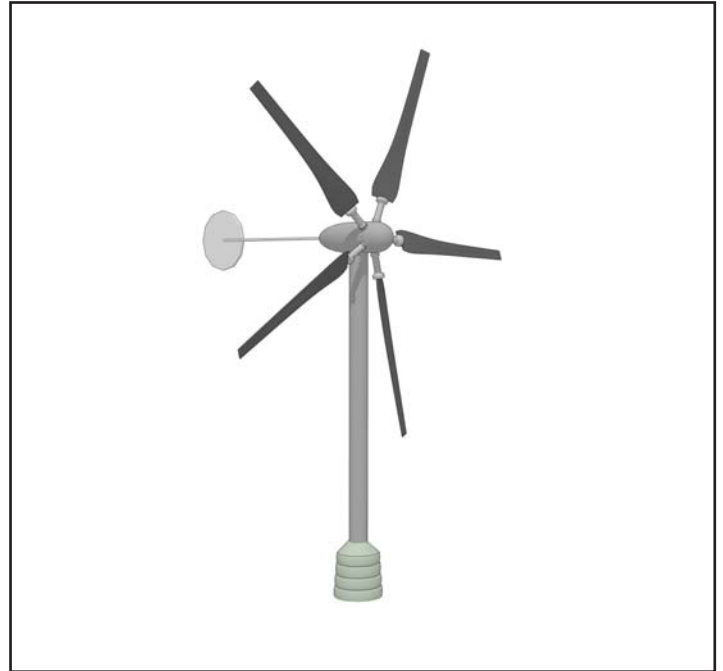
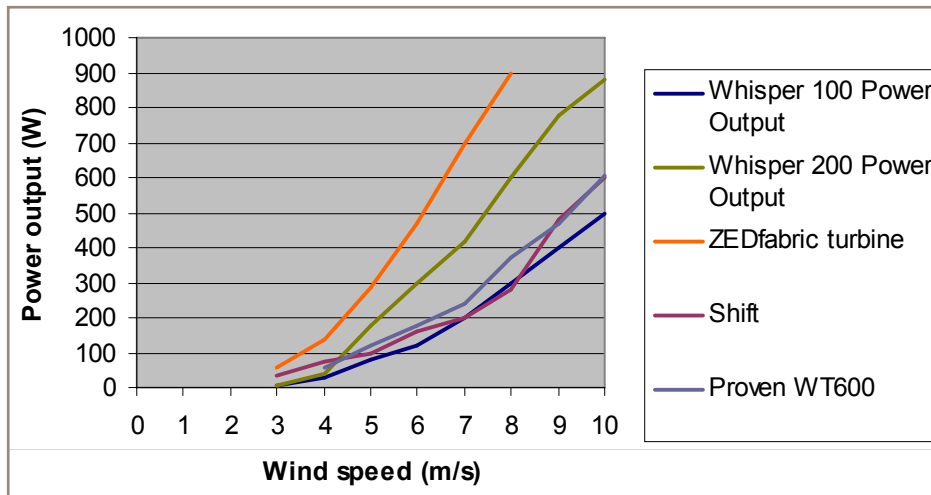


Fig.1 below compares the performance of the ZEDfabric turbine with other turbines currently available in the market.



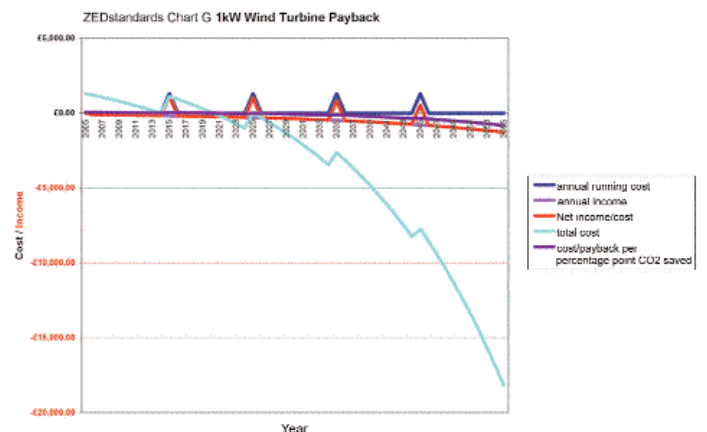
Technical information

The turbine blades have a rotor diameter of 2.7 meter. Startup speed: 2.5m/s. Cut-in speed: 3.5m/s. Output of 120W - 420W between 4-6m/s windspeed. A tailor-made inverter has been designed for our turbine to export the yield directly to the local main electricity grid.

Fig.2 shows payback over time. Due to the high financial value of electricity and the ability to export back to the grid, Our turbine has a direct income stream that improves as energy prices increase.

Kit components

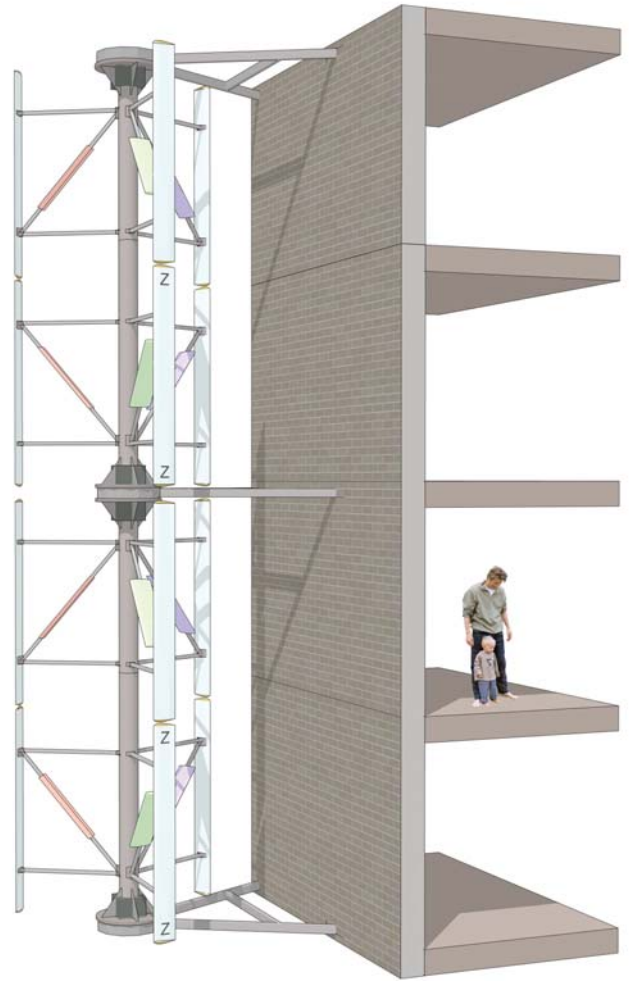
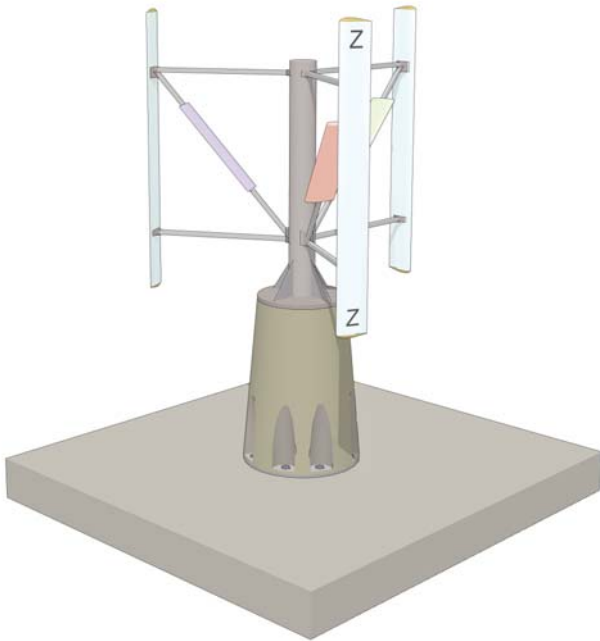
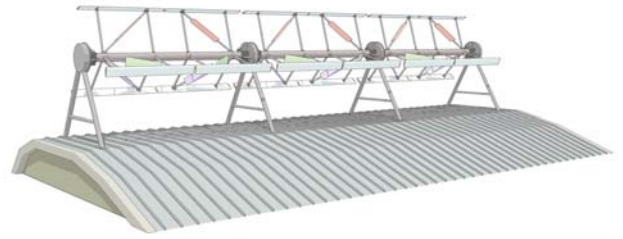
All the turbines will be supplied with controller, grid inverter, a 5m pole and fixings to timber clad buildings.



Vertical Axis Wind turbine

This product is currently in design and development stage - basic design, calculations and preliminary design drawings have now been completed. A UK light engineering firm has already expressed interest in prototyping and manufacturing this product.

Vertical Axis Wind Turbines (VAWT) have the advantage of being more tolerant for changing and inconsistent wind directions, making them ideal for utilisation in an urban context.

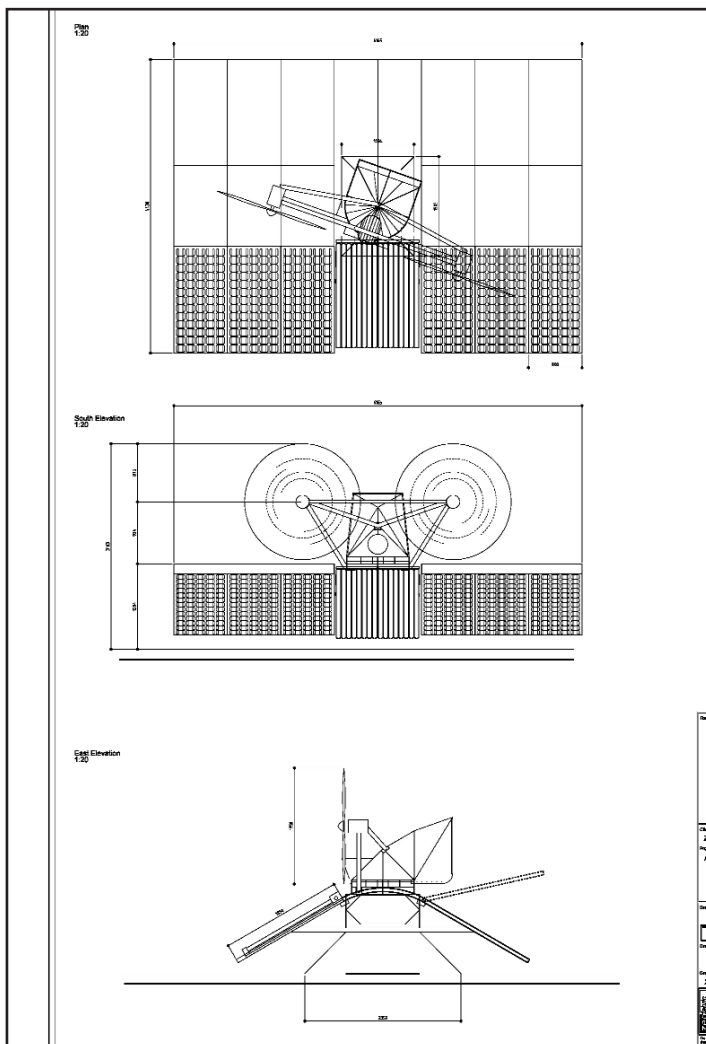
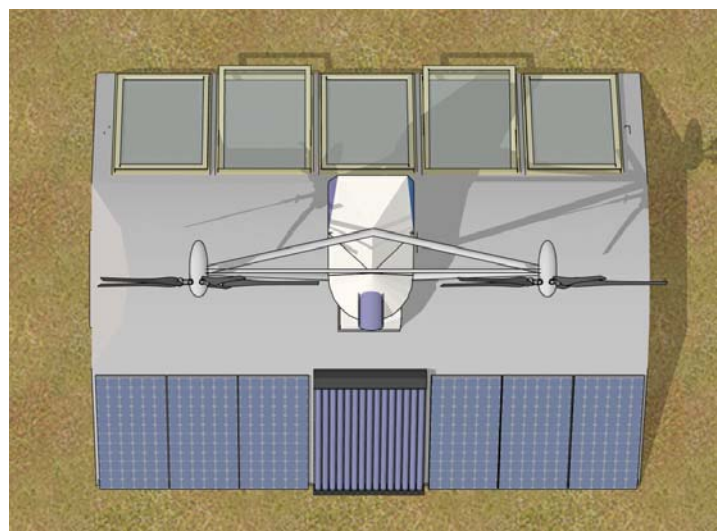
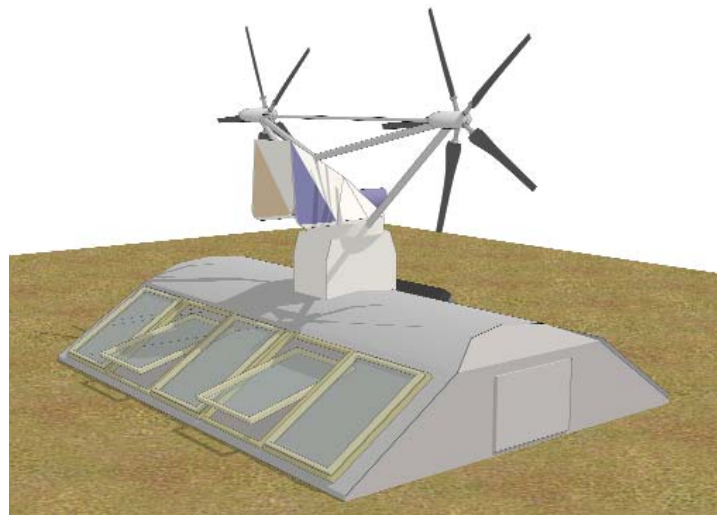
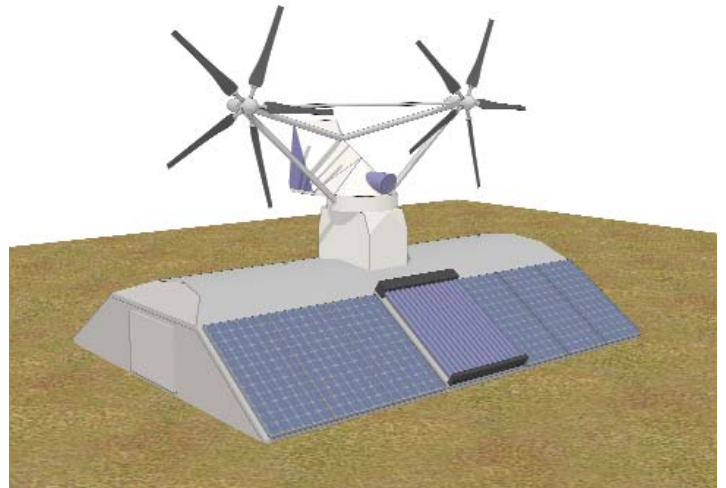


vertical turbines mounted between blocks on a seafront

Integrated renewable energy system - wind cowl, twin turbine, PV, solar thermal, rooflights

ZEDfabric is developing an integrated system to utilise the combined wind and solar energy output with one installation. The integrated system consists of a Wind cowl (with conventional Heat Exchanger), 2 x 2.7m diameter Wind turbines, 1 kWp PV panels and a Solar Thermal array (evacuated tubes) - meeting 100% of a ZED house's electrical demand and hot water in the summer.

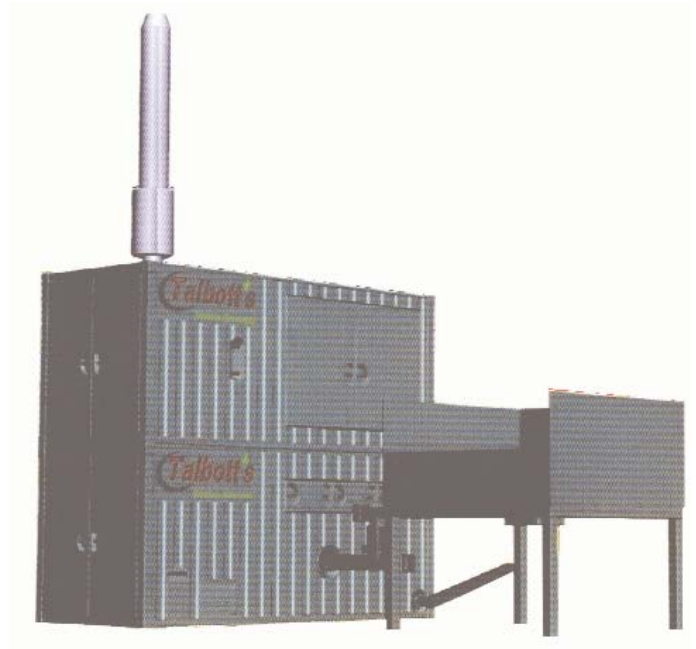
The hybrid system is being designed to be delivered on a flat bed as one complete unit, minimising on site installation costs and the number of roof penetrations.



Combined Heat & Power unit

The Talbotts Biomass generator (BG100) is a highly efficient technology capable of producing 100kw of renewable electricity and 150kw of renewable heat. The system is run on biomass which can be considered as solar energy stored in the chemical bonds of trees and plants, making it a renewable and sustainable source of energy.

The 100kw of renewable electricity and the 150kw of renewable heat produced by the system will lead to a carbon dioxide emission reduction of around 600 tonnes per unit each year; this is compared to emissions from fossil fuel fired heat and electricity production. This is a significant saving which will benefit the environment by reducing the release of carbon dioxide, a greenhouse gas, into the atmosphere.



Technical information

- 100 kw energy for sale to grid or for own use.
- 150kw thermal energy provides a continuous source of heat for a wide variety of heating applications.
- computer controlled combustion ensures that the system is fed with the right amount of fuel to maintain the required energy output
- Flexible fuel loading - bunker fuel storage or silos on request.
- High combustion temperatures ensure clean combustion, meeting all environmental standards.
- Step grate de-asher ensures even burn throughout combustion chamber for improved efficiency.
- High speed direct drive engine coupled to power electronics to provide high levels of engine efficiency and remove the need for a reduction gear box and the losses associated with it.

Summary

Zero Carbon Toolkit

ZED fabric provides a complete range of products to enable the upgrade of existing buildings and the specification of new builds to zero carbon performance.

This includes components for reducing energy demand, such as wall ties, low-e glazing and wind cowls with heat recovery. Components have been sourced to enable energy reduction in building developments both in the UK, China and further afield.

We also provide a full range of renewable microgeneration products that can then be used to meet 100% of a buildings energy demand. Again this covers technologies more suited to both the UK and China, providing heating, cooling and electricity.

We are working in partnership with suppliers in the UK and in China to streamline our innovative products and combine them in integrated systems to make carbon neutral developments achievable and affordable in both countries.