William Goodenough College Solar PV System

Michael Beale

Michael.Beale@EvoEnergy.co.uk
07805 679 873

EVOENERGY

Michael Beale
EvoEnergy Ltd
20 Flaxman Terrace
London WC1H 9AT

Technical Summary: Solar Photovoltaic system at William Goodenough College v2

Requirement:

The project requires a minimum of 16.2 kWp from the PV

Solution:

The requirement of PV is based on planning conditions detailed in Section V17 PHOTOVOLTAIC POWER SUPPLY of the Hoare Lea report. This states that 11% must be achieved from the PV to meet 13,800 kWh per year. Using Government Approved SAP figures this means a **MINIMUM of 16.2kWp** of PV is needed which will comply with the planning condition (SAP's nearest match for 15° & 30° systems facing south is 858.4kWh/kWp therefore 16.2kWp x 858.4kWh/kWp = 13,906 kWh)

Below we provide a technical submission for 16.385kWp of PV to ensure compliance. Please note that the frames are optimum at 30° unlike the 40° stated so we have used this incline and that SAP only recognises PV at 30° facing south as optimum. As an MCS approved installer SAP figures must be used to rate the performance of the PV by.

We have selected the high performance ZNShine to be fixed down to the existing roof on Heathcote (upstands to be created by the on-site roofer, normally at approx 1600mm centres) and CentroSolar modules with Ceniq frames to be bonded on JCC new roof, we will need your roofer to provide the bonding for perhaps ½ or 1 day.

Working roof drawings will be detailed following instruction to complete design and co-ordinated with roof works.

Your solar PV installation

We are specialists in every aspect of solar PV development from design and planning to procurement and installation. Our management team are experienced industry professionals who have delivered multimillion pound construction projects across the country. We will take care of your building and design the best solution for your needs.

Our engineering team will advise you on the most suitable system for your project at every stage. We source only high quality materials and leading brands at competitive prices to give you the best return on your investment.

We understand PV is a long term investment and we want to deliver a professional service throughout the system's life. We have completed many commercial installations across a variety of sectors and are very proud of our reputation for quality throughout the installation process. Over 25% of our business is referred by existing happy customers.

We hold the following nationally recognised accreditations:

"We have been very pleasantly surprised how quickly and efficiently the installation has gone. We have only had a bit more than a week's production and output has been well up to expectation."

Robin Buck, Jack Buck (Farms) Ltd.

Michael Beale, EvoEnergy Ltd
07805 679 873 michael.beale@evoenergy.co.uk

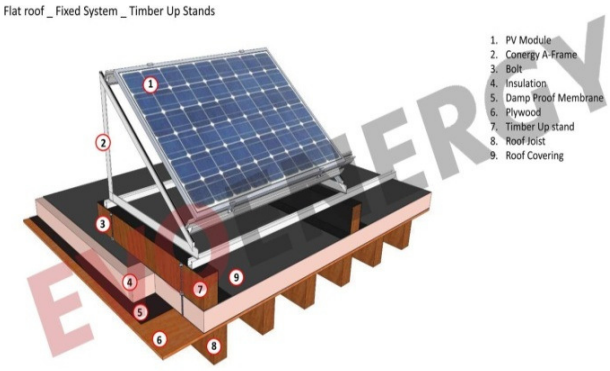
About EvoEnergy

- Over 13 MW installed across the UK
- Projected turnover (2011): £30 Million
- Over 200 staff across 6 offices: Nottingham, London, Halifax, Bristol, Leatherhead & Cornwall
- MCS accredited installer of solar PV systems & member of the REAL Assurance Scheme
- Design, supply, installation, maintenance & financing of top quality solar PV systems
- Renewable Energy Association 'Installer of the Year' award – 2011
- Capacity to install in excess of 50 x 50 kWp PV systems per month

Nick Offer Managing Director	Paul Norrish Sales Director	Justin Turnpenny Projects Director	Michael Beale UK Sales Manager
Director at Arup Head of Commercial Business UK ME BCO Technical Affairs Committee	11 years in the PV market Head of UK Projects Sales at Solar Century for 4 years Worldwide Sales Director at G24i – an organic solar R&D company	Regional Director at AECOM overseeing the delivery of over £100M worth of projects Key clients: NG Bailey, Laing O'Rourke, MACE, McAlpine	9 years in PV market Business Development Manager at Solar Technologies (British Gas) Sales Manager at Solar Century
nick.offer@evoenergy.co.uk	+44 (0) 7814 666 468 paul.norrish@evoenergy.co.uk	+44 (0) 7970 271 586 justin.turnpenny@evoenergy.co.uk	+44 (0) 7805 679 873 michael.beale@evoenergy.co.uk

JCC Roof PV Description: ZN Shine 250W on Upstands

- Due to the roof loading restrictions on the JCC Roof it has been specified that some fixing points for our frames will be provided in the form of upstands.
- The site roofing contractor, under their warranty, supply an up-stand/roof detail and dress over weather-proof membrane. The upstands lay horizontally across roof covering normally at 1500-1600 centres.
- EvoEnergy provide A-frames to mount the modules on and screw the frames down into the upstands.
- A-frames tilt modules at 20-30° inclination for optimum module performance – either way the MCS SAP figures overrule and would be counted as 30° facing South.
- Typical weight load of 16-23 kg/m²



Heathcote Roof PV Description: Centro Solar 235W Ceniq Bonded

- Most viable for new/recent roof builds. Aerodynamism provides the downward pressure predominately with some bonding to stabilise.
- System can be bonded directly to the roof membrane without the need for ballast or roof penetration. The roofer carrying the new warranty for this roof will be required on-site to heat bond down the PV frames (strap of the same membrane material used on the roof, normally off-cuts) which will hold them in place.
- We need to send the final design to Centro who provide the wind calculations for the frame. Typical weight load of 12-20 kg/m²
- Fast mounting process due to the modular construction and optimised number of components and unique rail system design allows effective roof drainage
- Low surface load due to wind-tunnel tested aerodynamic system
- Frame tilt 15° modules can be mounted closer together saving roof space

Michael Beale, EvoEnergy Ltd
07805 679 873 michael.beale@evoenergy.co.uk

System Summary:

System Size (Peak Output)	16.385	kWp
Orientation (SAP nearest fit option)	South	
Angle from Horizontal (SAP nearest fit option)	30°	
Specific Output (SAP 2009)	858.4	kWh/kWp/yr
Estimated Annual Energy Production	14,065	kWh/yr
Carbon Emissions Factor	0.529	$kgCO_2/kWh$
Carbon Emission Savings	7,440	$kgCO_2/yr$
Area of Active PV	120	m^2

Item	No.	Description	
Modules	66	35 x ZNShine Mono 250W & 31 x Centro 235W	incl.
Inverters		Selected to match modules & system size	incl.
Mech Install		Bonded & frames to upstands	incl.
Elec Install		AC & DC electrical equipment	incl.
G59 Protection		No G59 relay required*	excl.
PV Meter		Ofgem approved generation meter	incl.
Labour		Installation & commissioning	incl.
Access		No access or lifting equipment	excl.
Design		Engineering design & project management	incl.

**The inverters we have specified are pre-approved under G59/2 regulations which are the most up to date rating and requirement. We have installed multiple systems under G59/2 rated inverters on sites with UK Power Networks and they have not requested a relay be fitted for anything less than 50kWp since Jan 2011. Only until we complete the G59 application for connection can this be clarified for certain. If one is requested we would quote for fitting upon instruction from UKPN.*

Financial Savings & the Feed-in Tariff:

1. Electricity generation

In 2010, the UK government introduced the Feed-in-Tariff to incentivise the installation of solar PV. Your FiT supplier is obliged to pay you the following rates for every unit of electricity you generate from your solar PV system, regardless of whether you use this or not. These rates are linked against RPI and are guaranteed for 25 years. We will submit your application for you to ensure you receive your FiT payments. *Subject to government changes.

Size of PV System	Feed in Tariff (p/kWh)*
<4kW	22.0
>4-10kW	17.6
>10-50kW	15.9
>50-250kW	13.5
>250kW- 5MW	8.9
Off Grid System	8.9

*FiT rates adjusted to the proposed rates + 4.5% RPI in April 2012

2. Exporting to the grid

If you do not use all of the energy your system generates, you will export the remainder back to the grid. Your FiT provider will pay you an extra 3.1p for every unit you sell back. For systems under 20kWp, 50% of the electricity generated is deemed to have been exported and will qualify for an extra 3.1p payment, even if the electricity is used in the building.

3. Saving on your electricity bill

While your panels are generating electricity, you will save around 10p for every unit you use. If you need more electricity, you will buy it from the grid at your normal rate.

Your returns:

PV Summary	System 1
Peak Output (kWp)	16.39
Estimated Annual Energy Production (kWh/year)	14,065
FiT Generation Rate Applicable (p/kWh)	15.9p
Electricity Saving Rate (p/kWh)	10.0p
Percentage of Electricity Exported	0%
FiT Money Earned (£/year)	£2,461
Electricity Money Saved (£/year)	£1,406
Total (£/year)	**£3,868**

25 Year Financial Projections

These calculations take into consideration the following annual changes due to degrading system performance, RPI adjustments & energy cost rises:

- System performance drops by 0.25% per year
- Feed-in-Tariff rates increase with RPI of 3.5%/yr
- 'Real Term' electricity costs increase at 2.5%/yr

Year	FiT & Export (£/year)	Money Saved (£/year)	Cumulative Benefit (£)
1	£2,461	£1,406	£3,868
2	£2,541	£1,487	£7,896
3	£2,623	£1,572	£12,092
4	£2,709	£1,663	£16,463
5	£2,796	£1,758	£21,018
6	£2,887	£1,859	£25,763
7	£2,981	£1,965	£30,709
8	£3,077	£2,078	£35,864
9	£3,177	£2,197	£41,239
10	£3,280	£2,323	£46,842
11	£3,386	£2,457	£52,684
12	£3,496	£2,597	£58,778
13	£3,609	£2,746	£65,133
14	£3,726	£2,904	£71,763
15	£3,847	£3,070	£78,681
16	£3,972	£3,247	£85,899
17	£4,100	£3,433	£93,432
18	£4,233	£3,630	£101,295
19	£4,371	£3,838	£109,503
20	£4,512	£4,058	£118,073
21	£4,658	£4,291	£127,022
22	£4,809	£4,537	£136,368
23	£4,965	£4,797	£146,130
24	£5,126	£5,072	£156,328
25	£5,292	£5,363	£166,984
Total	**£92,637**	**£74,347**	**£166,984**

Supporting Information

Access and edge protection: A means of access to the rooftop and edge protection to enable the safe installation of the solar arrays whilst working at height will be provided by **others**.

Lifting: A scaffold hoist, crane, telescopic forklift or platform lift will be provided by **others** to facilitate the safe lifting of panels and associated mounting equipment to the roof.

Structural Assessment: Structural assessments of the capacity of the roof for carrying PV is outside our scope of works and will need to be provided by others. EvoEnergy will provide information on the proposed system to assist the structural calculations.

Roof Fixings: The system will be mounted on up-stands to carry the PV in portrait on the west roof and bonded to the roof on the east roof by the roofing contractors. Both systems will resist against wind forces.

Point of Connection: We have assumed that our inverters will be located in a suitable location and lockable AC cabling will be routed on existing primary cable containment between a three phase connection position near roof level and our inverters. Where no containment is available EvoEnergy will install cabling in an appropriate manner.

Standard energy prediction (SAP) disclaimer:
"The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the Government's standard assessment procedure for energy rating of buildings (SAP) and is given as guidance only. It should not be considered as a guarantee."

Embodied Energy
It is generally recognised that the amount of energy required to produce PV is generated by the modules in 2-4 years of operation (the figure is dependent on the precise installation location).

Warranty and Expected Life of System
EvoEnergy offer a 2 year turnkey workmanship warranty. The modules typically come with a 5 or 10 year product warranty and a 25 year peak power warranty. The inverters have a 5 year product warranty.

Many PV systems installed over 30 years ago are still operating, the expected system life is 40 to 60 years.

Sub Contract
The costs cover design, supply, installation and commissioning of the PV system. All site installations will be carried out by EvoEnergy staff who are direct employees.