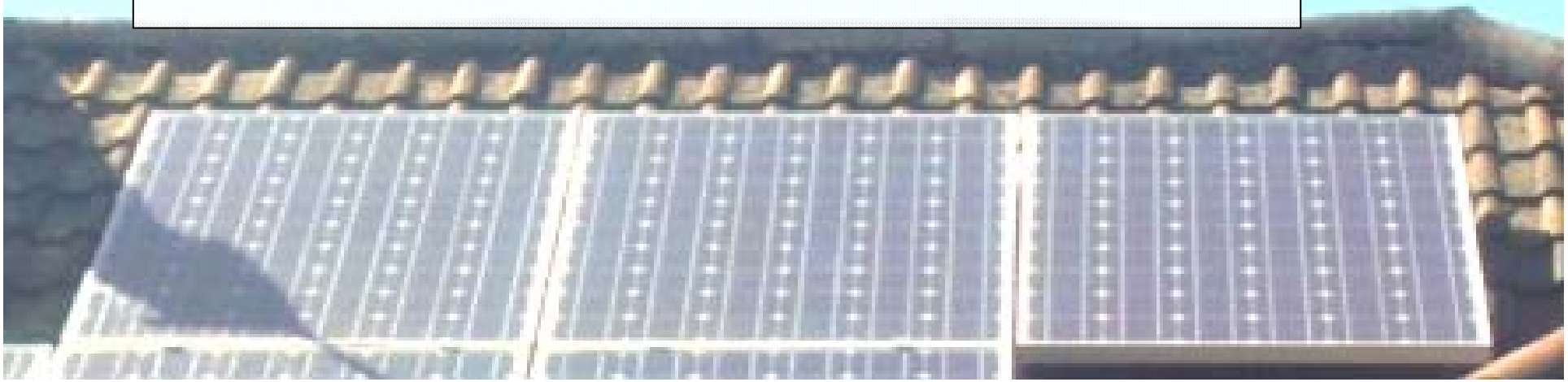
presents

SOLAR WORKSHOP

12:45 – 13:00 pm	Welcome and refreshments
13:00 – 13:15 pm	An overview of solar technologies
13:15 – 13:30 pm	Case study 1: solar (electric) photovoltaics panels
13:30 – 13:45 pm	Case study 2: solar (electric) photovoltaics panels
13:45 - 14:00 pm	Case study 3: solar (hot water) thermal
14:00	Questions and answers

…with a solar tombola – great prizes (solar chargers, grow-bags etc.)



An Overview of Solar Technologies

Background

The desire to increase renewable energy consumption is shared across the European Union (EU), with the 2009 Renewable Energy Directive (RED) setting a binding target of 20 per cent of the EU's energy consumption coming from renewable sources by 2020.

The UK share of this target commits us to consuming 15 per cent of our energy from renewable sources by 2020.

PV or Thermal?

1. Solar Photovoltaics (PV)

Generates Electricity

2. Solar Thermal

Generates hot water

Solar PV panels capture the sun's energy and convert the sunlight into electricity, for your home.

On-Roof PV

In-Roof PV

Source: Solar Technologies

Solar PV panels capture the sun's energy and convert the sunlight into electricity, for your home.

PV Tiles
(conservation area)

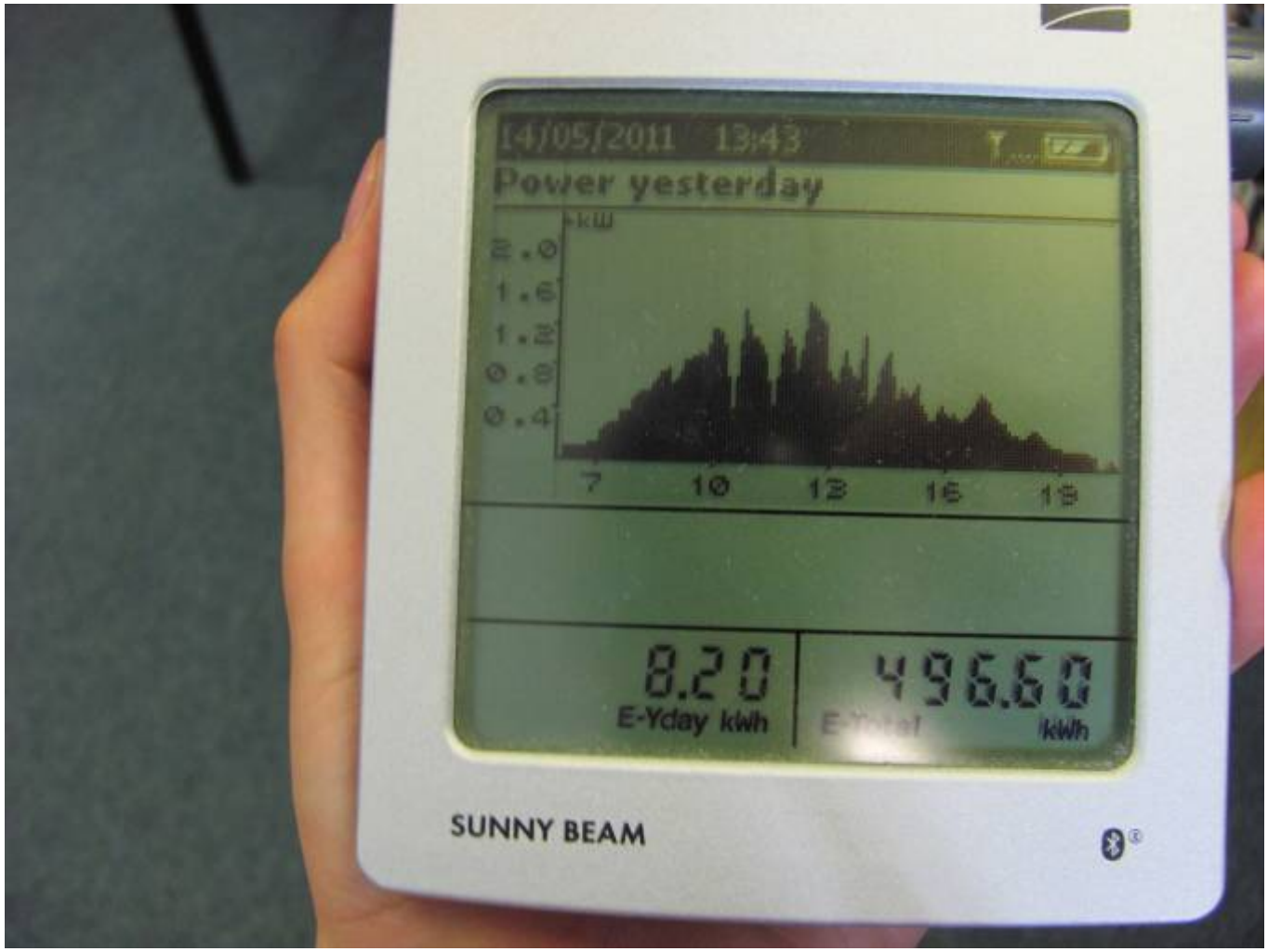
Flat Roof PV

Source: Solar Technologies

In House PV Equipment

Source: Solar Technologies

Displays


14/05/2011 13:43
Power yesterday
kW
2.0
1.6
1.2
0.8
0.4
7
10
12
16
18
8.20
E-Yday kWh
496.60
kWh
SUNNY BEAM

Definitions

kiloWatt (kW)
Power rating of an appliance

kiloWatt hour (kWh) = one electrical **Unit**
The amount of energy used or generated

E.G. if an appliance rated as 2kW was left on for 2 hours it would use 2 kWh (units) of energy.

kWp (kiloWatt peak)
PV power output under standard conditions*

So kWp (kiloWatt peak) is just a measure of the strength of the system. This is how much energy it would generate in full sunlight.

PV Panels: e.g. 6 x 175Wp rated panels = 1.05 kWp total for the system
1kWp (South) will generate **800-900 kWh/yr** of electricity

**(1,000 Watts/m2 light at 25ºC)*

Feed In Tariff (FIT)

The feed in tariff (FIT) is a government subsidy that pays you for the amount that your panels generate (regardless of how whether that electricity is used or exported). This is called the *Generation Tariff.*

If you then go on to use that electricity you will make the additional savings on the electricity displaced (i.e. the electricity that you have not needed to get from the grid).

Any electricity that is not used within your house i.e. in times of lots of sun and when you are not using much in the house, the electricity will be exported automatically to the grid. In addition to the Generation Tariff you will be paid around 3.1p/kWh for every unit you export.

Feed In Tariff (FIT)

The FIT is both index linked and guaranteed for 25 years.

The generation tariff last year was 41.3p/kWh.

The generation tariff this year is 43.3p/kWh.

Average electricity costs are currently: 12.5p/kWh

This means that you receive/save 55.8p if you use the electricity you produce or 47.4p if you don't use it.

Not bad!

Feed In Tariff (FIT)

So good in fact that it makes commercial sense for many companies to offer you free installation in return for this incentive. You keep the free energy, they keep the FIT.

Be careful though, your savings will still be in the order of around £100/kWp/year but you'll be missing out on around £346/kWp/year without the FIT.

The general advice is: If you can afford to install it yourself it will yield higher savings, if you can't afford to and want free electricity then a rent you roof scheme may be worth considering.

Feed In Tariff (FIT)

The Energy Saving Trust have a very good guidance that I really recommend on this:

http://www.energysavingtrust.org.uk/Generate-your-own-energy/Solar-electricity/Consumer-guidance-on-free-solar-PV-offers

Source: Energy Saving Trust

PV Costs & Savings

	Proposal 1	Proposal 2	Proposal 3	Proposal 4	Proposal 5
System Size	0.84 kWp	1.40 kWp	1.68 kWp	2.10 kWp	2.52 kWp
Panels	4 x 210W Sharp modules	8 x 175W Sharp Modules	8 x 210W Sharp Modules	12 x 175W Sharp Modules	12 x 210 Sharp Modules
Price (with 5% VAT)	£6,800	£8,100	£9,200	£10,600	£13,819
Annual Generation[1]	714 kWh	1,190 kWh	1,428 kWh	1,785 kWh	2,142 kWh
CO_2 Saved[2]	406 kg	676 kg	811 kg	1,014 kg	1,217 kg
% of Homes Elec.[3]	21%	35%	42%	53%	63%
FiT pa[4]	£261	£434	£521	£652	£782
Consumption saving[5]	£51	£86	£103	£129	£154
Export saving[6]	£14	£24	£29	£36	£43
Annual Savings	£326	£544	£653	£816	£979
25 year Savings	£8,157	£13,596	£16,315	£20,394	£24,472
Roof Space Required	5.6 m²	11.1 m²	13.1 m²	16.6 m²	19.7 m²

Source: Solar Technologies

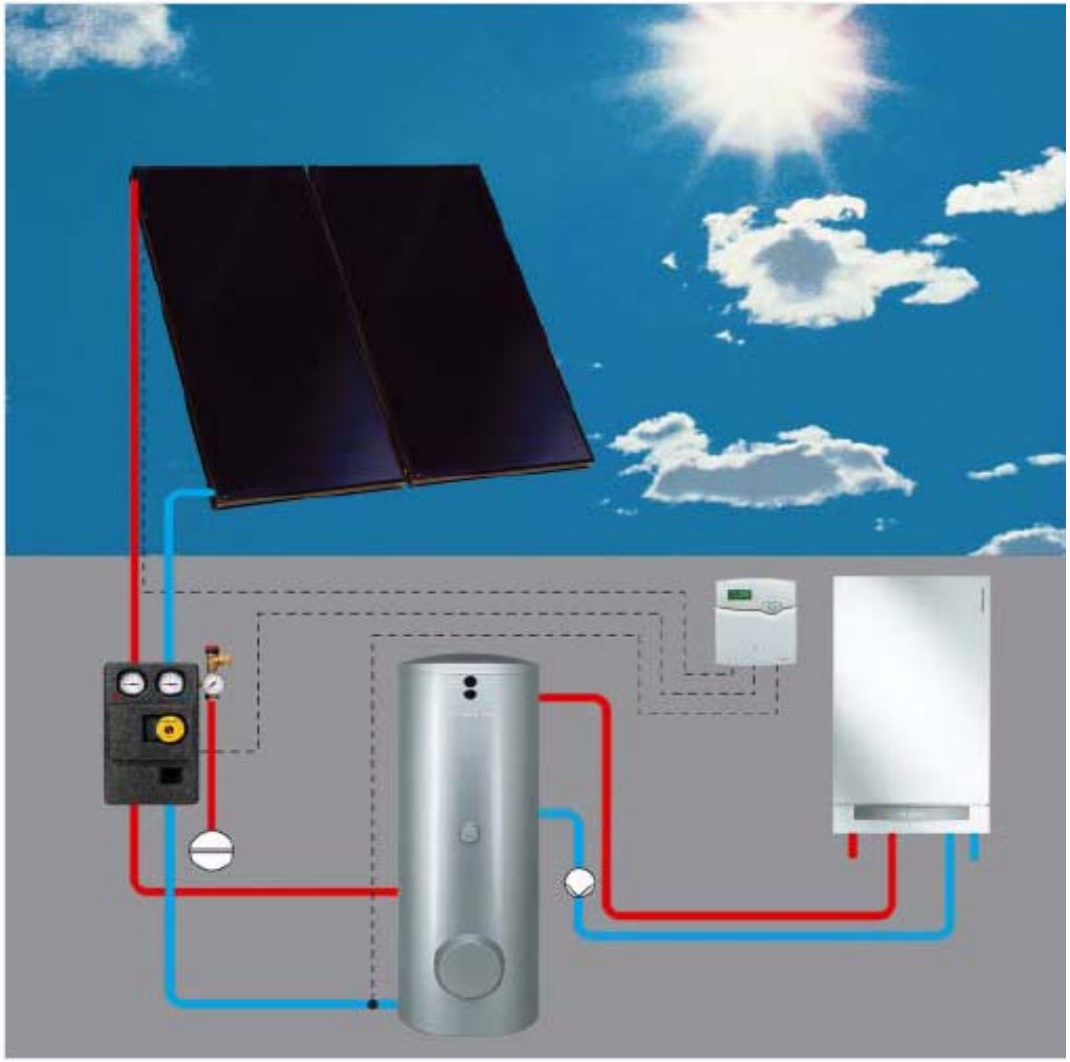
What does Solar Thermal look like!

Flat panels

Tubes

Source: Solar Technologies

Solar Thermal Schematic



Panels

Controller

Temp. Sensors & Pipes

Pump Unit

Calorifier

Boilers

Source: Solar Technologies

Definitions

Solar Thermal m^2

ST **power** $1m^2 = 0.7$ kWth

kWh (kiloWatt hours)

energy or **Unit**

Solar Thermal saves approximately 400-600 kWh/yr/m^2

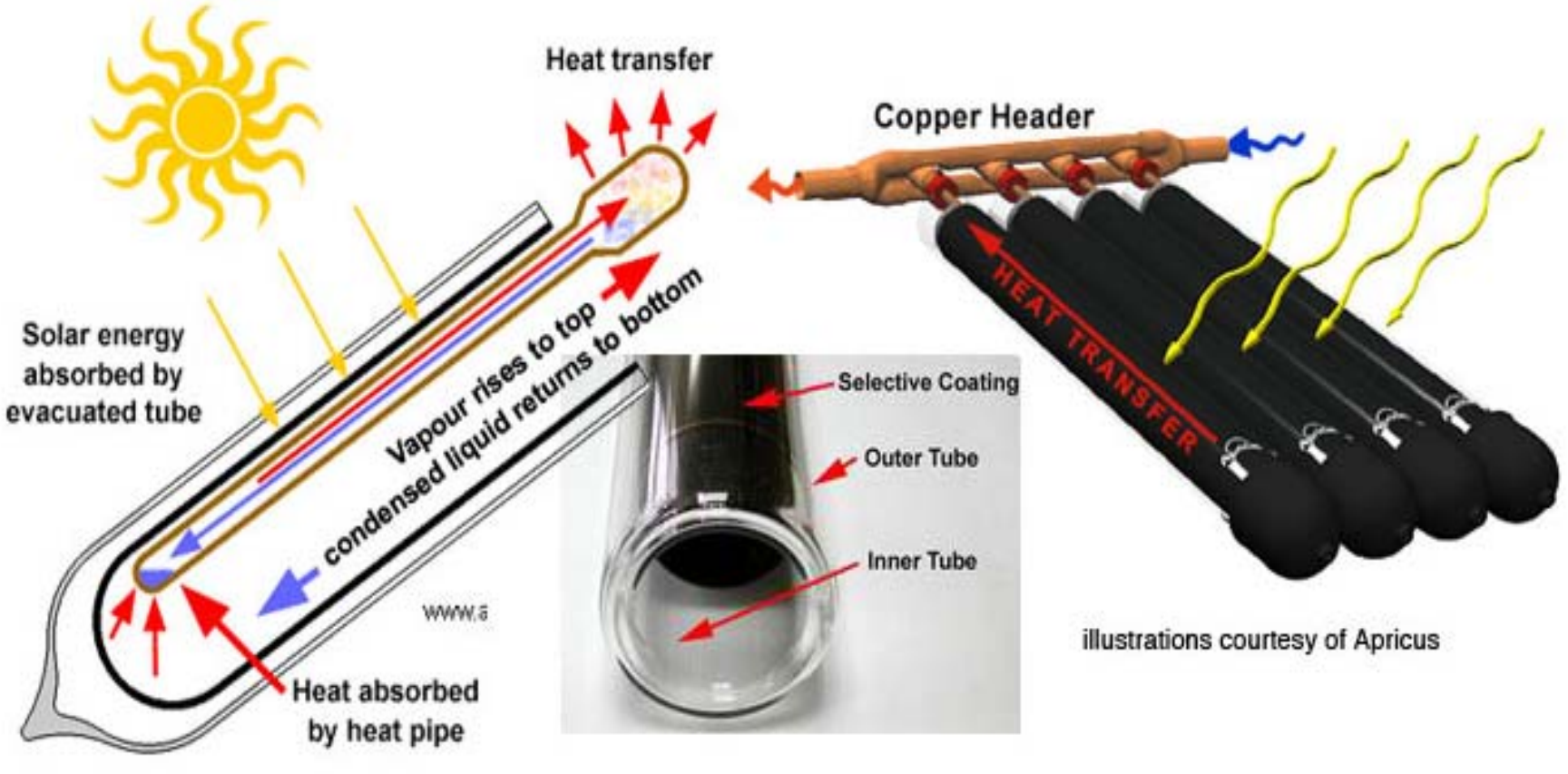
Flat Plate Collectors

1. **Meandering pipework**
2. **Sunselect absorber coating**
3. **Low E Glass**
4. **Anodised aluminium frame**
5. **Fibreglass insulation**

Cheaper but lower efficiency....

Source: Solar Technologies

Evacuated Tube Collectors



... More expensive though higher efficiency & less robust

Source: Solar Technologies

Thermal - Internal System

Source: Solar Technologies

Renewable Heat Incentive

Worlds first incentive for renewable heat.

Department of Energy and Climate Change to make an announcement next week or week after to confirm all details.

Renewable Heat Incentive

Will happen in two phases for domestic systems…

Phase 1: July 2011 – Oct 2012

Renewable Heat Premium Payment

Those that install a solar thermal system (MCS installer and products) with a heat meter will be eligible for a ~£300 grant towards it.

Renewable Heat Incentive

Will happen in two phases for domestic systems…

Phase 2: Oct 2012 onwards

Renewable Heat Incentive

Solar thermal systems installed after 15th July 2009 that are eligible (MCS, heat meter etc) will receive 8.5p per kWh they generate.

This will be index linked and guaranteed for 20 years.

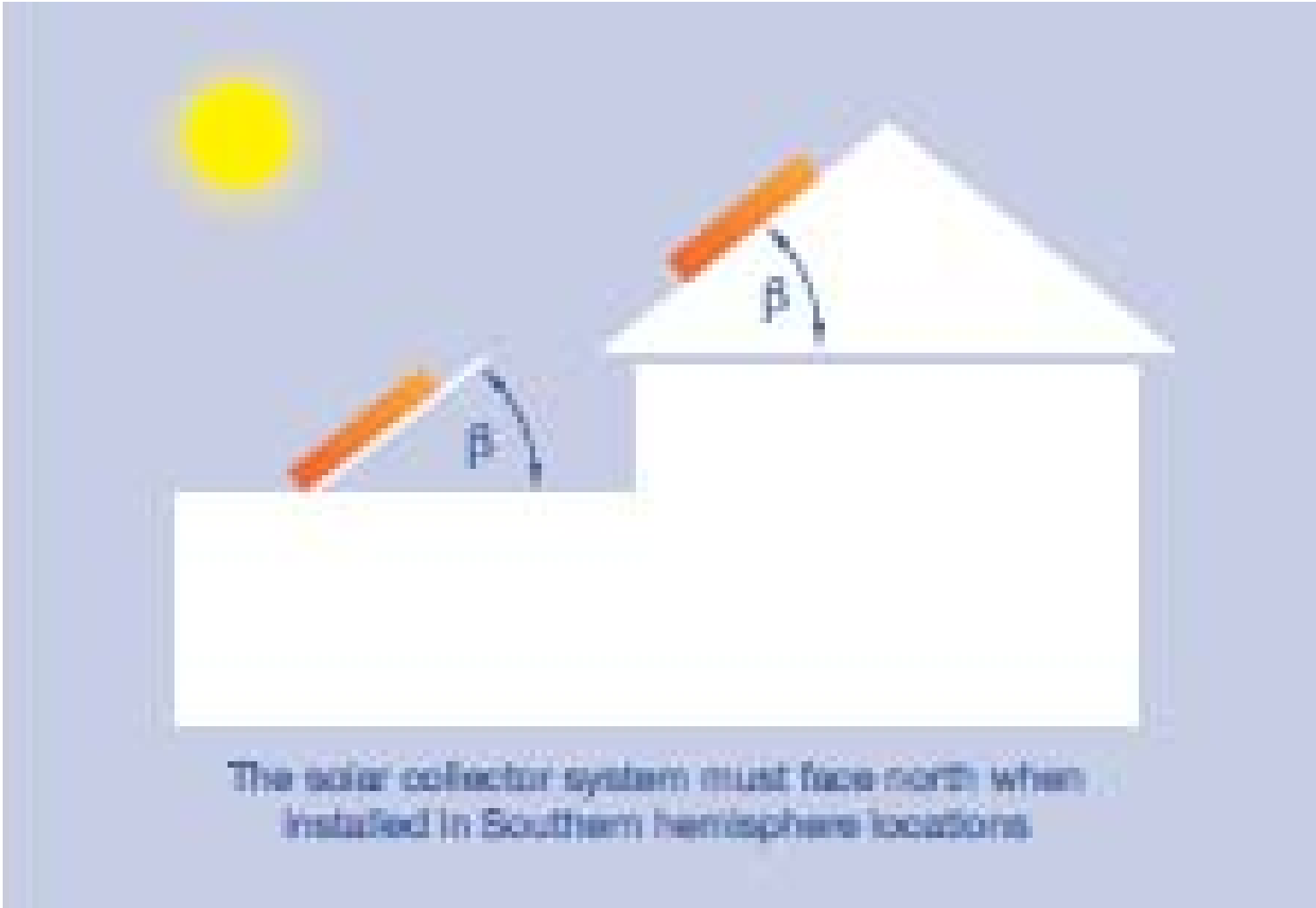
ST Costs & Savings

ST System Summary	Option 1	Option 2
No. Residence :	2-3	3-4
System Size :	**2.5 m²**	**4.0 m²**
Size of Hot Warer Storage:	210 litres	300 litres
Annual Yield :	1,250 kWh	2,000 kWh
Annual CO_2 Offset :	243 kg	388 kg
Fully Installed Price :	**£3,750**	**£5,200**

Source: Solar Technologies

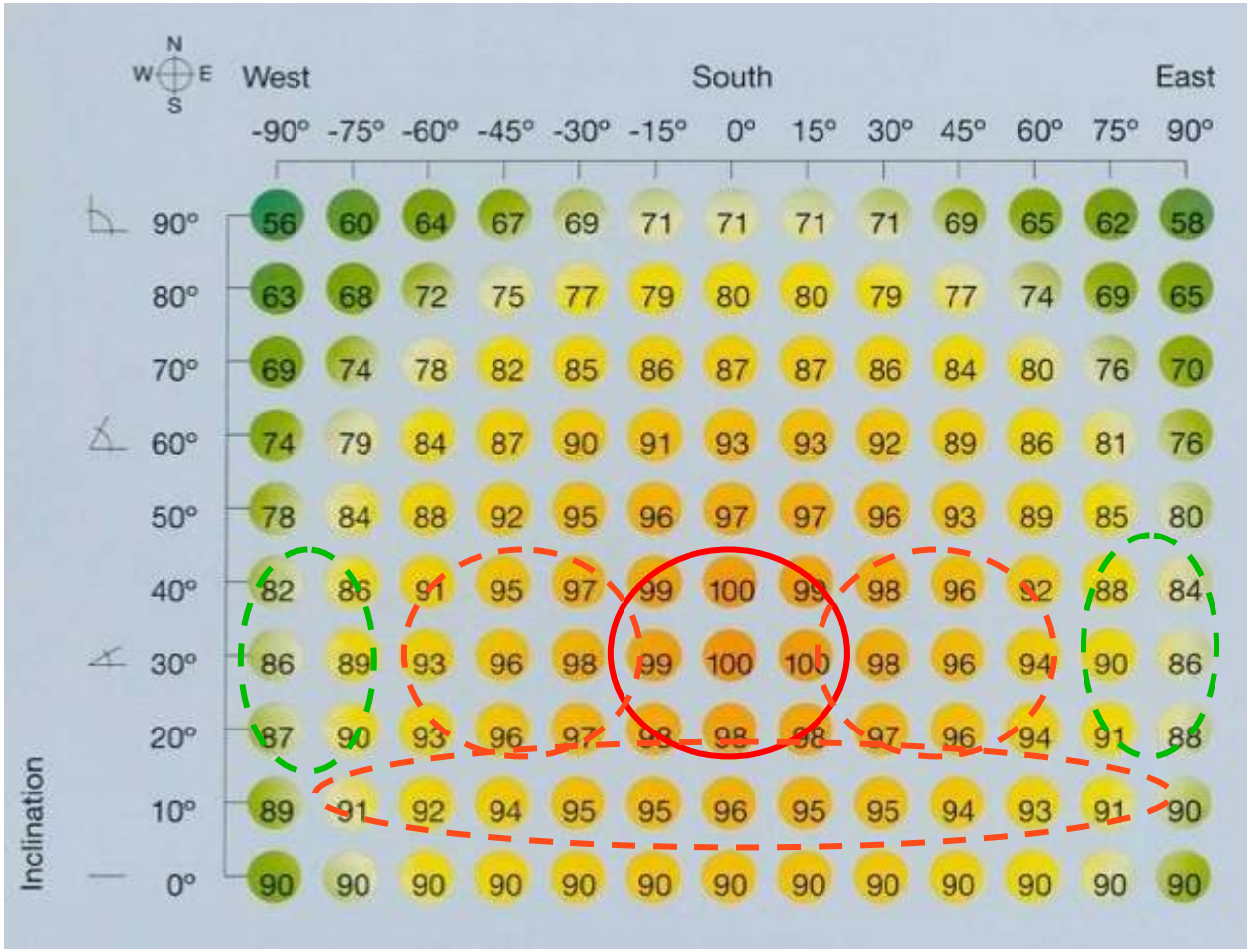
Solar electricity systems (and thermal systems) don’t require a planning permission if they are on a pitched roof and do not protrude more than 200mm above the roof surface.

Panels on flat roofs or on any roof in a conservation area will need planning permission.



Source: Kingspan Solar

Solar Orientation



Best: Facing South at 20-40°

5% loss if low pitch or SE/SW

10-15% losses if East / West

Source: Kingspan Solar


5542


L
REQUEST STOP
Ham Gate Avenue
towards
Richmond
65


E SCHOOL

Solar PV

Case Study 1

My motives:

- Concern for the environment
- Legacy
- Cost-effective
- Support from Green Streets project
- Subsidy/ discount of £2,700
- Interest-free loan
- Highest level of Feed in Tariff

Home energy consumption

- 2010: 2,400 kW hours electricity.. £410
- 4,500 kW hours gas….. £230

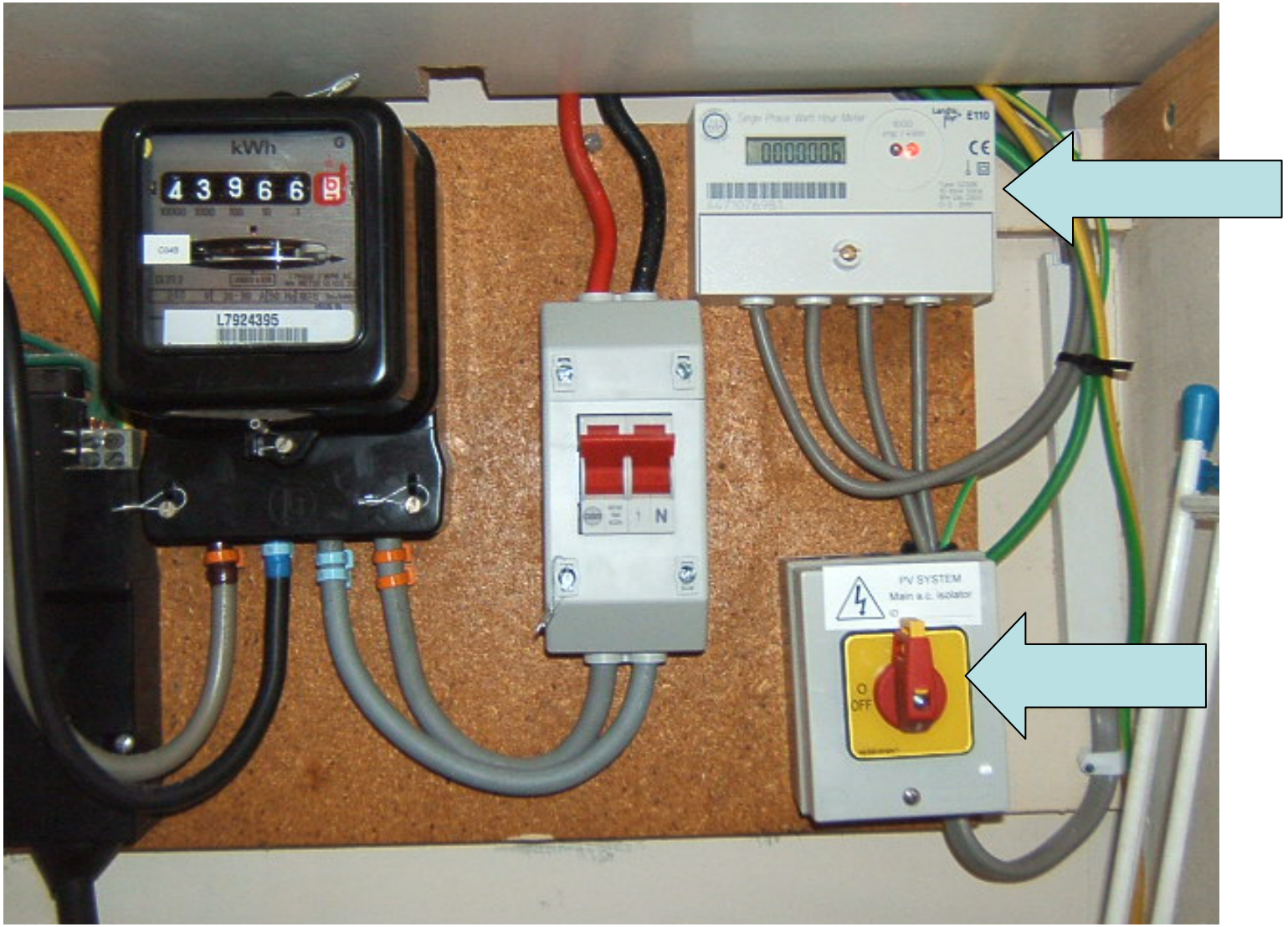
- Solar Panels
- generating 1,380 kWh per year
- £570 + £20 + £200 = £790
- System cost: £8,250
- Payback ….about 10 to 11 years?

South-facing roof

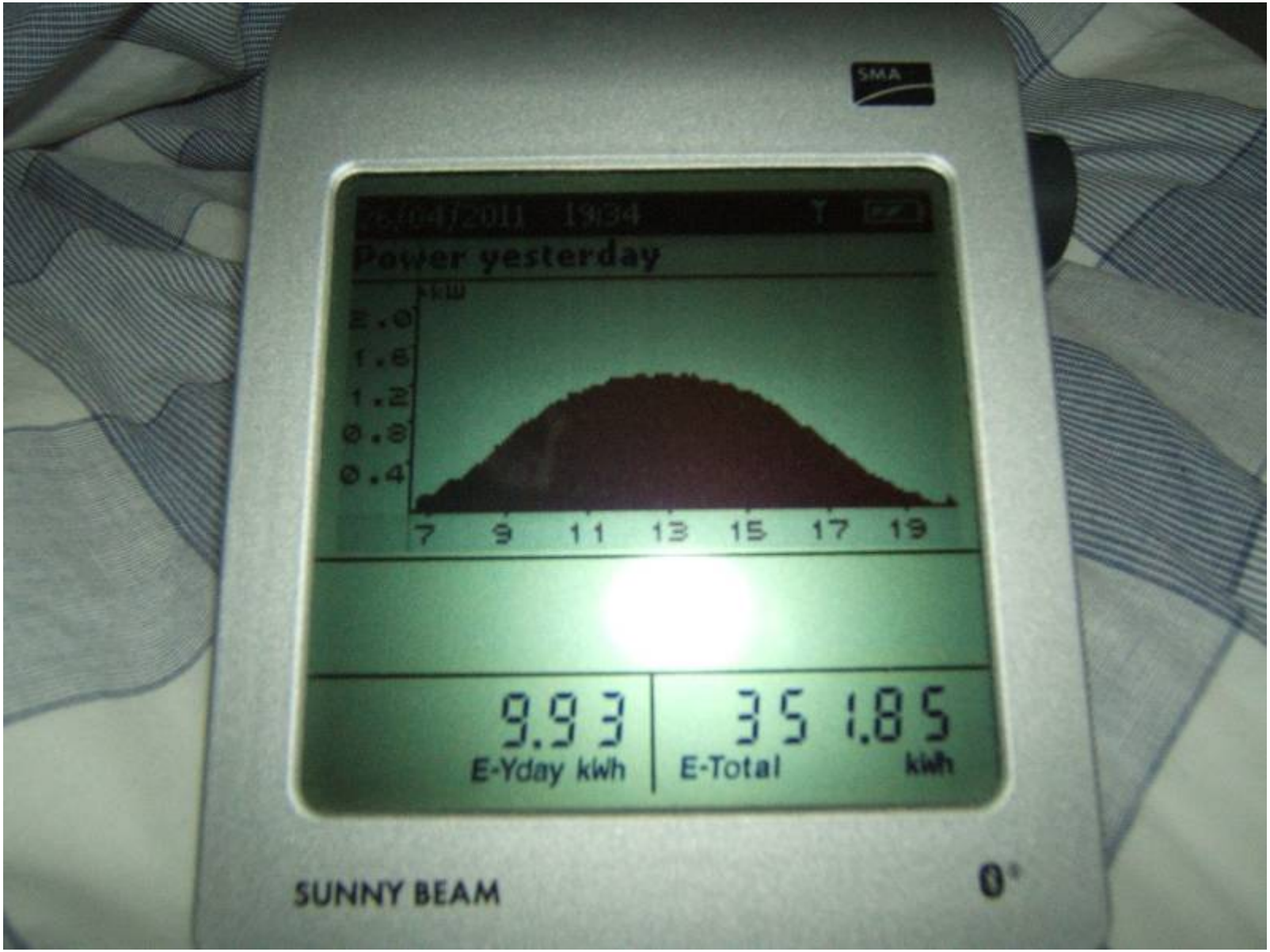
The frame is fitted

8 panels installed

Isolator and generation meter

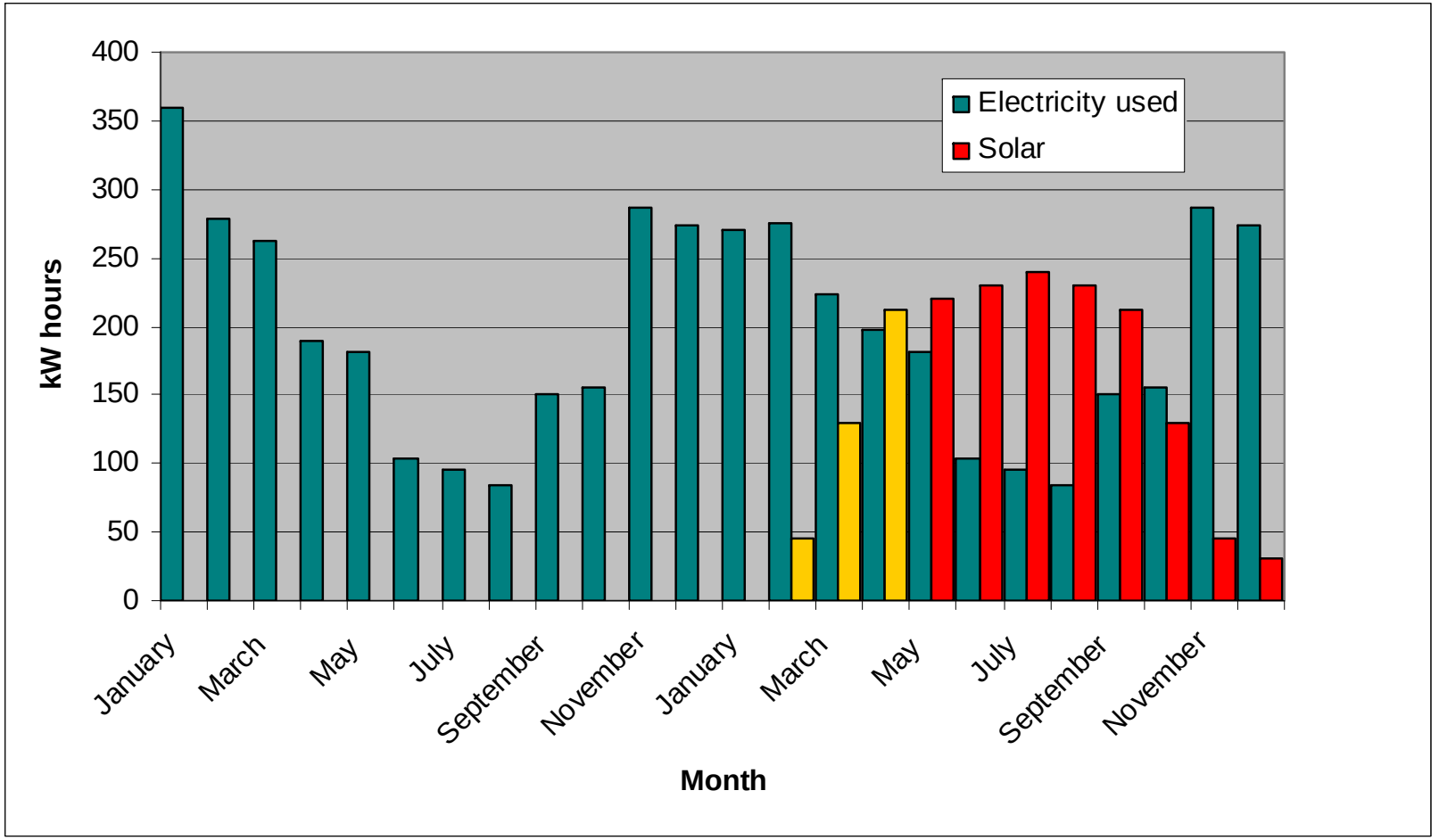


Cloudless day



Cloud comes and goes

Electricity use vs generation



Good and bad experience

- **Good price**
- **Big company – gives confidence**
- **Well-known panel manufacturer (Sharp)**
- **Quick workers**

- **Lack of experience**
- **Communications**
- **Wrong inverter**
- **Meter not connected correctly**
- **Incorrect meter for house**
- **Incorrect certificate**
- **No explanation of how to claim**

Trinity Village, Bromley


54 panels


65 panels

Thank you

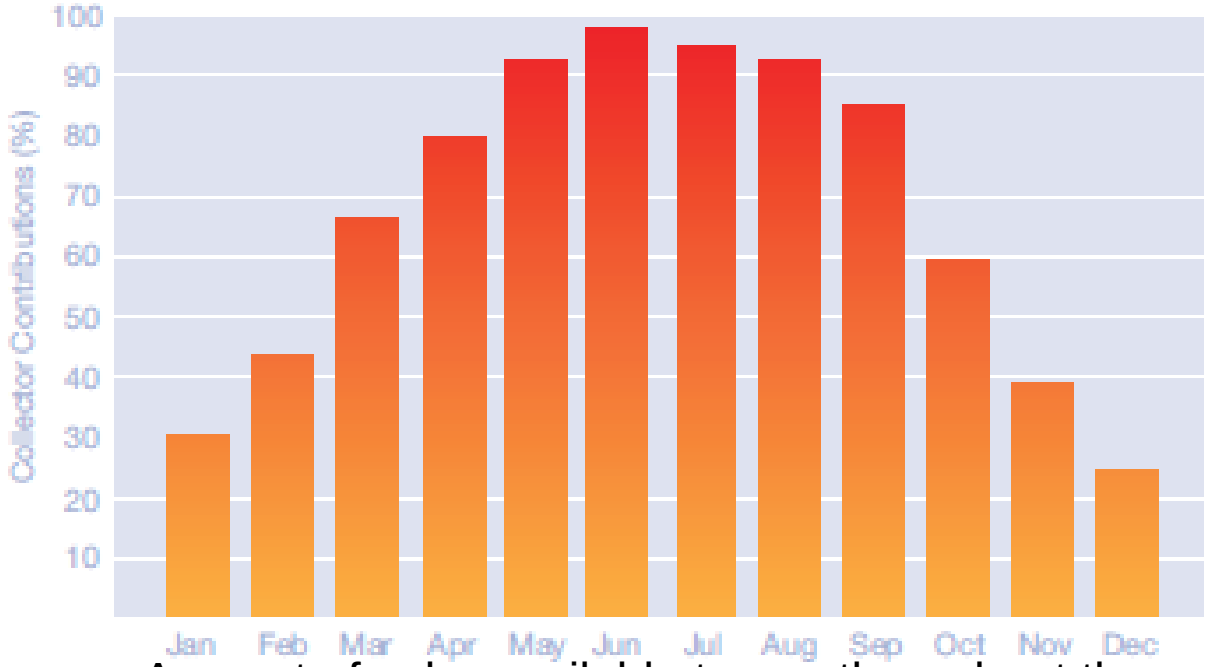
Solar PV

Case Study 2

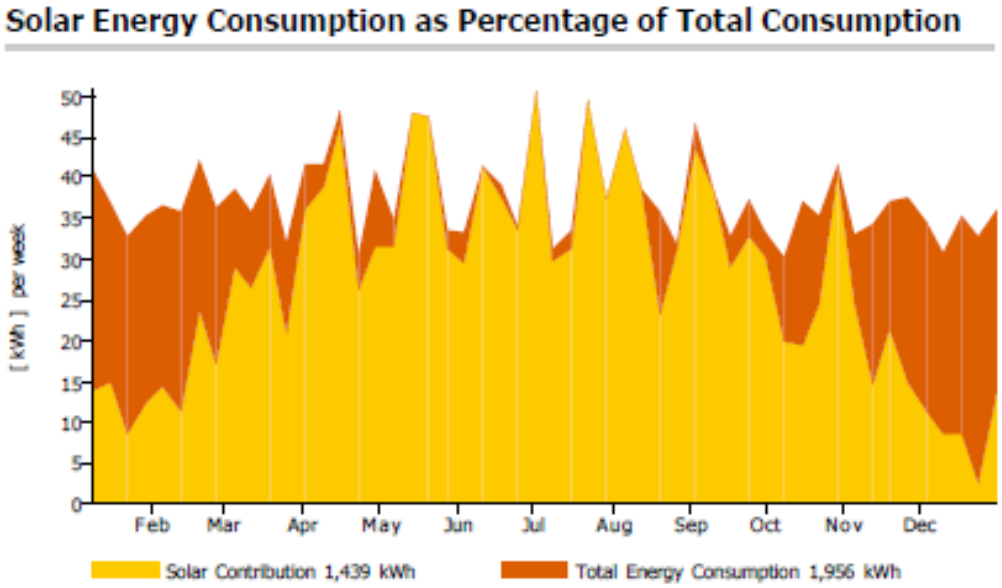
Solar Thermal

Case Study 2

TWIN COIL

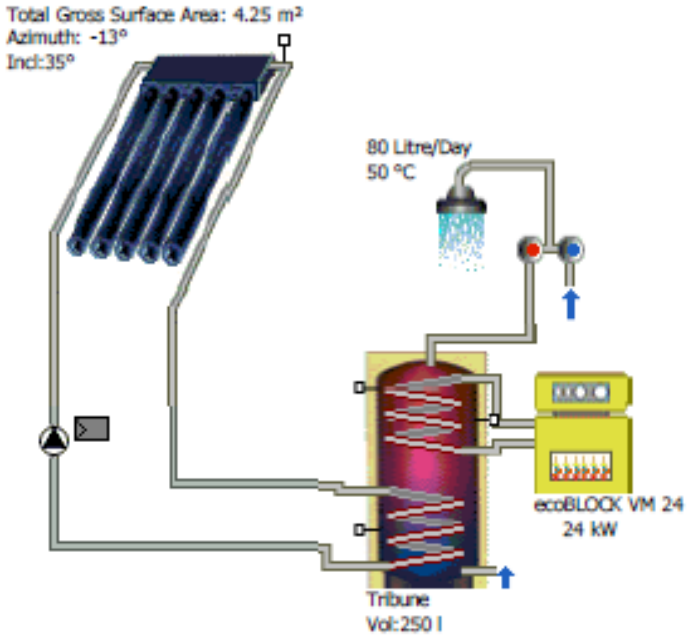


Amount of solar available to you throughout the year



DHW Heating Energy Supply:	1353.99 kWh
Solar Contribution to DHW:	1438.81 kWh
Energy from Auxiliary Heating:	516.83 kWh

Natural Gas (H) Savings:	**164.7 m³**
CO2 Emissions Avoided:	**348.28 kg**
DHW Solar Fraction:	**73.6 %**
Fractional Energy Saving (EN 12976):	**69.2 %**
System Efficiency:	**41.1 %**



Mr Metherell
60 Meadlands Drive
Petersham
Richmond-Upon-Thames
Surrey
TW20 7EE

Contract for Solar Water Heating System & Boiler

Solar Solution
The system I propose to install is a 'state of the art' solar thermal vacuum tube system. Designed and manufactured by Thermomax in Eire the collectors are the best in their class. Sleek, robust and powerful, one Thermomax DF100 vacuum tube panel has an excellent output due to the highly efficient absorber coating that can collect vast amounts of energy, greater than all flat plate collectors. The collectors are well matched to the Range Tribune 250 litre un-vented cylinder and put quite simply this is possibly the best system available on the market today. The vacuum tube panels and will be mounted on the south east facing roof so the tubes run vertically. The solar collectors will be connected to the cylinder using DN12 pre-insulated stainless steel tube for maximum heat transfer. All components are Resol and are of high quality and appealing design.

Gas Condensing Boiler Solution
I propose the Vaillant Ecotec Plus System Gas Condensing Boiler for the project. The boiler comes with a two year guarantee and is one of the market leaders in gas condensing technology. Shower tray will also be removed and tank platform made up.

Shower
An Aqualisa high pressure exposed shower and kit to be supplied to upstairs bathroom.

Installation Dates
Week commencing 2nd November 2009

Instalments Required

Supply & Installation of Vallant Ecotec Plus System 24kW & Controls exVAT @ 5%.....£ 1,990.00

Supply & Installation of Thermomax DF100 Solar System excluding VAT @ 5%.....£ 4, 600.00

Power Flushing of Nine (9) Radiators @ £40 Per Rad excluding VAT @ 5%.....£ 360.00

Aqualisa Opto Thermo Exposed Shower excluding VAT @ 5%.....£ 595.00

VAT@ 5%.....£ 377.25

Total including VAT.....£ 7,922.25

Please pay first stage deposit to order materials.....£ 2,772.78
(To book installation)

Please pay second stage deposit on delivery of kit.....£ 1,772.78
(Payment for kit)

Please pay third stage deposit when installation is complete.....£ 3,376.69
(Payment for kit & labour)

I Paul Elliott-Smith T/A Green Systems UK propose to install the solar heating system as described in the quotation and as outlined in this document.

DATE: 19th October 2009

SIGNED: Paul Elliott-Smith - T/A Green Systems UK

Supply & Installation of Thermomax DF100 Solar System excluding VAT @ 5%.....£ 4, 600.00

Year	Jan – Apr	Apr – Jul	Jul – Oct	Oct - Jan	Year total	Average
2000	6377	5926	2526	11072	27901	27020
2001	12070	1804	2570	8862	27307	
2002	9705	2952	2343	11375	28377	
2003	9106	2653	1814	10398	25974	
2004	9170	3397	2532	8972	26075	
2005	10367	3771	3627	9518	29288	
2006	13516	2744	1230	8067	27563	
2007	10163	4218	1091	8953	26432	
2008	8683	3597	1947	8030	24265	
2009	9130	3053 *	616	6551 **	21359	
2010	6908	1298	693	6552	17461	35% reduction on average
2011	5404					

* Cavity wall and extra loft insulation installed.

** Solar thermal water heating + new boiler installed.

Kingspan Technical Design Guide is a good place to start…

www.kingspansolar.com/pdf/thermomaxdesignguide.pdf

Source: Thermomax DF 100

SOLAR WORKSHOP

Thank you