

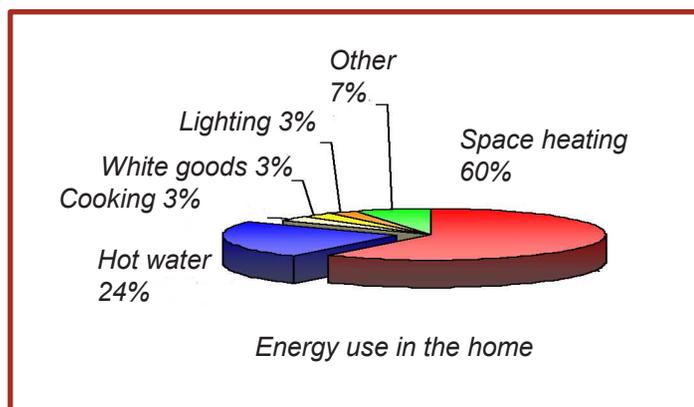
GREENHOUSE INFORMATION SHEET



Climate change is now the greatest challenge facing humanity today. During the coming decades, we must significantly reduce the energy we waste and the CO₂ generated. Buildings account for over half of our current energy use. Improving the energy efficiency of the built environment is crucial.

New buildings will need to be built to zero carbon standards, with the energy used in construction being as crucial as the energy used once the building is use.

Old buildings (including listed buildings) will need to significantly reduce energy consumption. The more we can reuse the materials (traditional and modern) invested in the building, the better.



In the UK water heating contributes 24% of the energy used in the home. In the UK solar hot water systems could contribute from 40-60% of our hot water requirements. The Greenhouse operates a kitchen during the day, so our use of solar hot water is very close to 60%

Solar water heating systems use light from the sun. The brighter the sun the hotter the water. The technology is now well developed and is one of the most widely used renewable technologies, used alongside fossil fuel systems to provide all year round hot water.

Solar hot water can provide most of your hot water during the sunny/bright months and about 50% as a percentage of your annual hot water use. The percentage depends on the size of the system and the amount of hot water required.

SOLAR HOT WATER

All proceeds from the sale of these leaflets help us print more

SUGGESTED DONATION 50p



An Alaskan glacier, melting fast.



In 1993 The Greenhouse Trust purchased this Victorian building, which was in a considerable state of disrepair. Historically, heating water in all types of buildings has come from fossil and nonrenewable sources (oil, coal, gas and uranium). These all generate CO₂, the main greenhouse gas.



INVESTING IN THE FUTURE

With fuel prices rising there has never been a better time to invest in renewable technology. A typical solar system has a working life in excess of twenty years, with many earlier systems now exceeding projections, with new estimates to last up to fifty years. However, be very wary of systems without a British Standard kite mark, cheap products may work well for a while, but may mean that the system only performs for 10 to 15 years.

THERE ARE TWO MAIN TYPES OF SOLAR HEAT COLLECTORS



Flat plate collectors comprise an absorber plate with a transparent cover to collect the sun's heat. Hot water systems that have flat plate collectors on the roof have an efficiency of around 30-35%.

Photo by Norfolk Solar: www.norfolksolar.co.uk.



Evacuated tube systems comprise parallel rows of evacuated tubes. Heat is prevented from escaping by a partial vacuum surrounding the tubes, providing better performance in the winter months. Hot water systems that use evacuated tubes occupy a smaller area and have a efficiency of around 35-40%, but are generally more expensive.

The typical installation cost for a domestic system is £3,500 for flat plate solar collectors compared to approximately £4,500 for evacuated tubes. This will vary according to the amount of plumbing any new or upgraded system requires. Solar systems add value to your home and the economic pay back on your investment starts as soon as the system begins to provide you with hot water.

Is solar for you?

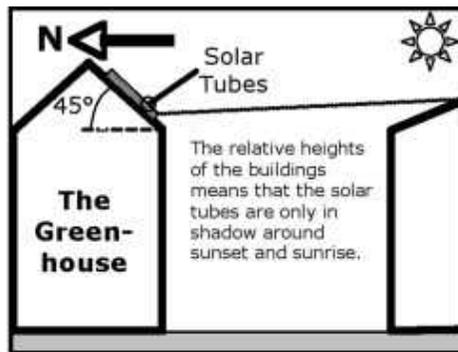
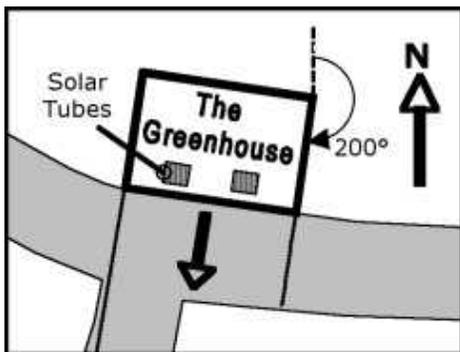
Given climate change and peak oil, it is vitally important that all new homes are built with south facing roofs and have some form of solar technology installed.

Not every existing building can benefit from solar power, but it is estimated that more than 50% of homes in the UK could benefit from solar technology.

South facing buildings have the added benefit of allowing the windows in the front to be designed to maximise the collection of light and warmth from the sun (called passive solar heating).



“Norfolk Solar is unlike other renewable energy organisations. Whilst it is important for every organisation to generate profits in order to remain economically sustainable, we have a particular interest in sustaining issues much larger than Norfolk Solar itself and believe our products and services have the potential to deliver far greater benefits to issues facing the positive development of the renewable energy industry, our regional and global environment, and the local community we live in.” (From www.norfolksolar.co.uk. Photo by Norfolk Solar)



Right: The Greenhouse location, pitch and height of roof.

The pitch of the roof is also important. The technology collects the maximum amount of solar radiation at a tilt from the horizontal in the UK between 30-40°.



Spot the difference: the building roof restored in 1995. Solar hot water installed in 1997. The PV technology is yet to come at the time of this photo (see PV Information Sheet).

HOW IT WORKS

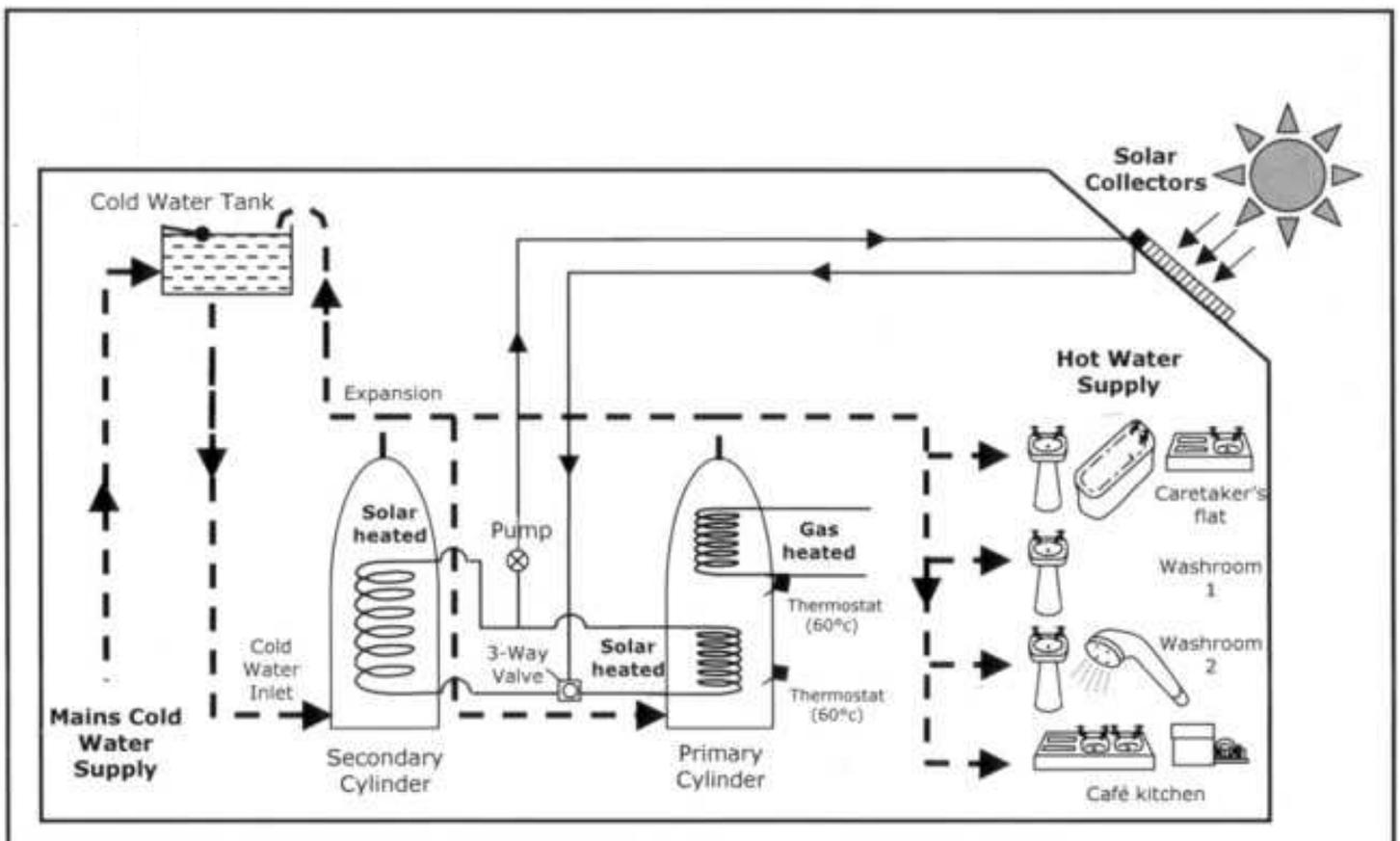
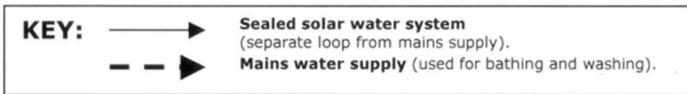
The three main components of a solar hot water system are:

- ◆ Solar panels (plates or tubes) fitted to your roof to capture the heat from the sun and transfer this to the fluid running around the system.
- ◆ A hot water cylinder to store the water heated during the day
- ◆ The plumbing system made up of pipe work, and sometimes a pump, to move fluid around the system. Fluid containing antifreeze circulates through central pipe work alongside highly efficient solar collectors (plates or tubes), usually positioned on the roof, where the fluid is heated and pumped via the plumbing to the hot water cylinder, where the circulation of the heated fluid transfers the heat to the water in the tank.
- ◆ When the sun doesn't succeed in raising the water temperature to the level required, the boiler kicks in to raise the temperature. The boiler can be set to work automatically, or can be operated by the owner.
- ◆ You will need to establish whether the existing boiler is compatible and whether you will need a new boiler as part of the system.

The Greenhouse has two hot water cylinders, which were included in the design due to the volume of hot water needed for the Greenhouse Café. The first (primary) water cylinder has the capacity to be heated by solar energy AND gas, the sun heats the second tank in the system here, in order to store all the available heat collected by the tubes on the roof.



The Greenhouse has two sets of 30 'Thermomax' evacuated tubes each measuring 1.96m by 2.12m with a total surface area of collector tubes of 7.8m².



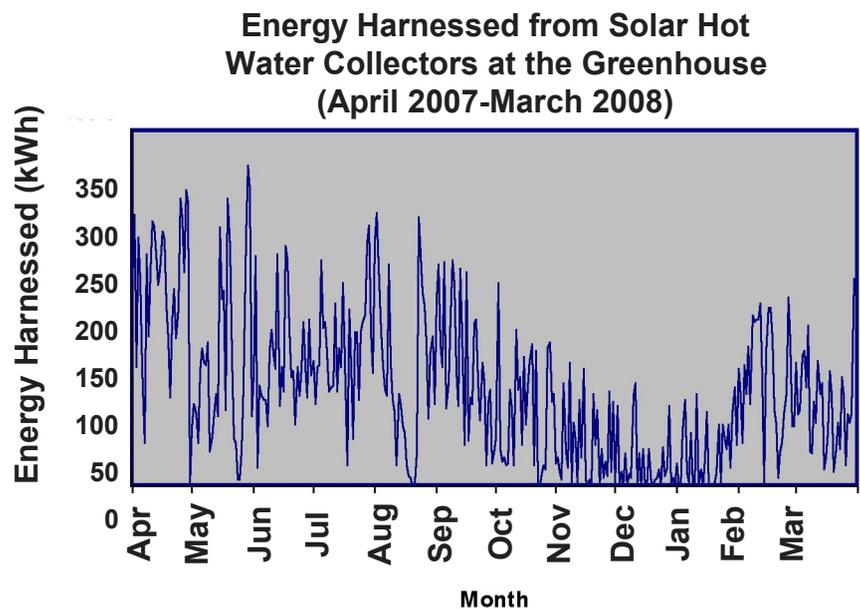
GENERAL MAINTENANCE

Solar water heating collectors generally come with a 5-10 year warranty and require little maintenance. A yearly check by the householder and a more detailed system check by a professional installer every 3-5 years should be sufficient. However, you should be aware that the solar collectors are only one aspect of the system. Just like any other plumbing/heating systems, valves and pumps and pipe work can all develop leaks and deteriorate.

It is important that you discuss with your installer how your lifestyle will affect the use of the system. For example: how many people are in the house, when do they use the water, do you all go away for long periods of time, use a little or lots of hot water? A well-trained and qualified installer will be able to design a system that caters for your needs.

SEASONAL VARIATION

The output of the solar panels varies throughout the year. The graph opposite shows the variation in 2007/08 of the system at the Greenhouse. From mid February to mid October the system provided enough hot water for all of the Greenhouse's hot water requirements. As a resident of a solar building, you also develop an awareness of when best to do your washing, have a bath etc. This awareness generates an additional saving, both economically and environmentally.



PLANNING

The General Permitted Development Rights Order (GPDO) introduced by government on 6th April 2008, grants rights to carry out certain types of development work on the home, without the need to apply for planning permission.

ROOF MOUNTED

Solar thermal (and solar PV)
Permitted unless:

- ◆ Panels when installed protrude more than 200mm
- ◆ They would be placed on the principal elevation facing onto or visible from the highway in buildings in Conservation Areas and World Heritage Sites.

STAND ALONE

Solar PV and solar thermal
Permitted unless:

- ◆ More than 4 metres in height
- ◆ Installed less than 5 metres away from any boundary
- ◆ Above a maximum area of array of 9m²
- ◆ Situated within any part of the curtilage of the dwelling house or would be visible from the highway in Conservation Areas and World Heritage Sites.

“If an architect proposes to hide solar panels behind a parapet invisible from the street, or formal stylistic concerns start to create poor solar access, poor daylight and overshadowing or windshade, the energy generation problems are automatically sent offsite to centralised fossil fuel power stations.”

Bill Dunster, Architect for Bed Zed @ Zed Factory www.zedfactory.com

The restrictions on listed buildings and buildings in conservation areas continue to fundamentally compromise the ability of people living in old building stock wanting to tackle their fuel bills and CO₂. This not only compromises the living standards (fuel poverty) of the inhabitants, it jeopardises the environmental security of buildings and landscape.

Sadly, it is still the case that planning officers rarely make planning determinations based on the science of climate change or awareness of future energy supply. Planners continue to describe Solar technology as ‘Eco Bling’, ignoring that in a world of climate change and peak oil, even the most well insulated building (new or old) requires hot water and electricity from renewable sources.

It is well worth establishing the support of your local councillor/s as they are often keen to challenge the inertia of the planning systems and the prejudices of planning officers.

Savings: the greenhouse example

ENERGY

Energy is measured in kilowatt-hours (kWh). 1 kWh is the same as 1 unit on an electricity bill, and is enough power to light a 20W low-energy light bulb for 50 hours. In 2007/08 The Greenhouse collected approximately 3,500 kWh of energy from the solar hot water collectors on the front of the building. This is energy equivalent to hot water for 3,500 showers if all the energy was converted directly to hot water. There is a further inhouse saving in that the glass washer in the Café is plumbed directly into the hot water supply. Hot water for glass/dishwashers (and washing machines) generally use electricity to heat water. Glass/dish washers are amongst the highest users of electricity in any home.

ECONOMICS

The Greenhouse saves approximately £210 per year on its water heating (based on 6p per kWh paid for gas). The Greenhouse system cost approximately £7,000 to install (including a new gas boiler and new plumbing throughout the building). The National Office of Statistics currently uses a fuel inflation figure of 9%. Many climate campaigners and Peak Oil commentators calculate that the real figure may be closer to 30%. So as fossil fuel prices rise, and the urgent need to reduce CO₂ becomes ever clearer, the faster your investment makes a financial return. On current gas costs the Greenhouse solar hot water system would pay for itself in 33 years. However, if the 9% fuel inflation figure is applied, the system will cover its full costs in 30 years. Using the 30% fuel inflation rate, the number of years before payback arrives is 25 years.

CO₂

The energy collected by the solar tubes on the system at the Greenhouse allows water to be heated without burning fossil fuels (coal, gas and uranium). The average domestic system can reduce CO₂ emissions by 0.4 - 0.75 tonnes (400-750kg) per year, depending on the type of fossil fuel being replaced. The Greenhouse system, which has 60 tubes avoids generating approximately 1.0 tonne of CO₂ per year for every year that the system operates. The solar technology not only generates hot water, it also reduces demand on fossil fuels.

YOUR CHANCE TO INCREASE MARKET AND ENVIRONMENTAL PAYBACK

Local (decentralised) energy is a vital part of creating a sustainable future. A number of independent companies are offering schemes that support local energy generators like the Greenhouse.

Good Energy will operate your gas bill alongside their commitment to renewable energy.

Buying your gas from Good Energy is a great way to support the development of renewable electricity and local energy generation. (See PV leaflet for information on solar electricity generation). This doesn't reduce your gas bill, but as a tariff on your non solar generated hot water, it's a great way to keep up the pressure for change.

Monkton Reach
Monkton Hill
Chippenham
Wiltshire
SN15 1EE

Tel: 01249 766090

Fax: 01249 766091

Email: enquiries@goodenergy.co.uk

www.goodenergy.co.uk



For every new customer who signs up to Good Energy via our website, the Greenhouse will receive £30. By being part of a local (decentralised) energy network the Greenhouse is helping to further reduce the overall consumption of fossil fuels being burnt which add to global warming.

SOLAR CHECKLIST

Have you installed other energy saving measures?

- ✓ Reducing the amount of hot water you use will always be the cheapest and best eco-plan.
- ✓ It is a requirement for obtaining a grant that other energy saving measures are implemented before installing a solar panel.

Have you got the available space?

- ✓ Solar hot water systems ideally need approximately 3-4m² of unshaded Southeast to Southwest facing roof.
- ✓ You may also need space for an additional water cylinder if required.

Can your roof take the extra weight from the solar panels?

- ✓ Solar panels can be quite heavy and in some cases will require additional roof support.

Have you got a compatible hot water system?

- ✓ Connecting Combi-boilers, for example, is not straightforward and can be an additional cost to factor into your investment plan.

Can you connect your lifestyle to the fluctuations of the system?

- ✓ Using the water at the most appropriate times

can have a significant impact on the overall efficiency of the system.

Planning your water use:

- ✓ Plan water use to minimise the use of the boiler - therefore reducing fossil fuel emissions
- ✓ Planning washing and drying for sunny days
- ✓ Showering when the weather has provided hot water
- ✓ Leaving washing up till there is hot water

Save energy from the use of:

- ✓ Gas Condensing Boilers
- ✓ If everyone in the UK with gas central heating installed a high efficiency condensing boiler, we would save enough energy to heat 3.3 million homes for a whole year and save around 12.5 million tonnes of CO₂. (Energy Savings Trust)

Save Energy from the use of Biofuel boilers:

- ✓ One of the most environmentally friendly methods of heating hot water and heating the home would be to use a solar panel in conjunction with a biofuel (wood) boiler.
- ✓ This would mean that 100% of heating and hot water requirements could be met by renewable energy.

LOCAL INSTALLERS AND GRANTS

SOLAR HOT WATER INSTALLERS

Norfolk Solar (*Established 2002*)
1 Baines Way
Bowthorpe Industrial Estate
Norwich, Norfolk NR5 9JR
☐ 01603 734851
Web: www.norfolksolar.co.uk
Email: lee@norfolksolar.co.uk



norfolk solar

INSTALLER OF THE GREENHOUSE EVACUATED TUBES SYSTEM

Natural Energy Systems (*Established 1984*)
Alderon Court, Norwich, Norfolk, NR2 4ER.
☐ Tel: 01603 661863 Web: www.naturalenergysystems.co.uk

More installers on the Energy Savings Trust, and for free, independent and local energy saving advice, call: ☐ 0800 512 012
www.energysavingtrust.org.uk



The most recent information on available grants can be found on the Low Carbon Buildings Programme, or via the Energy Savings Trust. Web: <http://www.lowcarbonbuildings.org.uk/home/>



Solar flat plate collectors. Photo by Norfolk Solar



Solar evacuated tubes. Photo by Norfolk Solar



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