

# A Local Eco House Renovation

*This series of articles follows the renovation of a local non-listed 1850s house to be close to carbon 'zero'*

## Part 4: SOLAR THERMAL ENERGY: TAKING A SUN SHOWER

Consider a hot shower or bath; one of our nicest, but largest, users of energy. In a large family, nearly a half of all energy used can go into the hot water tank. Debbie and Mike wanted to maximise the amount of solar energy they used so when it came to heating the water, solar thermal energy was vital. As the sun's warmth is not guaranteed in North Yorkshire, solar thermal energy is used as a contributor to home water heating, never (alas) the sole source.

Solar Thermal Energy is one of the simplest technologies.

A normal domestic design consists of roof mounted south facing panels, a twin-coil hot water tank, an expansion vessel, a pump station and a controller. It is important to ensure that the roof can take the weight of the panels. Inside the house, you will need a tank with a heat transfer coil for the solar thermal. Some tanks already have a spare coil. If not, you will need a new tank. You will also need an expansion vessel for safety.

The size of the new tank will be determined by the family's hot water demand. The tanks range from 120 litres (about the size of an old domestic 30 gallon tank) up to 300 litres (this can be 1.7m tall!). A new tank has the benefit of modern levels of insulation.

### So what size tank is best?

It is a balance between the number of panels you have and the amount of hot water you need. A smaller tank will heat up fully on a sunny summer day. Larger tanks (more water) will reach a good temperature, but may need a top-up from the existing boiler or immersion heater. However, the big tank can capture all the solar energy available, but will need more panels to reach the normal hot water tank temperature.

When the tank reaches its set temperature, the solar panels will be automatically disconnected to stop the tank water boiling. No further solar energy can then be collected. The panels on the roof continue to heat up, but they safely reach a temperature when the heat loss from them balances the solar input. This temperature is known as 'stagnation' and is about 180-200°C. The panels are safely out of the way on the roof, so this is no problem. A large water tank will be able to take more solar energy before 'stagnation' is reached.

In winter, the solar thermal panels will make a contribution, but the main heating source will likely be required to get the tank fully hot.

Solar panels are at their most efficient when heating water from cold. As the water heats up, the efficiency of all panels reduces. Ideally, the best systems will be designed to let the sun have first shot at heating the tank water, followed by the top-up.

A good supplier should be able to optimise the design to the family requirements.

D & M wanted to use as much solar thermal energy as possible. The roof has two solar panels, totalling about 4 square metres



Happily the roof faces due south. To optimise the solar thermal energy collected and stored, the eco-house has a 300 litre dedicated solar tank. (A rule of thumb for optimal collection is 70 litres of tank per square meter of panel). Rather than being used directly for the hot water, the solar tank is used as a pre-heater for the thermal store.



Whenever hot water is demanded in the house, the thermal store is topped back up by the solar water. If it has been a long sunny day, the large tank can reach over 60 °C and this hot water refills the thermal store for free. Even on a less sunny day, the solar tank will get to at least 40 °C, saving the heat pump from heating the water from cold. The beauty of this is that all heat losses from the solar tank are made up purely by the sun.

Solar thermal energy is very flexible. It can be used as a pre-heater for a hot water tank. It can be used to give shower and bath water in summer and it makes a contribution to hot water demand on sunny frosty days in winter. It is one of the simpler technologies to install and also one of the cheaper options. Provided it is understood that solar thermal is a *contributor* to hot water demand, it can be a good option to consider.

During the recent spending review, the government announced it will go ahead with the renewable heat incentive scheme, so payment for energy saved by installing solar thermal may be available.

Some points when considering solar thermal:

- **Basics** Solar panels must face as near to the South as possible. They are usually mounted on the roof, which must be strong enough to support them. An electric shower defeats the whole purpose.
- **Technology** Flat plate collectors are simpler, cheaper and more robust.. Evacuated panel collectors are slightly more efficient
- **Space requirements** Well lagged hot water tank and pipes, pump, controller and expansion vessel are installed inside the house
- **Installer** Get advice and recommendations; not all installers are equal - prices and workmanship can be very variable. An MCS approved installer will be required to receive any renewable heat incentive payments
- **Back up** Solar Thermal is an important contributor, not a sole provider of hot water.

*Next time: Ventilation & Heat Recovery; fresh air with an eco-twist*