

Some Useful Data

Monthly Irradiation Figures:

(Solar energy reaching each 1m² of the earth's surface at UK latitudes)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MJ/m ² day	2.3	4.2	7.0	11.6	15.0	18.0	16.0	13.0	10.0	6.0	2.8	1.7
kWh/day	0.64	1.17	1.94	3.22	4.17	5.00	4.44	3.61	2.78	1.67	0.78	0.47

Heat is energy. Energy is measured in Joules, 1 Joule in 1 second = 1 watt, 1 kW = 1000 watt

1 kWh = 1000 watts x (1 hour in seconds = 60 mins x 60 seconds) = 3600000 joules or 3.6 MJ

A Comfortable Hot water temperature for a shower is 38°C. For a bath it's 43°C,

We at SOLARGREENPOWER believe that the most advantageous way to install a solar water heating system is to increase the volume of hot water storage at the same time....

How much heat energy can I store in a cylinder of water?

The formula for measuring the quantity (Q) of heat stored in a cylinder is;- **$Q = m \times c \times \Delta T$**

Where **m** = mass of water (1 litre=1kg), **c** = Specific heat of water (4200 j/kg) which is constant

ΔT = delta T (the temperature rise due to heating)

Small Cylinder Installation 122 litre (perhaps most common size in uk homes)

1) A 122 litre cylinder filled with cold water @16°C is then heated for a hot bath to 60°C ($\Delta T = 44^\circ\text{C}$)

Heat in cylinder **Q** is therefore $122 \times 4200 \times 44 = 25.1 \text{ MJ}$ or $25.1 \div 3.6 \text{ Mj} = \underline{\underline{6.97 \text{ kW/hrs}}}$

Because we only have 122 litres we usually heat water with fossil fuel to a high temperature (60°C), we then have to mix it with cold water, to avoid scalding and make it usable. **Very wasteful from an energy viewpoint, and very expensive when we are paying to heat the water with Gas or Electricity or Oil.**

Large Cylinder Installation 300 litre

2) A 300 litre cylinder filled with cold water @16° heated to 60°C, ($\Delta T = 44^\circ\text{C}$) the stored Heat in the cylinder would be:- **$Q = 300 \times 4200 \times 44 \div 3.6 \text{ Mj} = \underline{\underline{15.4 \text{ kW/hrs}}}$ (more than twice as much)**

If however we heat this water with a solar panel (s). **the energy is free. It costs nothing**, so if the water gets hotter we mix it with cold water, and we have more usable hot water, **and it still costs nothing**.

INSULATION

Perhaps the most common cylinder size in the u.k. is 122 litres (25 gallons) not all are factory insulated. The hotter the water stored in a cylinder, the greater will be its heat loss to its surroundings. This is because insulation only slows down the rate of heat loss, it does not stop it. However the thicker the insulation the longer the water will stay hot.