

SOLAR THERMAL WATER HEATING

ESTIMATING ANNUAL SOLAR THERMAL PERFORMANCE

The annual solar thermal performance (Q_s [kWh/annum]) is estimated using the follow formula:

$$Q_s = K_P \times S_T \times A \times 0.46^{\text{*Note 1}}$$

where,

K_P = Positioning factor based on system's tilt and orientation – see diagram 1

S_T = Total solar radiation on collector [kWh/m²/year] – see diagram 2

A = Area of solar collector array [m²]

Example – The estimated annual thermal performance for an AES 3.3m² collector on a 30° pitch, South West facing roof located in Edinburgh:

$$Q_s = K_P \times S_T \times A \times 0.46 = 0.95 \times 900 \times 3.3 \times 0.46 = 1298 \text{ kWh per annum}$$

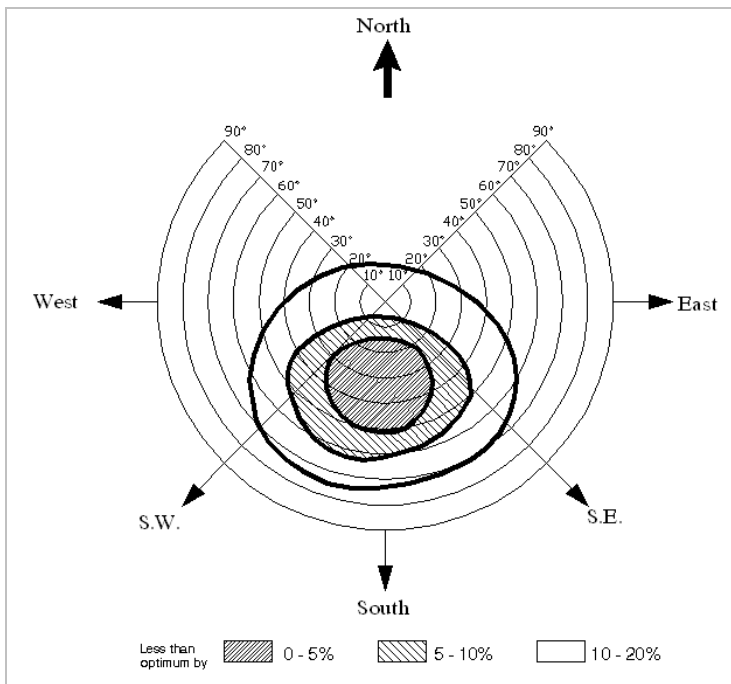


Diagram 1. Solar effect on pitch and orientation

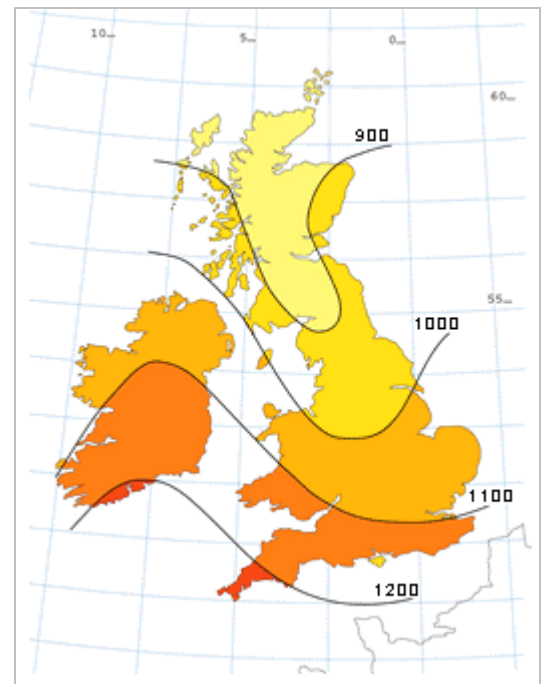


Diagram 2. Map showing average solar radiation on a 30° incline facing due south [Source: Solar Trade Association]

***Note 1**

Collector performance factor \times Zero-loss collector efficiency = $[0.87 - 0.034 (a_i/\eta_o) + 0.0006 (a_i/\eta_o)^2] \times \eta_o = 0.46$

where, a_i = Heat transfer coefficient = 2.907 W/m²K – Taken from AES EN12975 Test Report

η_o = Zero-loss collector efficiency = 0.633 – Taken from AES EN12975 Test Report

The above does not take account of any losses from the hot water storage or usage patterns.



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