Solar panels for electricity

In 2007, the UK had about 8 MW of solar panels for electricity (also known as 'solar photovoltaic' or solar PV). By 2010, the capacity had increased to about 75 MW, generating less than 1 TWh.

Level 1

Level 1 assumes that solar PV's contribution remains much less than 1 TWh/y up to 2050.

Level 2

Level 2 assumes that solar PV capacity reaches 6 GW in 2030 (producing 5 TWh/y) and 70 GW by 2050 (producing 60 TWh/y). At this level there are 4 m^2 of solar panels for every person in the UK. This would be a 900-fold increase compared to 2010.

Level 3

Level 3 assumes that UK solar PV capacity reaches 16 GW in 2030 (producing 14 TWh/y) and 95 GW by 2050 (producing 80 TWh/y). This is the equivalent of 5.4 m^2 of roof space for every person by 2050. This is roughly half of all South-facing roofs of domestic homes.

Level 4

Level 4 assumes that solar PV capacity reaches 150 GW in 2030 (producing 127 TWh/y) and 165 GW by 2050 (producing 140 TWh/y). The area of panels required is about 10m^2 per person, roughly the same as the area of all South-facing roofs of domestic homes.

Level 4 can also be visualized in terms of land-based solar farms, where the land area required to deliver 140 TWh/y is 3 200 km^2 (assuming a power per unit land-area of 5 W/m^2). This is equivalent to 12 800 of the solar farms in Figure 2. It is also equivalent to 1.3% of the country and similar to the land area currently occupied by all buildings.

Figure 1. The peak power delivered by this 25 m^2 array is about 4 kW. The average is 0.5 kW, equivalent to 20 W/m^2.

Figure 2. The peak power delivered by this 25 000 m^2 solar photovoltaic farm in Muhlhausen, Bavaria is about 6.3 MW. The average is 0.7 MW, so the average power per unit area is 5 W/m^2.