Supplying All US Electrical Power Needs Using Photovoltaics

Electrical energy/year = 11.14 Q = 3.3×10^{12} kWhr. [1,2]

Average daily electrical energy = 0.9×10^{10}kWhr

Arizona yearly-average daily solar energy = 7.0 kWhr/m^2.

PV efficiency = 10%

Electrical energy = 7.0 kWhr/m^2 × 0.1 = 0.7 kWhr/m^2

Area needed = 0.9×10^{10} kWhr / 0.7 kWhr/m^2 = $1.3\times10^{10}m^2$.

$1.3\times10^{10}m^2$= $(1.14\times10^2km)^2$, or 70 mi × 70 mi

Cost = \$500 to \$1000 /m^2

Maximum cost = $\$13\times10^{12}$, or \$13 trillion

Mass production → \$1.3 trillion [3]

20 year life → $\$13\times10^{12}/20/3.3\times10^{12}$kWhr = \$0.2/kWhr

Current power costs \$0.06 to \$0.2 /kWhr

Corvallis receives an average of 2 kWhr/m^2.

[1] US Annual Energy Outlook 2000, Energy Information Agency, Dept. of Energy.

[2] 1Q = $\times10^{15}$btu = 0.293×10^{12}kWhr

[3] the current tax reduction total for the next ten years