Fundamental energy calculations for thermal solar panels
Assume a **conservative power collection** of 500 W

[1] How much energy is this when collected for 1 hour?

$$\text{Energy} = (\text{mass})\,x\,(\text{acceleration due to gravity})\,x\,(\text{height}) = (\text{Power})\,x\,(\text{time})$$

Total energy collected in 1 hour:

3600 seconds = 1 hour x 60 minutes/hour x 60 seconds/minute

$$\text{Energy} = (500\,\text{Watts}) \times (3600\ \text{seconds}) = 1{,}800{,}000\,\text{Joules}$$

In terms of lifting a 220 pound person, how high would this correspond to?

220 Pounds is about 100 Kg.
1800 meters is about 1 mile
Acceleration due to gravity is 10 m/s^2

100x10x1800=1,800,000 Joules
So a 220 pound person climbing a 1 mile ladder requires almost the same energy as collecting 500 Watts for 1 hour.

[2] How long will it take to heat 20 gallons of water from 60^0F to 120^0F?

20 gallons weighs 166 pounds and has a mass of about 75 kg.
The specific heat of water is 4186 J/kg ^{0}C
A change in temperature of 60 F is about 15 C.

$$\text{Energy Required} = (\text{mass}) \times (\text{specific heat}) \times (\text{change in temperature})$$

$$\text{Energy} = (75\,\text{kilograms}) \times \left(4186\,\text{Joules}/(\text{Kg}\,^0\text{C})\right) x\left(60\ ^{\text{C}}\right) = 18{,}837{,}000\,\text{Joules}$$

This is about the energy needed for a 220 pound person to climb a 10 mile ladder.

Roughly said, the panel would have to collect 500 Watts for 10 hours to do this.

How many panels do you need to collect the same for 60 gallons of water?

The answer is 3: it is a proportion:

$$\frac{20\,\text{gallons}}{1\,\text{panel}} = \frac{60\,\text{gallons}}{x\,\text{panels}}$$

$$x = \frac{60\,\text{gallons}}{20\,\text{gallons/panel}} = 3\,\text{panels}$$

In fact, I have previously measured about 700 Watts of collecting power with these panels and so these estimates will probably be low. The panels are about 1 square meter and the rule of thumb is that 1 square meter heats about 20 gallons of water.