Power Calculation

$$Q = m c \Delta T$$

The solar system holds 6 Gallons of water. The mass is thus:

$$m = 6 \text{gallons} \times 3.785 \frac{\text{kg}}{\text{gallon } H_2O} = 22.71 \text{Kg}$$

The specific heat of water is :

$$c = 4186 \frac{\text{J}}{\text{kg C}}$$

We will take the average temperature between the top and bottom to get the change in temperature. From the graph:

$$T_{\text{average}} = \frac{1}{2}(47.5 + 40.5) = 44 \text{C}$$

The initial temperature was 25 C

$$\Delta T = 44 \text{C} - 25 \text{C} = 19 \text{C}$$

The amount of heat collected is then:

$$Q = 22.71 \times 4186 \times 19 = 1806217 \text{ Joules}$$

This energy was collected over 95 min = 5700 seconds

We can calculate the average power of collection:

$$\text{Power} = \frac{\text{energy}}{\text{time}} = \frac{1806217}{5700} = 317 \text{ Watts}$$

On colder days about 1/2 of the absorbed energy is being re-radiated. Under more normal temperature conditions, this re-radiation would be less of a factor. However, since the solar panel is about 1 square meter, we collect a net intensity of about $317 \frac{\text{Watts}}{\text{meter}^2}$.