

# Dual-Purpose Solar Water Heater and Electric Generation

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Project ID#

## Q1: Research Question/Engineering Goal

Is it possible to generate electricity to recharge a battery and produce hot water using a Dual-purpose solar panel during different times of day?

Engineering goal:

To build a device to generate heat and electricity during different times of the day.

## Q3: Data Analysis & Results

Table 4: Dual-Purpose Solar Panel – Water Heating Summary

Time	Water Evening Delta_T	Water Morning Delta_T	Water Afternoon Delta_T
5 min	-1.4 °C	-1.0 °C	4.3 °C
10 min	0.7 °C	3.3 °C	1.8 °C
12 min	3.0 °C	5.6 °C	1.2 °C
15 min	12.1 °C	3.1 °C	1.5 °C

Figure 1: Dual-Purpose Solar Panel – Water Heating Summary

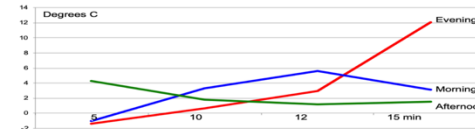


Table 5: Dual-Purpose Solar Panel – Electrical Power Summary

Time	Battery Evening Watts	Battery Morning Watts	Battery Afternoon Watts
5 min	21.8 Watts	20.9 Watts	21.8 Watts
10 min	21.8 Watts	20.6 Watts	21.2 Watts
12 min	21.8 Watts	21.8 Watts	21.4 Watts
15 min	21.8 Watts	21.8 Watts	21.9 Watts

Table 1: Dual-Purpose Solar Panel – Trial 1 (Evening)

Time	Water: T_inlet	Water: T_Outlet	Water: Delta_T	Battery: Amperes	Battery: Volts	Battery: Watts
5 min	14.9 °C	13.5 °C	-1.4 °C	2 amps	10.9 volts	21.8 Watts
10 min	13.8 °C	14.5 °C	0.7 °C	2 amps	10.9 volts	21.8 Watts
12 min	7.3 °C	10.3 °C	3.0 °C	2 amps	10.9 volts	21.8 Watts
15 min	6.7 °C	18.8 °C	12.1 °C	2.1 amps	10.3 volts	21.8 Watts

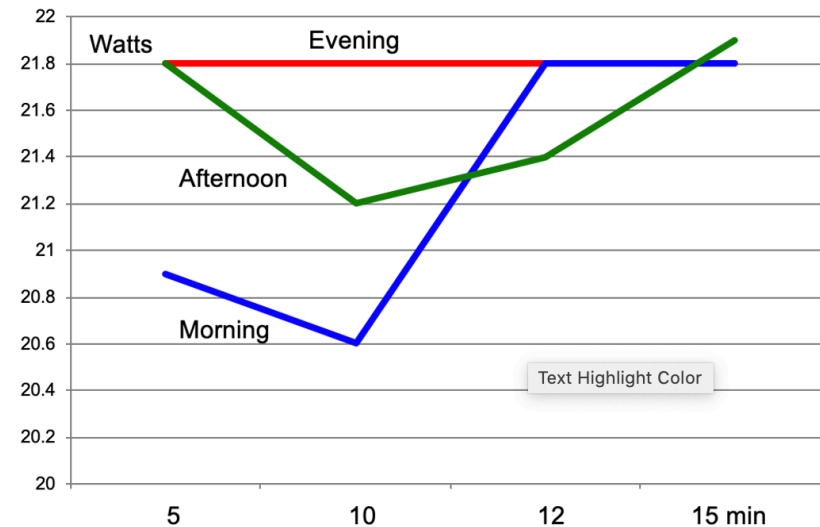
Table 2: Dual-Purpose Solar Panel – Trial 2 (Morning)

Time	Water: T_inlet	Water: T_Outlet	Water: Delta_T	Battery: Amperes	Battery: Volts	Battery: Watts
5 min	15.9 °C	14.9 °C	-1.0 °C	2 amps	10.4 volts	20.9 Watts
10 min	17.3 °C	20.6 °C	3.3 °C	2 amps	10.3 volts	20.6 Watts
12 min	15.3 °C	20.9 °C	5.6 °C	2 amps	10.9 volts	21.8 Watts
15 min	14.2 °C	17.3 °C	3.1 °C	2 amps	10.9 volts	21.8 Watts

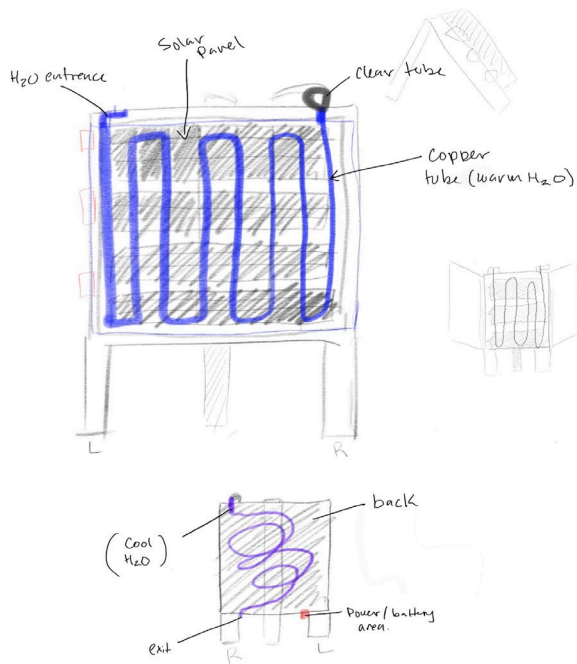
Table 3: Dual-Purpose Solar Panel – Trial 3 (Afternoon)

Time	Water: T_inlet	Water: T_Outlet	Water: Delta_T	Battery: Amperes	Battery: Volts	Battery: Watts
5 min	14.8 °C	10.1 °C	4.3 °C	2 amps	10.9 volts	21.8 Watts
10 min	13.5 °C	15.3 °C	1.8 °C	2 amps	10.6 volts	21.2 Watts
12 min	15.5 °C	16.7 °C	1.2 °C	2 amps	10.7 volts	21.4 Watts
15 min	17.7 °C	19.2 °C	1.5 °C	2.1 amps	10.4 volts	21.9 Watts

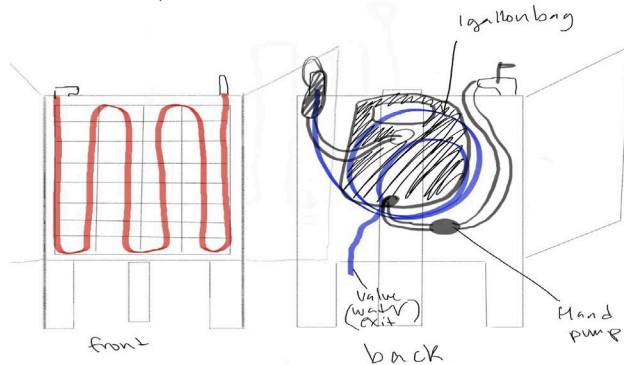
Figure 2: Dual-Purpose Solar Panel – Electrical Power Summary



## Q2: Methodology/Project Design



- Water circulates
- Want water access, open the valve from the water that circulates drains out.
  - Purpose, to keep the water warm



## Q4: Interpretation & Conclusions

The hypothesis states that placing a Dual-Purpose solar panel under the sun would generate electricity to recharge a rechargeable battery and heat the water passing through the solar panel at different times of day was accepted. The Water Heating Summary and Electrical Power Summary data demonstrates that the solar panel generated heat and electricity during the experiment. The Electrical Power Summary showed minimal change over the additional minutes and the time of day. In comparison, the afternoon time created the most watts at the end of the 15 minutes compared to the evening trial. The Water Heating Summary showed that the trial's evening time showed an increasing difference in the initial temperature and the max  $T_{outlet}$  temperature. The morning trial had the most considerable temperature in all trials, but the evening trial had enormous  $\Delta T$  temperature changes. This experiment demonstrates that this project will have the possibility to recharge and heat water using the sun.