



Investigating Output from Solar Panels – Case Study

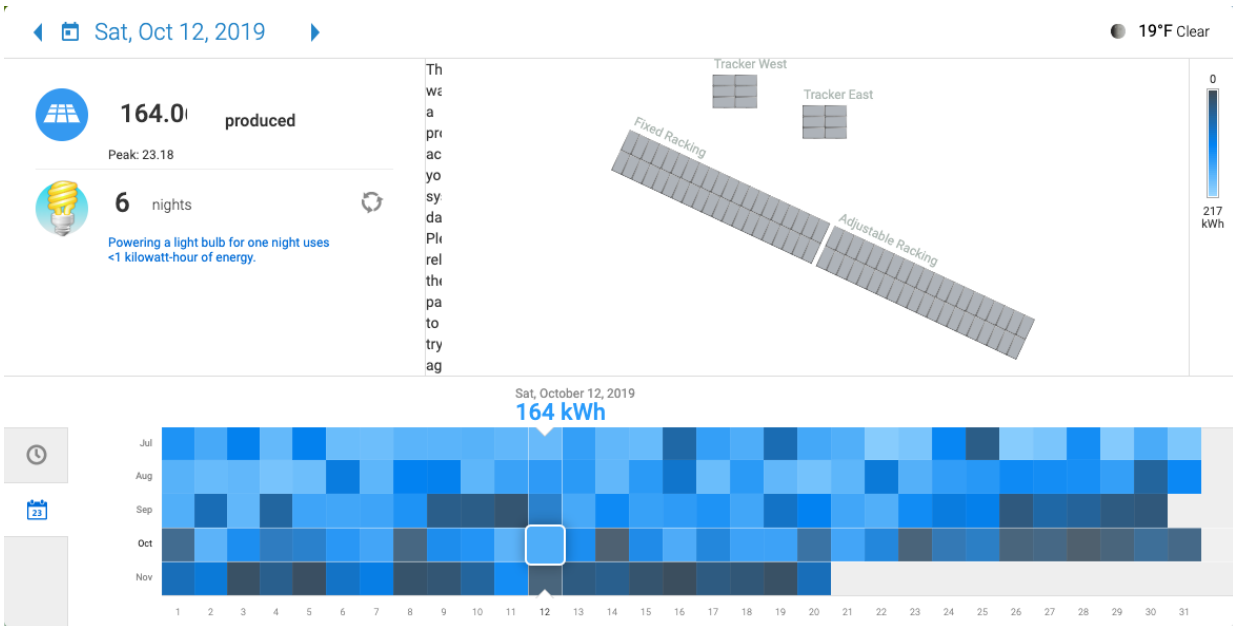
The City of Saskatoon has photovoltaic or PV solar panels (PV panels generate electricity) set up at the Landfill Gas Collection site. More information about the project, and live energy production from the site is here: [Solar Power Demonstration Site](#)

Read the demonstration project description and answer these questions:

1. Where is it?
2. Find the current power being generated by the panels.
3. Look at the daily energy data graph. What is the largest amount of power produced so far today? What time did that occur? When is power not being produced by the panels? Why is that? *Note: the graph is mislabeled. Although it says “energy”, it plots power on the y axis, and time on the x axis. Power x Time = Energy.*
4. In total, how many solar panels are at the site?
5. What is the electricity generating capacity of the solar panel installation?
6. What is the electricity used for?

Further energy information and historic trending

This screenshot is from [Enphase](#), the company that tracks the energy production of the panels. It shows energy production from individual days - very dark squares in November are low production days, much lighter squares in July through October show higher production. In the screenshot the cursor was hovering over Oct 12 and it shows the actual kWh produced on that day (164kWh). Go to the link and hover over dark and light days to see the different energy production of each, then answer the questions on page 2.





Find a low production day – how much energy did the panels produce? What caused low production?

1. Find a higher production day – how much energy did the panels produce? What led to higher production?
2. In the last year, which 3 months had the highest energy production? Why do you think those months have higher energy production? *Note: you can scroll up and down to see more months on the grid.*

SES Solar Co-op Two Twenty Rooftop

The SES Solar Co-op tracks the [real time power production](#) of the PV solar panels on the roof of The Two Twenty office building on 20th St W. in Saskatoon. This information shows both the power output and the energy output of the panels. Look over the site and then answer these questions:

1. How much energy have the panels produced this month?
2. What is the highest amount of power produced today?
3. What time did the panels start producing power today? *Think:* how that might be different at a different time of year? How would that affect energy production?
4. Which day produced the most energy in the last week?
5. The page lists 2 environmental benefits. What do they show?
6. Why is reducing greenhouse gases (CO_{2e}) important? *Think:* what are greenhouse gases contributing to?

What is the difference between power and energy?

Energy = Power x Time

Power: Each solar panel has a generating capacity – that is the maximum power the panel could produce under ideal conditions. When the sun shines on it, either directly, or from an angle, or through cloud cover, the panel will generate a portion of that capacity, depending on the strength of the sun's rays. Power is measured in Watts or kilowatts.

Time: Time is measured in hours and is the length of time that power is being generated.

Energy: This is the amount of power, multiplied by the amount of time that power is being generated. Energy is measured in watt hours, or kilowatt hours.

$$\begin{array}{l}
 \text{Energy} = \text{Power} \quad \quad \quad \times \quad \text{Time} \\
 \text{Energy} = \text{Watts} \times (\text{kW}/1000\text{W}) \quad \times \quad \text{hours/day} = \quad \text{kWh}
 \end{array}$$

A kilowatt is 1,000 Watts
Watts(W), and kilowatts(kW) are a measure of power.
Watt hours (Wh) and kilowatt hours(kWh) are a measure of energy.



Curriculum Connections:

Grade 6 Science EL6.1 Assess personal, societal, economic, and environmental impacts of electricity use in Saskatchewan and propose actions to reduce those impacts.

Science 9: CE9.4 Critique impacts of past, current, and possible future methods of small- and large-scale electrical energy production and distribution in Saskatchewan.

Science 10: SCI10-CD1 Assess the implications of human actions on the local and global climate and the sustainability of ecosystems.

Environmental Science 20: ES20-HP1 Investigate technologies and processes used for mitigating and managing resource use, waste generation and pollution associated with a growing human population.