

ENERGY & THE ENVIRONMENT

AT THE ALBERTA SCHOOL OF BUSINESS

Alberta's Electricity Market Energy Industries and Markets Slide Pack

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February 18, 2019

How did we come to install solar power?

- I gave my students an assignment each year on installing solar using my own house and family as the 'clients'
- I got updated quotes each year (Thanks, Kyle Kasawski!)



BUEC 463/563: Energy Industries and Markets

Mini-case #4 – Renewable energy investments

For this case, you are to provide a recommendation to my family with respect to the installation of solar power on my house. Here is the relevant information. First, my house is quite solar-ready, as we have an optimal location (a south-facing, custom designed roof segment with limited shading from neighbours or trees) with easy access to our electrical service entrance, so balance of system and installation costs will be relatively low. Second, our house is highly energy-efficient, so a solar array will get us close (but not quite) to NetZero. Third, we have a very particular decision to make with some cash we have available: invest in solar panels or lump down cash on our mortgage. We hold a variable-rate mortgage at prime minus 0.75%, so today our opportunity cost of capital for this project is about 2.15%.

How did we come to install solar power?

- Each year, students would reliably find that it didn't make financial sense
- In 2017, one group explained that, if a solar power system would generate a cup of coffee per day of nerd value, it would have a 20% rate of return

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How much did it cost?

The Financials

System cost \$18,900.00

Alberta Solar
Rebate -\$5,670

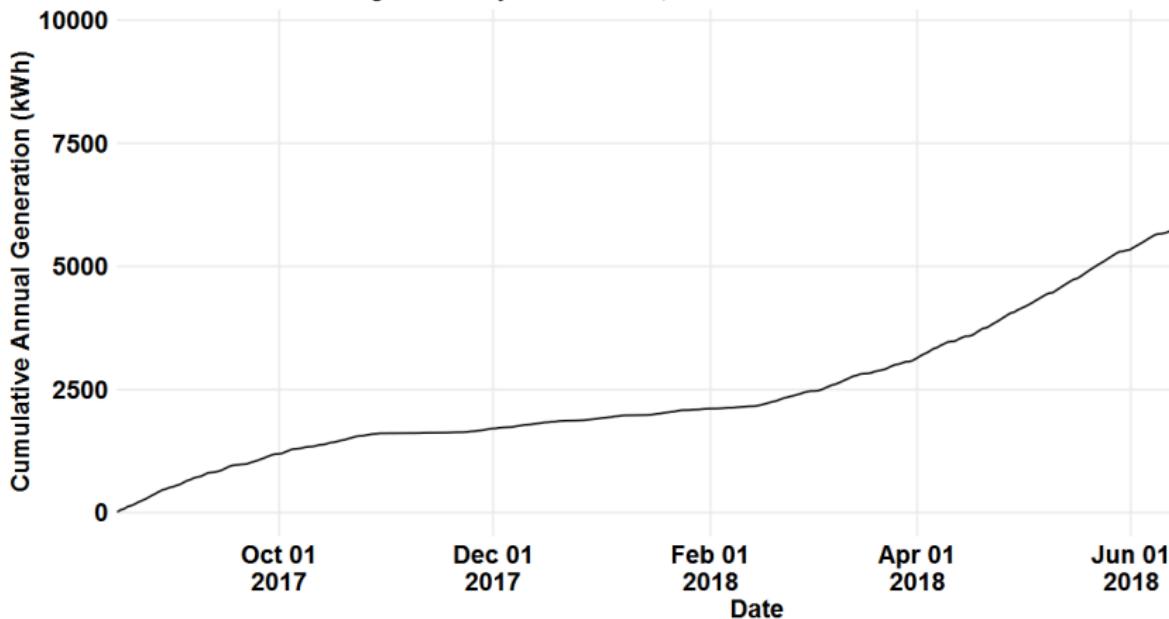
Take adv.
upcoming

Cost to you **\$13,230.00**

How much does it generate?

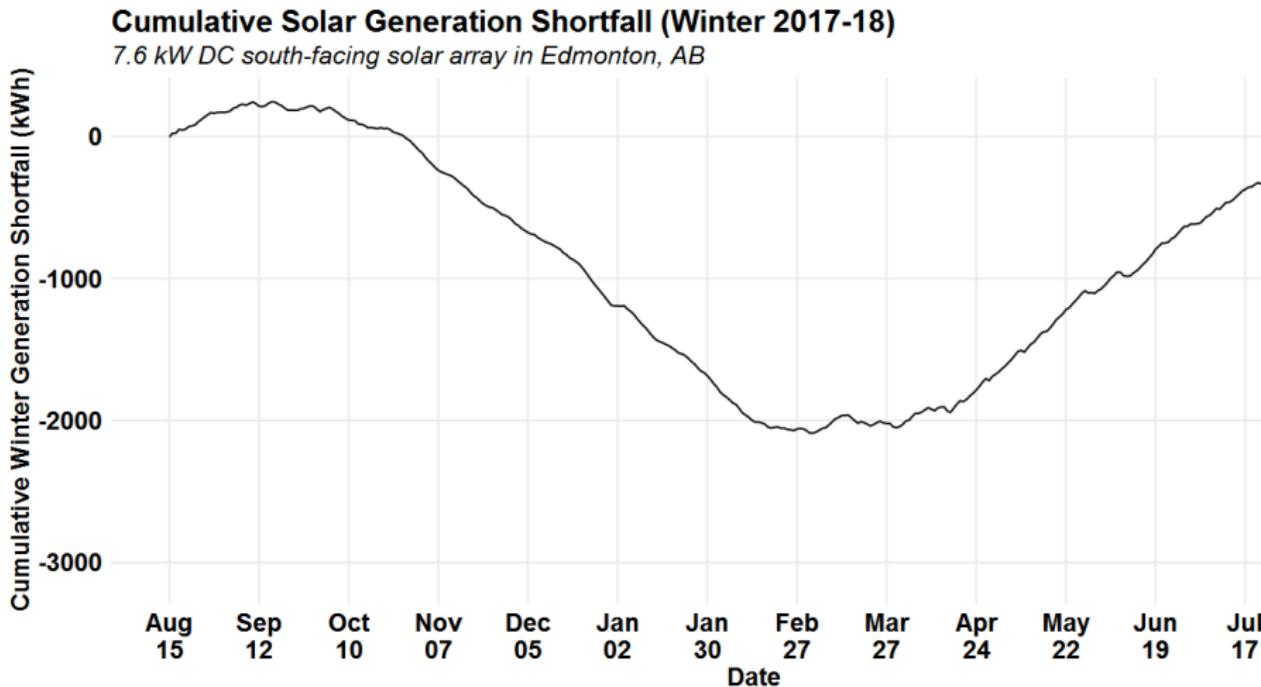
Cumulative Solar Generation (Year 1, 2017-18)

7.6 kW DC south-facing solar array in Edmonton, AB



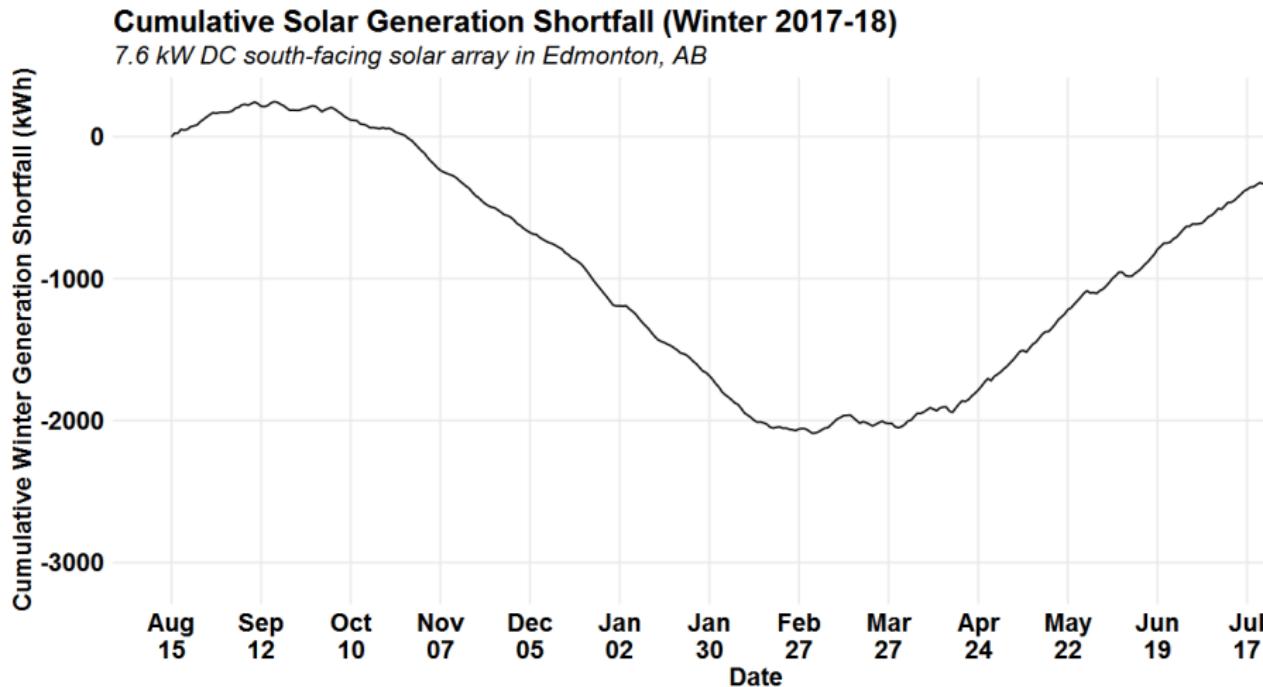
Source: SolarPeople system data via Neurio API, graph by Andrew Leach
Total cumulative year 1 generation was 9724kWh.

Do you generate as much as you consume?



Source: SolarPeople system data via Neurio API, graph by Andrew Leach
Maximum cumulative shortfall for 2017-2018 was 3123kWh, or roughly 250 Tesla Powerwalls

Does this mean you could be off-grid?

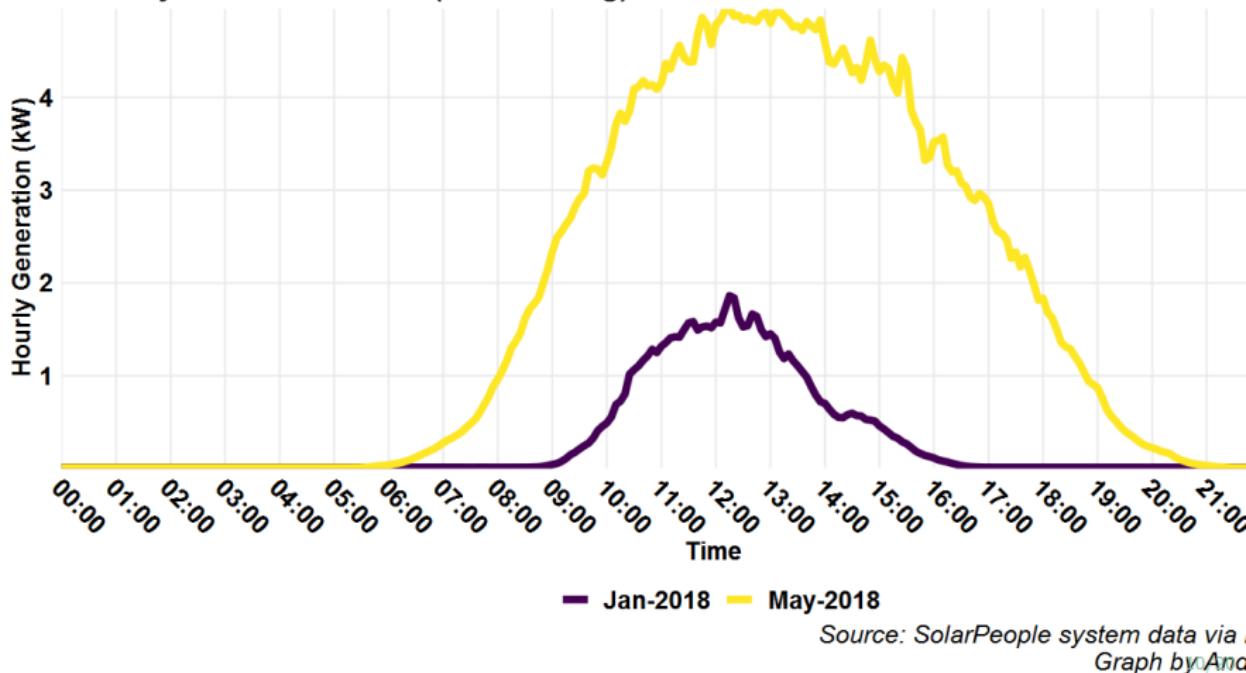


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Winter vs Summer

- We get fantastic solar in the spring and summer, not so much in January

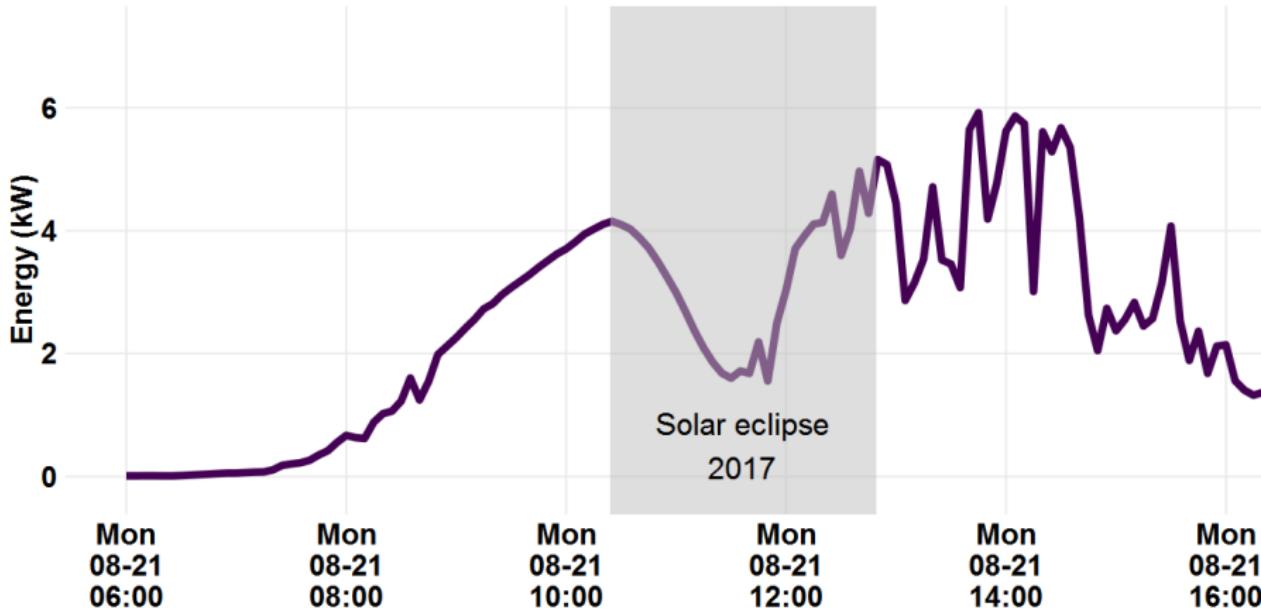
Monthly Solar Generation (2017-18 Avg)



Fun with your solar power system

- Watch an eclipse from your basement!

Residential rooftop solar generation during the 2017 solar eclipse

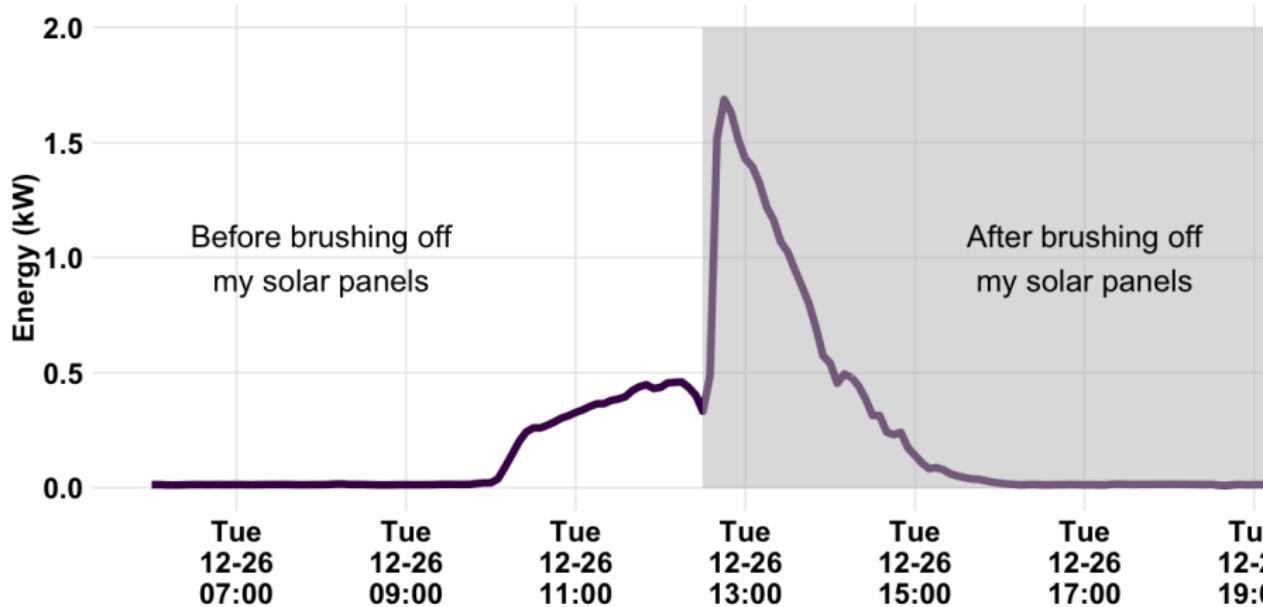


Source: SolarPeople system data via
Graph by Ar

Fun with your solar power system

- Check whether shoveling snow matters!

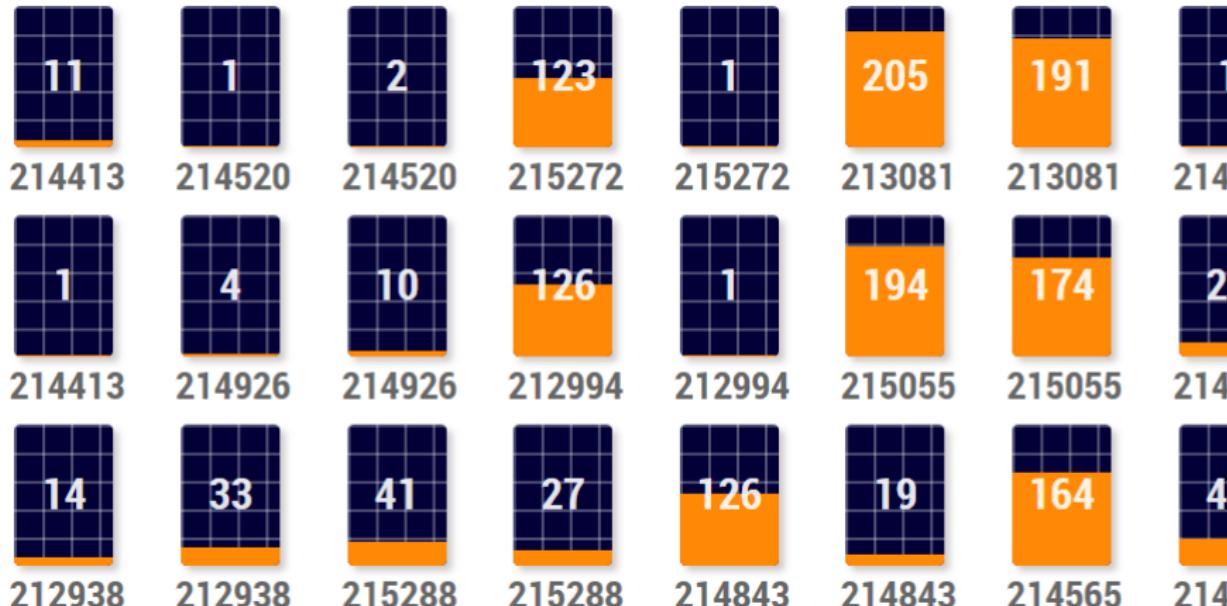
When you clean the snow off your solar panels



Source: SolarPeople system data via
Graph by Ar

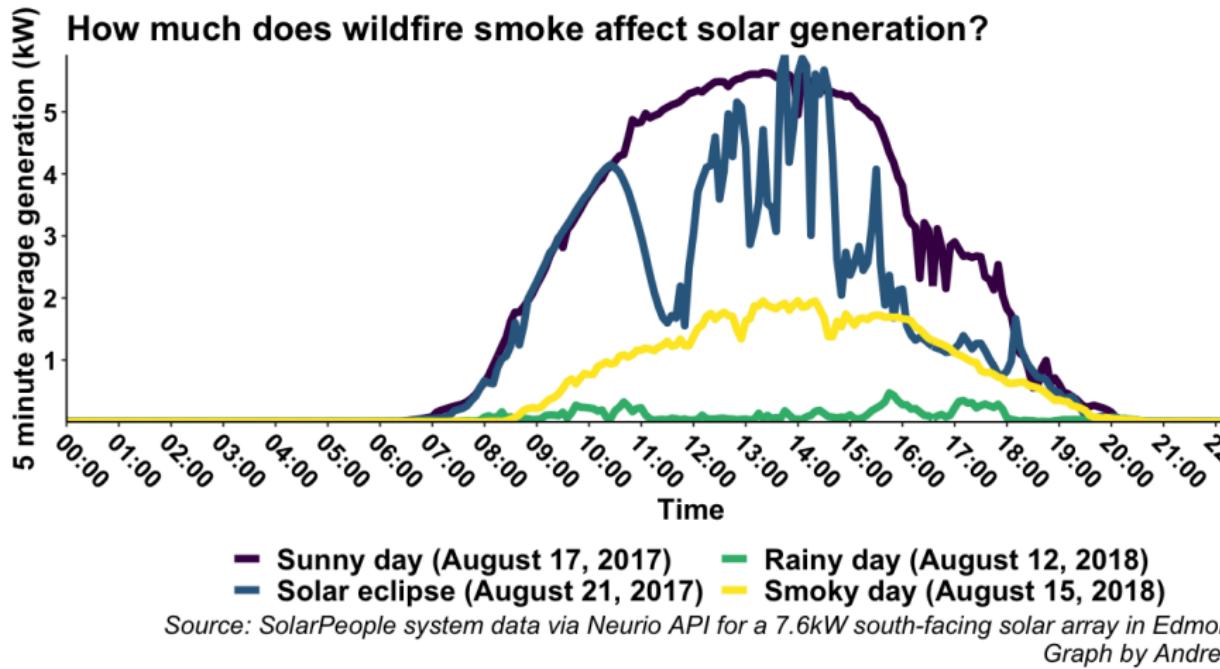
Fun with your solar power system

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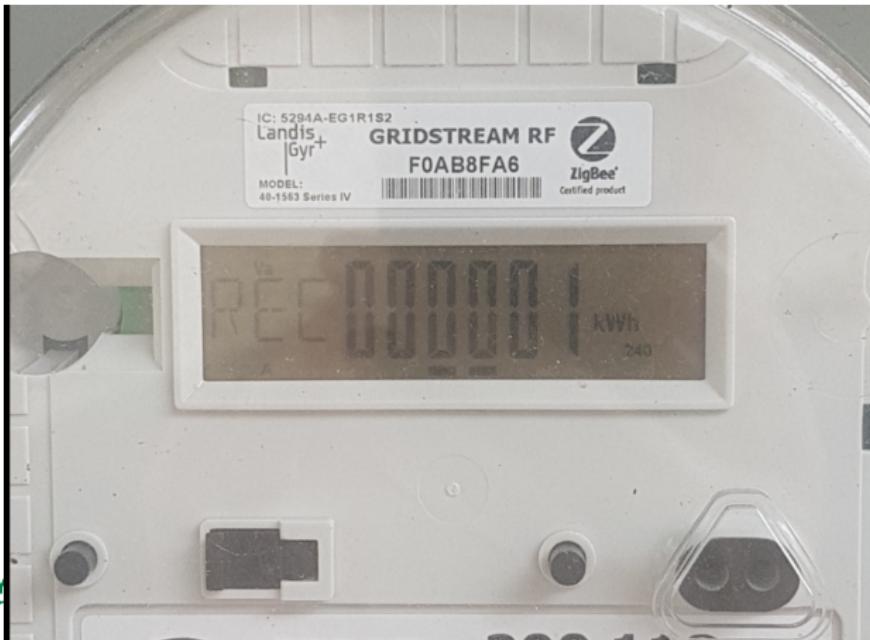
Fun with your solar power system

- See how wildfire smoke compares to an eclipse!



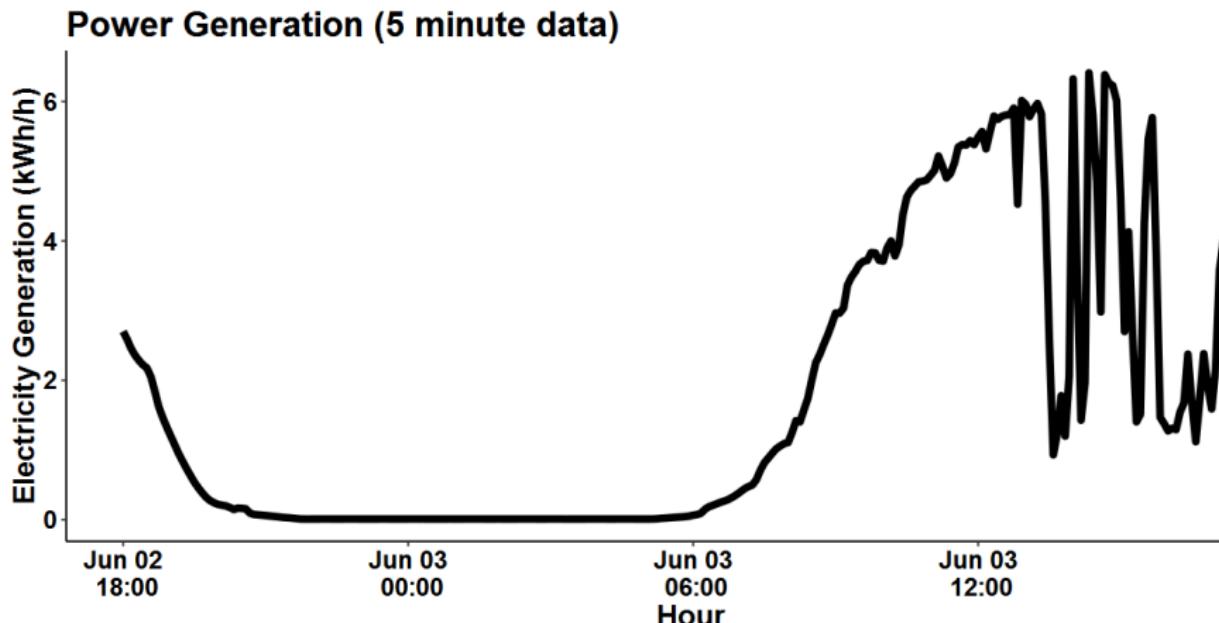
Alright Mr. Economist, show me the money

- Two main sources of savings: avoided transmission and delivery costs and sales back to the grid of excess power
- Meter measures receipts (power sent to the grid) and deliveries (power purchases)



Alright Mr. Economist, show me the money

- Power generation tends to be more predictable but isn't always greater than use



Source: SolarPeople system data via Neurio API, graph by Andre

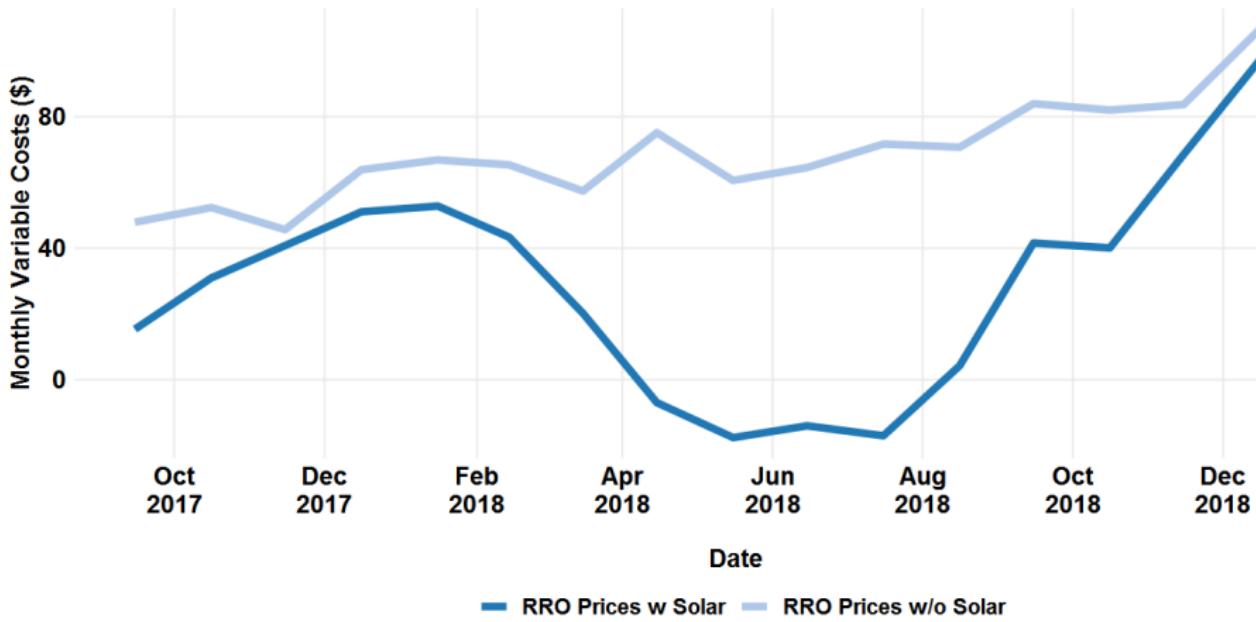


Alright Mr. Economist, show me the money

-transmission and distribution costs are charged on power deliveries
-power prices (same price all month long) paid on deliveries and rebated for sales

Household energy variable costs, with and without solar

Includes energy charges, variable portion of transmission and distribution, as well as rate riders



Source: Household power data via Neurio API, graph by Andrew Leach



What's the payback? Were your students correct?

- At current and expected future power prices and other variable charges, I'll capture about a 0.5% rate of return
- If microgeneration premia continue to be available, in addition to future energy and transmission prices, I'll capture about a 3.5% rate of return
- If microgeneration premia continue to be available, in addition to future energy and transmission prices, and you account for a cup of coffee per day in nerd value, I'll capture about a 14.5% rate of return
- No question they were correct - I've already gotten enough enjoyment out of it to eliminate any potential losses from the investment

Power Prices

Alberta Monthly Average Peak and Off-Peak Wholesale Power Prices
January, 2000 to January, 2019

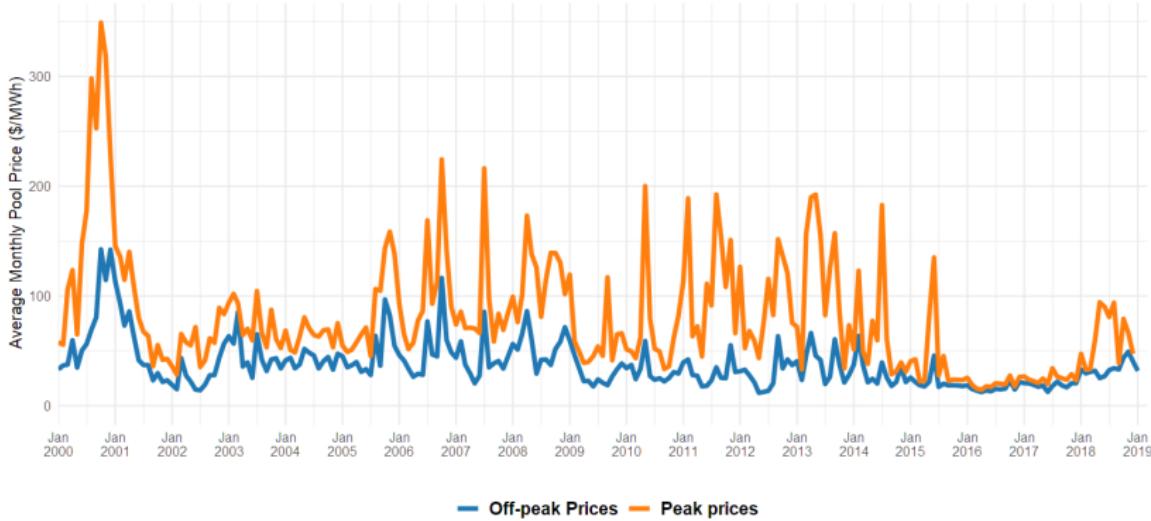
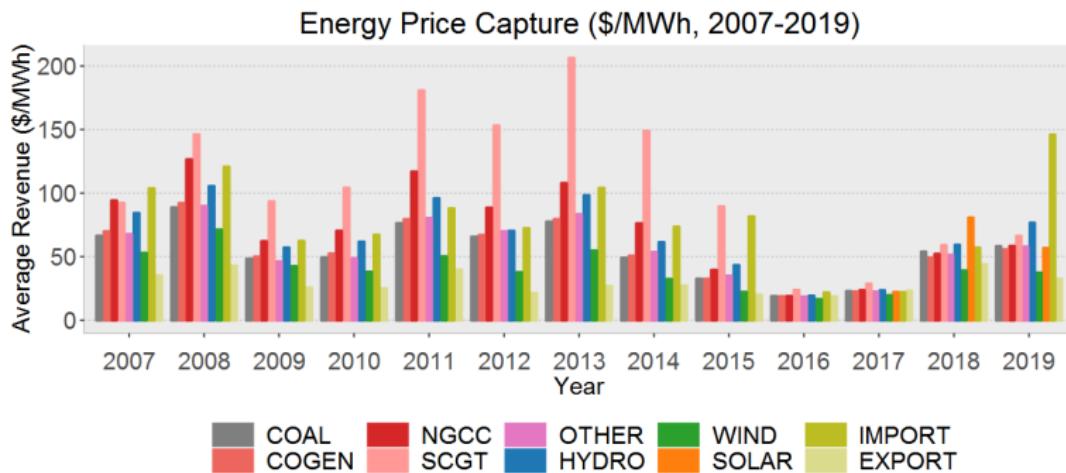


Figure 1

Pool Price Capture



Source: AESO Data, accessed via NRGStream
Graph by @andrew_leach

Figure 2