Financial Results of Solar Panel Pilot

(as of June 24, 2022)

Solar panel-based renewable energy has been tossed about so much, and fake news is so pervasive that it's tough to know the truth of its real savings potential. And every utility company's predisposition towards solar power is different too.

The impact on increased property equity caused by a notable cost reduction can be substantial. For those of you who have read my newsletters for a while, you know my phrase: one dollar of NOI ("noy" or net operating income) is $20 of joy (at a 5% cap rate). For every one dollar you can reduce your operating costs without a related recurring expense (therefore, increasing NOI), you could increase the value of your investment property by $20.

I bought a 12-unit building in 2011 and "suite-metered" it. That is, I installed an electrical meter for each rental unit and one for the building ("house"). Installation was a one-time cost of about $1,000/meter at that time. As tenants moved out, new tenants paid their own electricity. Within four years, 11 of the 12 units had turned over with the final unit converted about 8 years later. My electricity bill dropped from about $15,000/year in 2011 to about $5,000 by 2016.

- I would have recovered the cost of the meter install in just over one year if every tenant converted instantly, but it took about 3 years in reality
- I added $10,000 income to my bottom line before taxes (arrggh! I get heart palpitations every time I think about the 50%!! "passive income" corporate taxes)
- MOST IMPORTANTLY … I added $10,000 / 5% cap rate (or multiply by 20) = $200,000 equity improvement, which I could then borrow to buy another building

Why wasn't the savings amount lower? The common areas of the building still need electricity – laundry machines, lighting, common area heating (which I turned down but not off to prevent frozen pipes) and three electric hot water tanks (HWT). After much research I determined that about 85% of my remaining common area electricity consumption was the three tanks.

So, back to the two electrically-heated buildings—I wanted to know how much electricity expense I could potentially reduce if I installed solar panels on these two buildings. The first building mentioned earlier still has about $5,000/year electricity expense. The other is a 25-plex which incurs about

$30,000/year.

To separate fact from fiction and get to the truth of solar panel financial viability, I installed a solar panel system on my home roof, which went operational June 12, 2021. Performance monitoring began July 12, 2021.

System details are:

- The 9.9 kW DC system produces 11,405 kWh/year (about 10 MWh/year)
- Manufacturer's 25-year panel power output warranty
- $15,507 for the system plus $2,016 HST
- Total Panel Area is 630 sq-ft
- PV (photovoltaic) panels: 30 x Canadian Solar, Model: CS1 H-330MS
- Microinverters: 30 x Enphase Energy, Model: IQ7PLUS-72-x-US (240V)
- Each panel generates a different amount of electricity because of influences like shade from trees, compass point orientation (south is best), temperature, etc.
- Each panel's output is monitored by a box connected to WiFi that collects consumption data every minute year-round, even offline during a power failure or communication network failure

Did you know:

- Einstein did *not* win the Nobel Prize for his $E=MC^2$ discovery. He won it for his work in … photovoltaics, both published in 1905. He predicted that the light particles we call photons will eject electrons above a certain energy level. This discovery led to our modern semiconductor technologies, including solar cells.
- Toronto receives more sunlight (2,066) than Paris, Milan, or Berlin
- The Netherlands has the highest number of solar panels installed per capita. China has the highest number per volume.

I'm an above-average consumer of electricity. I consume about 13 mWh per year (13,194,670 to be exact) or about 35 kWh/day.

Rules (not technical limitations) for Ontario's Net-Metering Program appear to make it difficult and expensive for systems over 10 MWh/year to connect to the utility grid, particularly for residential use. I have not found a satisfactory answer for this limitation yet except perhaps that utility companies are in a love-hate situation with solar power. On the one hand they promote conservation, green energy production, and reducing peak demand needs.

On the other hand, solar reduces electricity demand which could impact the company's fixed operating costs regardless of production volume (layoffs?) and the utility company doesn't profit either. There's also the ultimate impact that such distributed power production weakens their monopolistic hold. Power generation assets are transferred away from the utility to consumers. Utilities generate a return on the equity (assets) they own, so a reduction in assets can be a direct threat to earnings.

Many utility companies are classic "old school." In classic contrast, solar generation is "disruptive technology." Here's a brief list of companies that went bankrupt or lost significant market share from "technology lag" and their failure to embrace new technologies:

- Eastman Kodak
- Polaroid
- All photo film makers
- Blockbuster
- Borders (bookstores)
- Toy R Us
- Pan American World Airways
- Tower Records
- Compaq
- General Motors ("new GM" formed in 2009 purchased majority assets of old GM with a government bailout)

Here are a few once-world-leading technologies that have become obsolete (I grew up with all of these except steam locomotives, so the rise-and-fall has been rapid):

- Slide rule
- Typewriter
- Compact disc
- Laserdisc
- Vinyl record, phonograph
- Video/audio tape
- Overhead projector
- Cathode ray tube (CRT)
- Telegraph
- Carbon paper
- Phonebooks
- Vacuum tube
- Cobblestone
- Steam locomotive

Financial Analysis

All of the following financial data excludes HST and (supposed) rebates.

My total 2020 to 2021 electricity bill was:

- Electricity consumption cost - $1,543.10
- Delivery charges - $584.63
- Regulatory charges - $56.36
- Total = $2,184.09 for consuming 13,194.67 kWh per year or average 36.15 kWh/day

From July 2020 to June 2021:

- Power I took from the electrical grid = 6,499 kWh
- Power I put onto the grid = 6,786 kWh
- Total = 12,285 kWh … almost exactly the same as the year before (90.3 kWh more)
- I generated a surplus of 287 kWh. This surplus is subtracted from my next bill if I use more than I sent to the grid or added to my surplus. Each month's surplus is carried over to the next month for up to a year
- There are periods, such as severe thunderstorms and snow storms that reduce generation to zero.

The Jan. 17/22 storm resulted in my solar panels being covered for about a week with little-to-no generation, even though the panels were working perfectly (see chart further below)

My total 2021 to 2022 electricity bill was:

- Electricity consumption cost = $82.34CR (surplus)
- Delivery charges = $355.68
- Regulatory charges = $5.89
- Total = $279.23 for consuming 13,285.000 kWh per year or average 35.7 kWh/day

Results: Cash Flow

- 2021 = $2,184.09
- 2022 = $279.23
- **Savings = $1,904.86**
- **87.2% reduction in total payments or 7.8 times reduction**
- All bills paid to the utility were for the delivery charges. The electricity cost itself was fully covered and the regulatory cost was inconsequential.
- If installing solar panels on the two buildings first mentioned above results in just a 50% net reduction in electricity costs then that would add $2,500 to the cash flow and equity to building #1 of $2,500 increased NOI / 5% cap rate = $50,000. Building #2 would earn $15,000 cash flow / 5% = $300,000 added equity.

Results: "Payback" or Return OF Investment

Setting aside the provincial government's questionable electricity rebate scheme (see: https://www.realestatemagazine.ca/opinion-the-great-ontario-electricity-rebate-con/), and after analyzing the historical rate increases, I determined that the net effect, even after including the four-year moratorium on increases, was that electricity costs increased by an average 10% every year for the last decade. That's 50% in 5 years and doubling the cost in 10 years.

- All-in installation cost = $15,507
- Savings per year = $1,904.86
- Assuming 0.0% electricity cost increase/year payback = 8.2 years
- Assuming 5.0% electricity cost increase/year payback = 7 years
- Assuming 10.0% electricity cost increase/year payback = 6 years

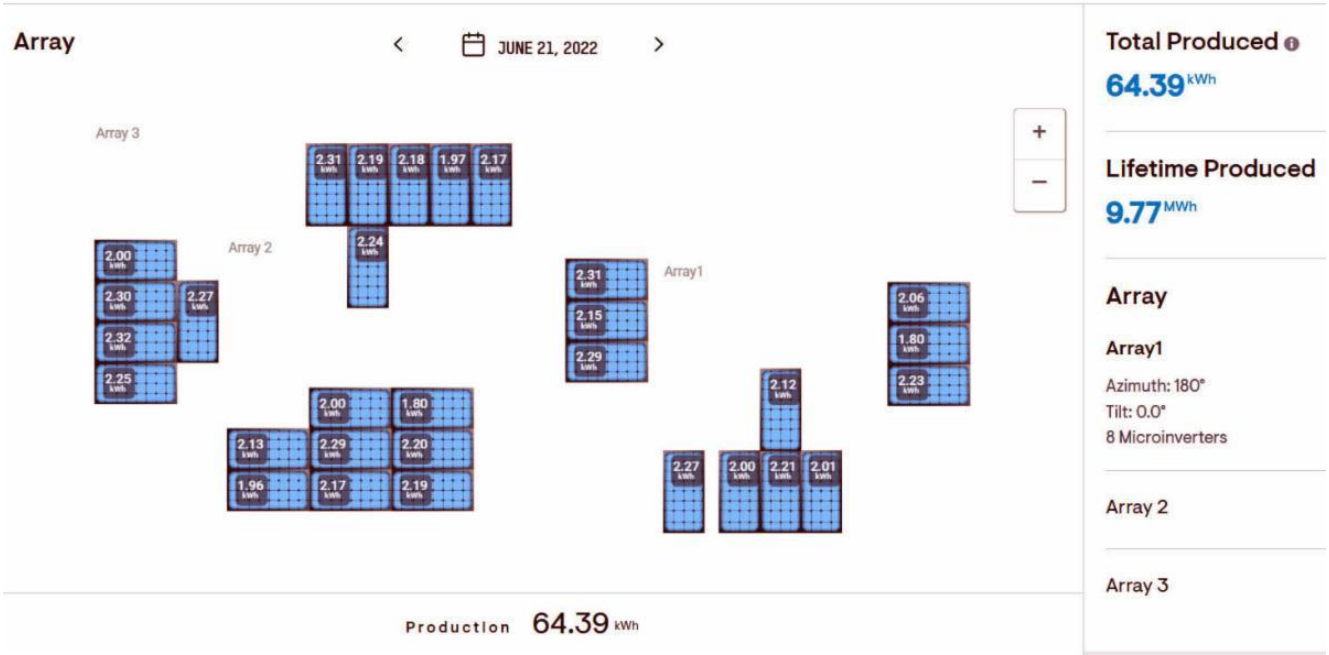
Environment

In addition to the savings, over the projected life of my solar panel system, my system will eliminate 271 **tons** of carbon dioxide (C02). This is equivalent to any one of the following:

- Planting 6,314 trees
- Or driving reduced by 542,000 auto miles or 27,642 gallons of gasoline
- Or recycling 856 tons of waste instead of sending it to landfill
- Or eliminating 264,068 pounds (132.0 tons) of coal burned
- Or avoid a thermoelectric power plant from using up to 6,615,480 gallons of water

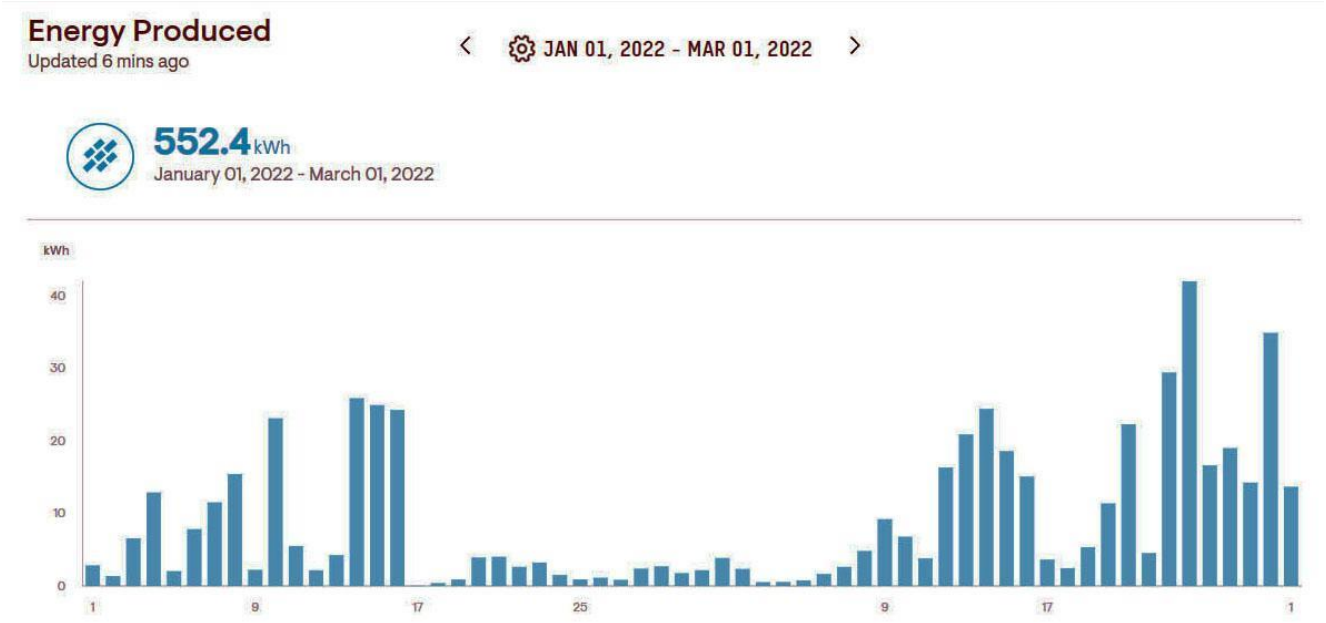
Below are charts and diagrams related to performance monitoring of the system. I used to be able to obtain daily consumption statistics from the utility company but the utility company stated that it doesn't provide daily performance statistics when you convert to a solar panel system. I never received

a satisfactory answer for why.

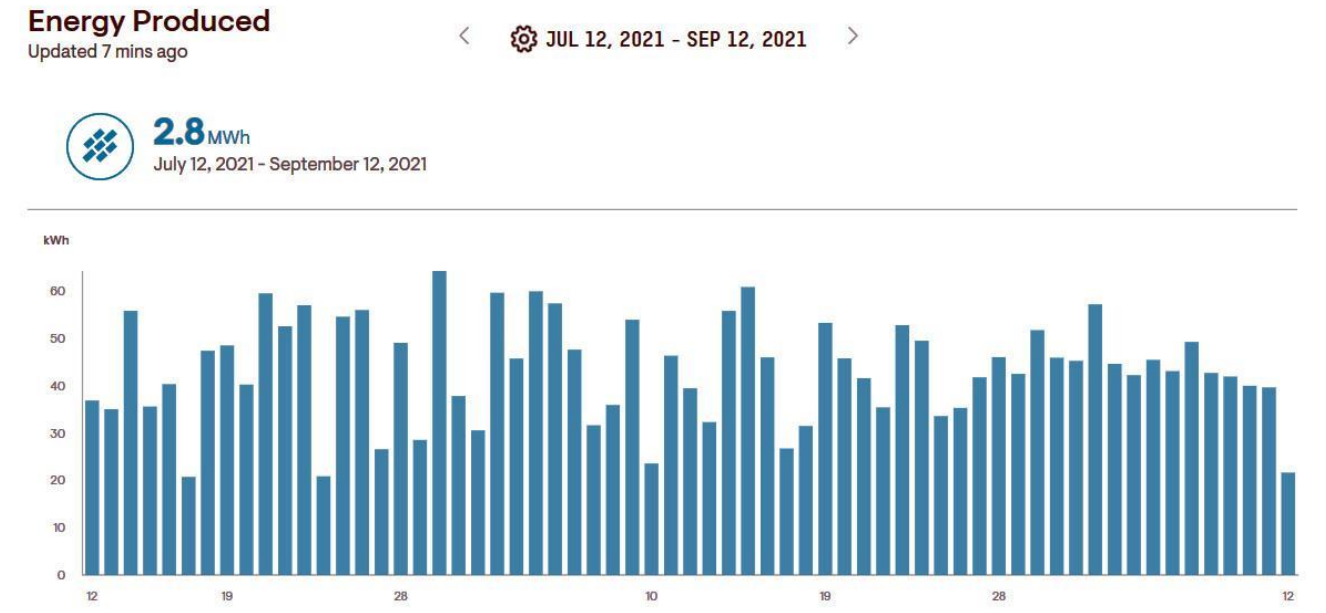


My system is divided into four arrays; 8, 8, 8 and 6 panels respectively. Each panel generates a different amount, depending on several factors including shade from nearby buildings (there are none), trees (one that's nearby), orientation (6 on north face of peak rook, 6 on east face, 5 on west face and 13 on south face), temperature, etc. On June 21 the panels ranged from 1.80 to 2.32 kWh per day per panel and generated 64.39 kWh for the day. I consume on a yearly average about 35 to 36 kWh/day.

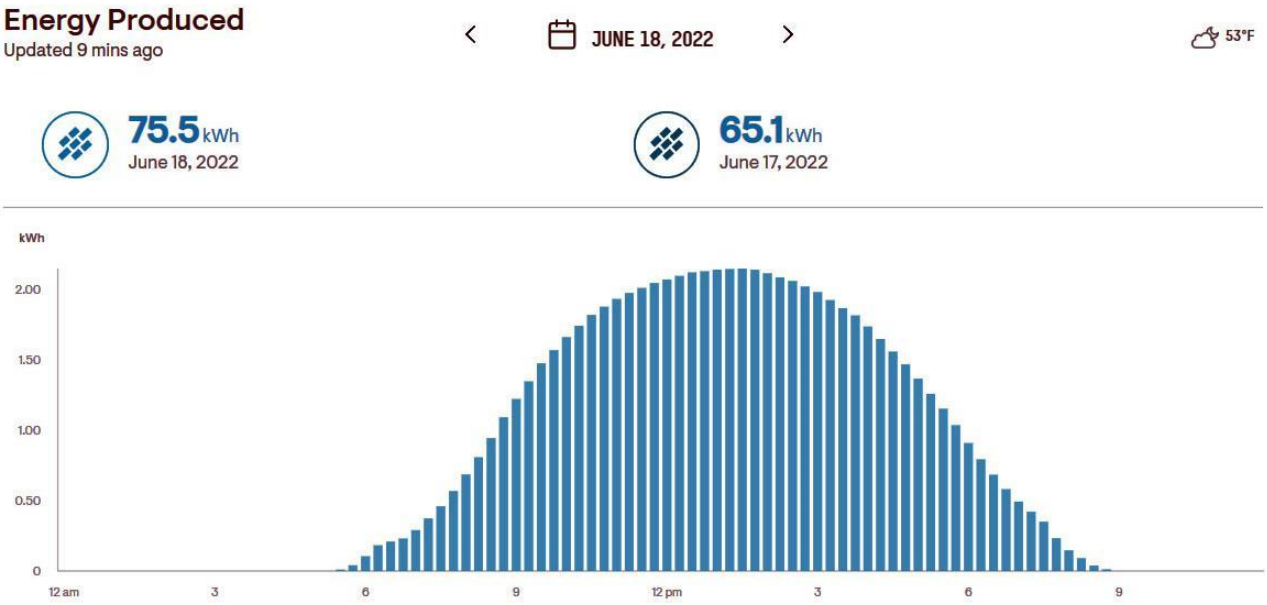
Since measurements started on July 12, 2021 (11 months ago), the system has generated 9.77 MWh, with each panel ranging from 254 to 370 kWh per year.



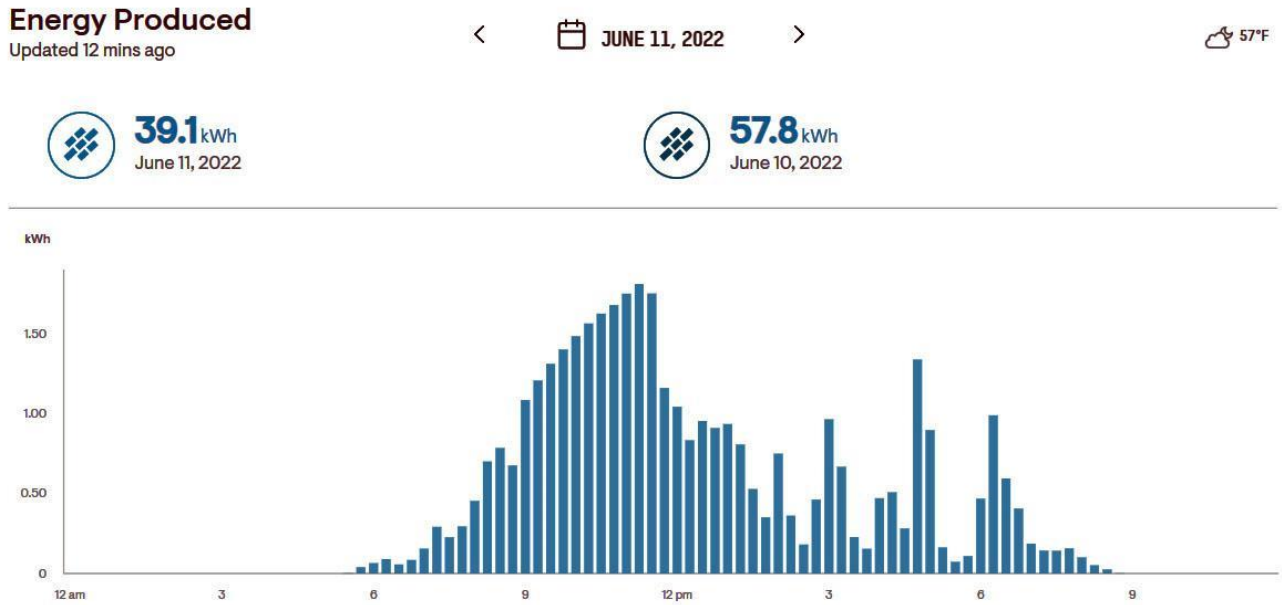
The system generates power throughout the winter but obviously much less than during summer time. On Jan. 17, 2022 there was zero-kWh generated when we had the massive snowfall in less than five hours. It took three days before the system started to deliver power again since most of the panels were covered in snow and ice. It took more than three weeks for the panels to start generating meaningful power with a peak on Feb. 24/22



Every day during the peak summer months (July 12 to September 12) generated at least 20 kWh per day and sometimes as much as 60 kWh. This two-month period generated 2.8 MWh.



A picture-perfect day generating the maximum power (75.5 kWh) over the maximum period of the day (5:30 am to 8:30 pm), which is more than double the yearly-averaged 36 kWh per day I consume.



One week earlier on June 11, 2022 it was a mostly sunny morning turning to overcast for the afternoon with a couple of sunny breaks. The day generated 39.1 kWh) over the maximum period of the day (5:30 am to 8:30 pm) but still exceeded my yearly-averaged 36 kWh consumed per day.

SUMMARY

- The system covers my entire annual power generation requirement but not quite all utility company charges
- It pays for itself in 6 to 8 years

- For investment properties it can increase equity substantially and provide a decent boost to pretax cash flow
- Electricity costs have risen a roughly-estimated 10% per year for the past decade and there's no reason to believe that trend will change
- I'm investigating the installation of similar (or higher capacity) solar panel systems for my two electrically-heated residential investment properties

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