

Sugar Hill's Solar Array is Up and Running

Sugar Hill's solar array is designed for annual production of 48,000 kilowatt-hours(kwh) of electricity, as much electricity as is consumed each year by all of the town's buildings and street lights. The array was installed last fall behind the Town Garage, pretty much out-of-sight even when traveling along South Road. Annual savings are expected to exceed \$5,000 per year, and total savings over the 30-year life of the system are expected to exceed \$175,000. The cost of installation was \$82,000, and annual operating/maintenance costs are expected to be on the order of \$1,000 per year.



Figure 1: The array consists of 94 panels mounted on six frames on the hillside behind Sugar Hill's Town Garage.

The array went into operation on November 29th, so we now have data for the first two months of operation. During December, the darkest month of the year, the array produced 1,400 kwh of electricity; in January, with somewhat longer days, the array produced 1,700 kwh. By the summer, production is expected to exceed 5,000 kwh/day.

Figures 2 and 3 show some of the information that is updated continuously on-line for the system. Figure 2 shows the kwh of electricity produced during each 15-minute period on February 9th, a typical sunny winter day. Production began at day break and quickly built to a peak that was sustained until a couple of hours before sunset. During the summer, production will begin sooner and continue into the evening, but the peak quarter-hourly production will be about the same as the 5 kwh/quarter hour documented in this figure.

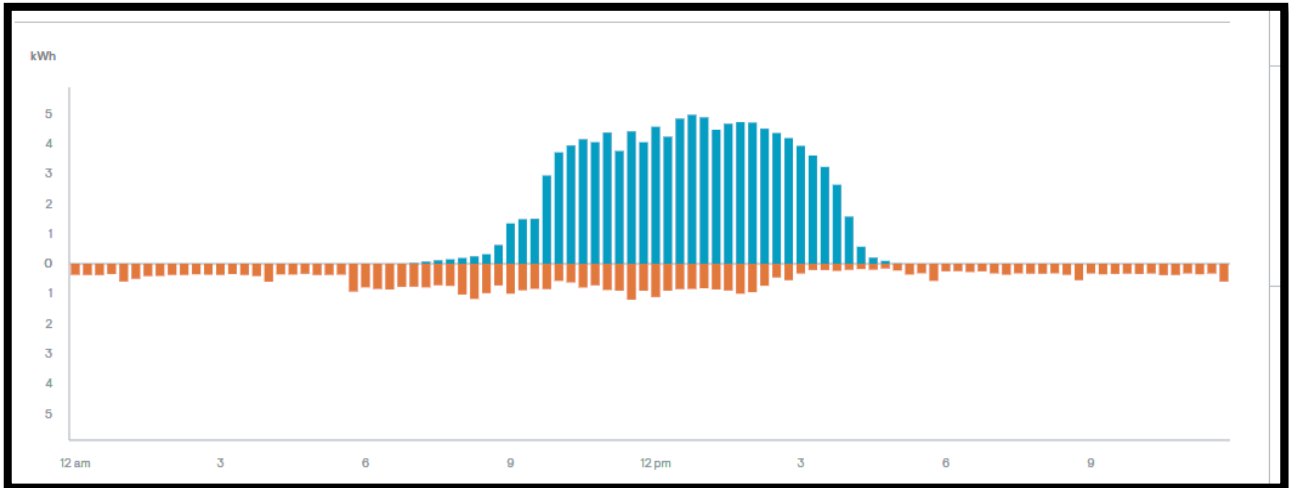


Figure 2: Quarter-hourly production and consumption on a sunny winter day (February 9, 2022). Production reached a maximum of about 5 kwh/quarter hour between 11am and 3pm.

At night, when there is no production, electricity must flow in from the grid. In the daytime, electricity from the grid can be used directly at the garage. Known as “behind the meter production,” this electricity bypasses the meter and will not show up on any electric bill. However, as illustrated clearly in Figure 2, a sunny day will normally provide much more electricity than can be used immediately, so a great deal of the production will be exported to the grid. On the day portrayed in Figure 2, nearly all of the energy produced was exported to the grid during the day, while all of the energy consumed in the night had to be imported from the grid.

Figure 3 shows daily production and consumption of electricity at the garage in January 2022. Production from the array, which was only a few kwh/day during the first week, reached a peak of 133 kwh on the 26th. Consumption was much less variable, generally ranging between 35 and 55 kwh/day. Most electricity used at the garage had to be imported during the first two weeks, while most production had to be exported in the last half of the month. These daily differences, however, are much less important than the cumulative difference between production and consumption over each billing period.

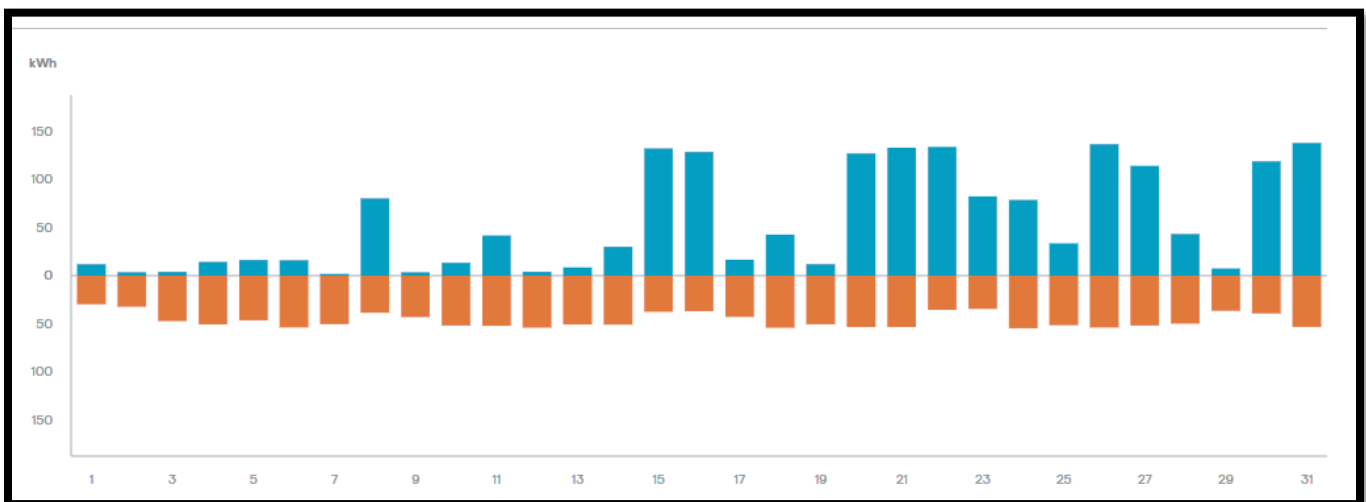


Figure 3: Daily production of electricity (blue) and daily usage (orange) at the Town Garage in January 2022

Other data from the on-line reporting system showed that total production in January 2022 was 1,700 kwh, while total consumption was close to 1,400 kwh, resulting in a net surplus of 300 kwh that was exported to the grid. As a result, Sugar Hill did not pay anything for any of the electricity that they consumed at the garage in January, and they received a credit for the 300 kwh exported to the grid.

Eversource's bills for Sugar Hill have a fixed monthly cost and a much larger cost related to consumption. While rates vary over the course of a year, recent rates have been about 18 cents/kwh. In January, the solar production in January therefore saved the town a little more than \$250 ($\$0.18/\text{kwh} * 1,400 \text{ kwh}$). In addition, the town accumulated a credit for the 300kwh exported to the grid. The monthly bills will show the monthly purchases and sales of electricity, the net monthly difference, and the total credits accumulated by the town. Over the course of an entire year, the town expects to accumulate credit for net exports of about 30 thousand kwh.

According to rules established by New Hampshire's Public Utilities Commission, the town will be able to receive a check from Eversource each year at the end of March for the net amount that the town has exported. The price/kwh is regulated by the PUC, and it reflects the savings to Eversource associated with producing, transmitting and distributing electricity. This price is expected to exceed ten cents per kwh in 2022, and it is expected to rise over the life of the system.

In summary, the town will have two major annual benefits from the solar array, each worth approximately \$3,000 per year:

- No cost for the electricity used at the town garage ($18 \text{ cents/kwh} * 1,400 \text{ kwh/month} * 12 \text{ months/year}$)
- Excess production credits ($30,000 \text{ kwh/year} * 10 \text{ cents/kwh}$)

Together, after allowing for maintenance and other operating expenses, the town expects the solar array to save \$5 thousand or more per year.

By the end of the summer, we will be able to provide further insight into the technical and financial aspects of the solar system based upon additional information about its production, the garage's actual use of electricity, and the PUC-approved prices used for net imports and exports.

Prepared by Carl Martland, February 10, 2022