

## A very early look at Highway Department Electricity usage

We now have 58 days worth of consistent energy usage data. The Emporia energy monitoring system supports up to 16 individual branch sensors so it took several tries to determine which of the 34 circuits were the most significant. By November 6, 2021, we had identified 16 circuits which would monitor an average of 97% of consumption (daily range 95% to 99%); the data presented here are from November 7, 2021, onwards. Ten months from now we will have a full year's worth.

In order to measure total consumption, the Emporia system was installed in the main service entrance panel in the basement of the office building. This meant that consumption in the "new barn" is measured as a total without finer granularity because its own panel is fed by a single breaker in the panel being monitored. Being able to measure individual circuits in the new barn would require installation of a second Emporia system in that building's main panel.

The pie chart to the right shows the share of usage between the various circuits.

The New Barn consumes a roughly 50% of the total. This does not mean that it has doubled total consumption because in prior years the Quonset building would have consumed much more than it now does. **[1]**

Of the monitored circuits, several stand out:

The "fridge" circuit feeds the refrigerator which consumes 6.6% (~ \$120/year). A modern unit would consume about half as much, but the savings would only be ~ \$60/year.

The "Wcool, office" circuit feeds several loads in the office, the most significant being a water dispenser which provides both hot and cold water. This consumes 12.1% (~ \$212/year); a timer to turn off this dispenser outside of working hours could easily halve this cost. Such timers are inexpensive and could pay within a few months.

The remaining office circuits (C10, C12 and C13) consume ~ 7.2% (~ \$127/year).

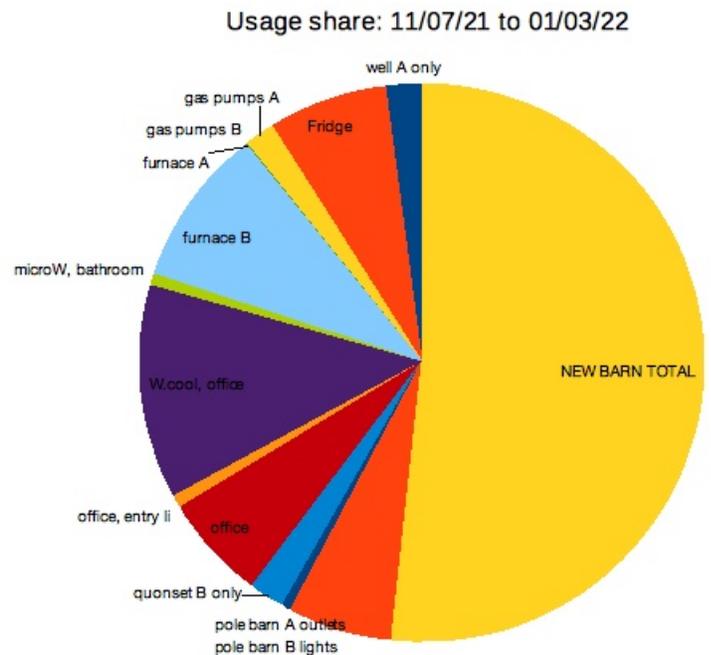
"Furnace B" (8.9%, ~ \$150/year) feeds the air handling system so is active both Summer and Winter; "Furnace A" has been negligible, but may increase during Winter.

"Quonset B only" (the old barn) is now negligible. Note that only 1/2 of the 240 service is being monitored, in other words capturing only all the 240 V loads and ~ 1/2 of the 120 V loads, so actual consumption will be somewhat higher.

"Pole Barn B" feeds some outside lights using ~ 5.8% (~ \$127/year) over our Nov-Dec period. These lights are controlled by a photo-sensor, so will use less in Summer. It has been noted that these lights seem to turn on early and turn off late - suggesting that the photo-sensor sensitivity has been set too high so the lights are on too many hours per day. If the electrician happens to be on site for some other reason, it might make sense to have him tweek the setting (assuming it is adjustable).

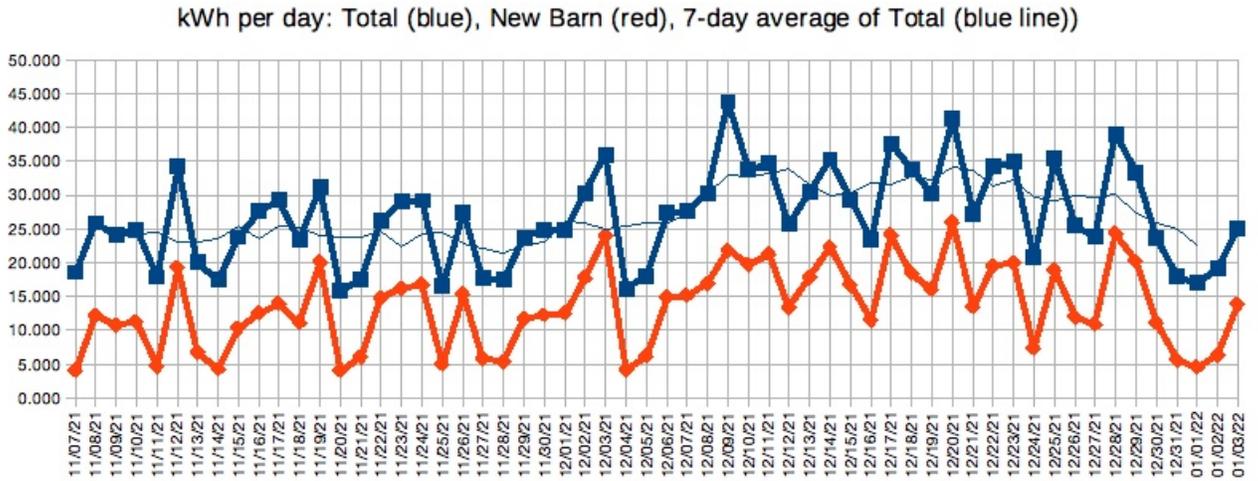
"Pole Barn A" feeds some outlets. Negligible until now but may rise steeply if block heaters are plugged in - which is why we've kept a sensor on that circuit.

"Gas pumps A" (includes lighting near the pumps), and "Gas Pumps B" (pumps only) and "Well A only" are all negligible. "Well A" also reassures that there are no electrical leaks to the well water. In HAREI's experience, in 2 cases installing an energy monitor detected significant leakage from wiring



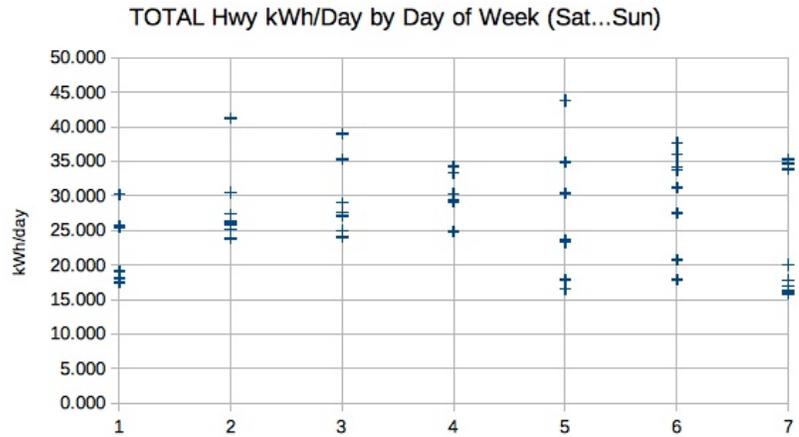
to submersible pumps...

Total consumption over the Nov/Dec period is shown below:



As can be seen, the New Barn largely determines the pattern of fluctuations in usage. There is a gradual increase between November and December, consistent with shorter days and decreasing temperatures.

Usage by day of week does show some drop on weekends, but not a very large one. This suggests that much of the load is "baseline", i.e., routine consumption used to maintain the building environment rather than other loads; and/or reflects the 7 days per week operations of the Highway Dept.



So, that is all we know based on only 2 months worth of data. More to come...

**[1]** Total Highway consumption for 11/15/18 to 01/18/19 was  $1611+1260 = 2871$  kWh over 64 days, or 44.8 kWh/day. While not covering exactly the same period as our monitoring data (58 days from 11/7/21 to 01/03/22), it does provide an estimate of consumption before the new barn addition.

Over the 58 days being monitored, the average total consumption (1551 kWh) averaged 26.7 kWh/day, only 60% of the 2018 Nov/Dec average.

While much too early to be sure, it does appear that replacing the old Quonset with the new barn **might** be saving significant amount of energy (26.7 kWh/day now v 44.8 kWh/day previously).

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