**Nighttime Setback Experiment for Heat Pumps November 16 2021**


Summary

A cold climate air source heat pump was installed in a new well-insulated and eco-friendly home in Burlington, Ontario, Canada in 2010.

The thermostat had been programmed during the winter to set the house temperature at 21 C during the day then down to 19 C at 11 pm. It was returned to 21 C at 8 am.

The energy use of the heat pump outdoor unit and the internal blower fan was monitored using the Eyedro WIFI electricity monitor.

The Mitsubishi ZUBA heat pump is rated at 40,000 BTH/h heating. The smart thermostat (Honeywell) starts heating before the desired time for the temperature call. The heat pump ran for almost an hour to recover from the house temperature of 19 C on cold days. This heavy use is at a higher electricity rate which occurs at 7 am.

The experiment was designed to determine if the nighttime setback actually saves money and energy. The results show that the energy use was more but the cost was lower.


Test Procedure

Two days in November of 2021 with similar nighttime temperatures were used to conduct the experiment.

On the first night, the setback was 19 C at 11 pm and the recovery set to 20 C at 7 am and 21 C at 8 am.

On the second night the temperature was left at 21 C during the night.

The hourly outdoor temperature from the Environment Canada weather database for Burlington Piers was used.

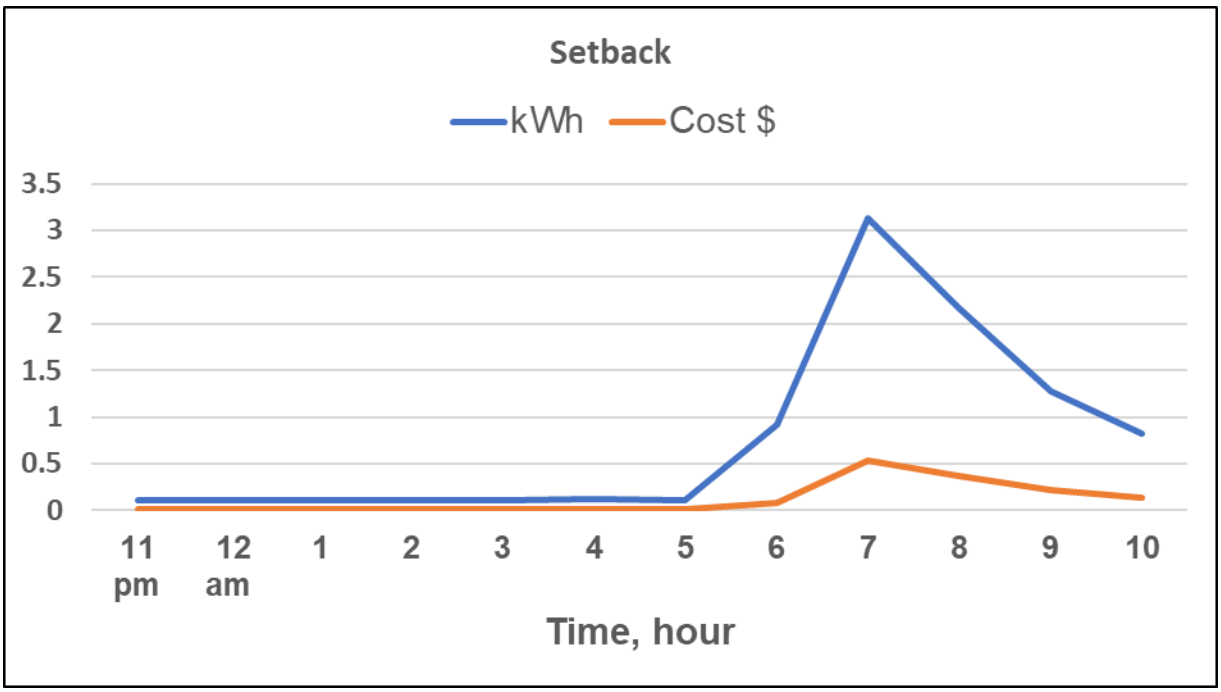
The hourly energy consumption in kWh was monitored using sensors on both the 240 VAC outdoor unit and the 120 VAC blower motor. The system was set to the FAN ON mode which runs the blower fan at low speed continuously when heat is not called for.

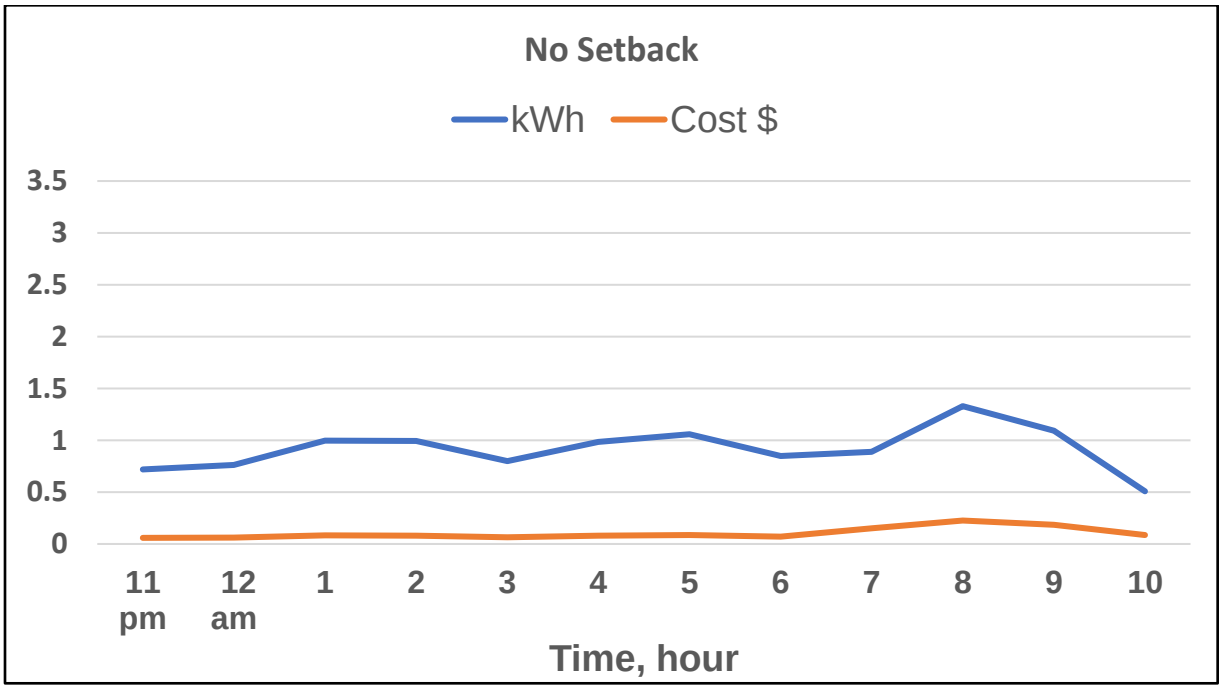
The Time of Use rates from Burlington Hydro for winter 2021/22 were used (Peak 17 cents per kWh and Off Peak 8.2 cents per kWh).

Results

Setback Energy 9.10 kWh, Cost $1.40

No Setback Energy 10.97 kWh, Cost $1.24


Setback
kWh
Cost $
3.5
3
2.5
2
1.5
1
0.5
0
11 pm
12 am
1
2
3
4
5
6
7
8
9
10
Time, hour


No Setback
kWh
Cost $
3.5
3
2.5
2
1.5
1
0.5
0
11 pm
12 am
1
2
3
4
5
6
7
8
9
10
Time, hour