

# Residential Heat Pumps

## Hingham, MA Case Study

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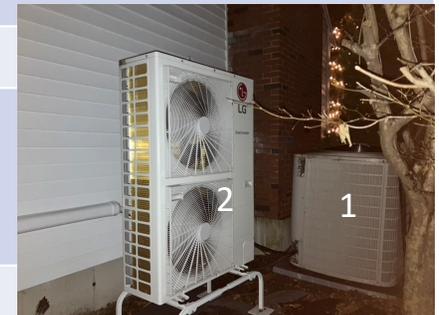
April 2022 – May 2023

DRAFT



# House / System Information

Home	2 Story with partially finished basement. Approximately 2,550+/- SqFt National Grid Gas customer
HVAC	<p>2 Units (both 3 ton, both forced air using existing ductwork):</p> <ul style="list-style-type: none"> <li>• Unit 1: <ul style="list-style-type: none"> <li>• Installed 2009, High Efficiency Dual Fuel Heat Pump (Electric heat pump above 30 degrees, Natural Gas below)</li> <li>• Services basement and ground level</li> </ul> </li> <li>• Unit 2 (main subject of this document): <ul style="list-style-type: none"> <li>• Installed March 2022, all electric heat pump, no resistive assistance (LG)</li> <li>• Services top floor</li> <li>• Replaced a potentially failing Natural Gas heating / Electric AC unit (circa 2003)</li> </ul> </li> </ul>
Installation	3.5 days
Gas continues to be used for	<ul style="list-style-type: none"> <li>• Heating when temps fall below 30 degrees (unit 1)</li> <li>• Water heater</li> <li>• Clothes dryer</li> <li>• Stove top</li> </ul>
Note	<ul style="list-style-type: none"> <li>• An EV and charger were purchased early Feb 2023</li> </ul>

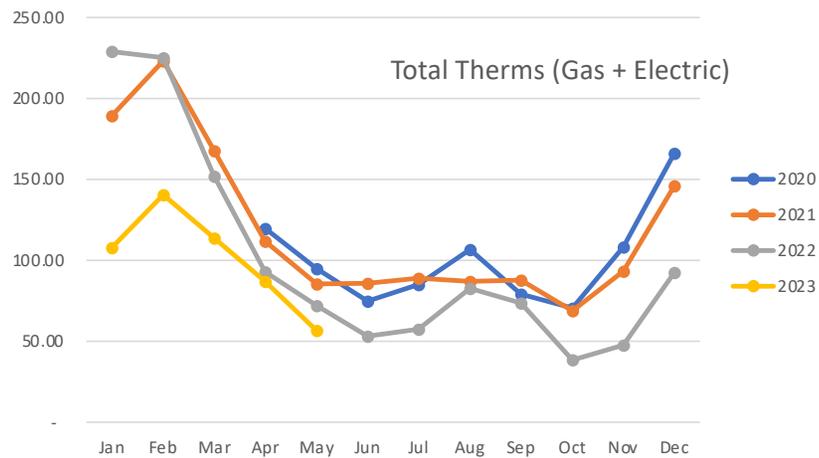


# Preliminary Observations and Conclusions

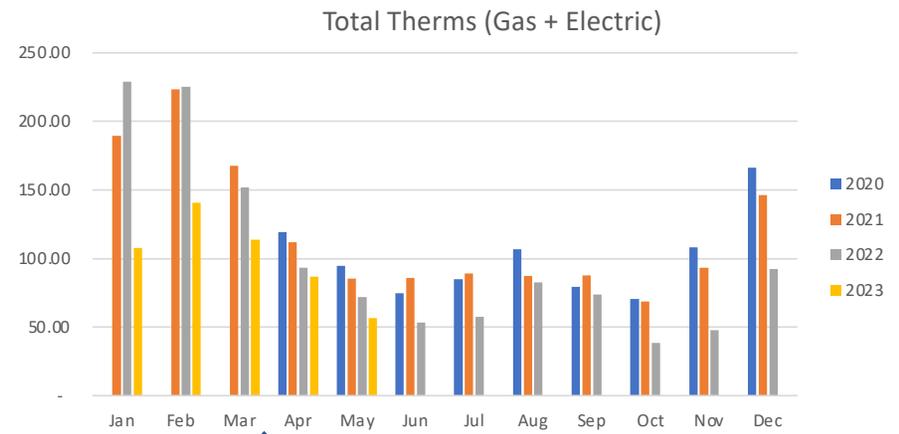
- As expected:
  - Natural Gas consumption reduced every month
  - For the period of Apr-Feb, gas consumption reduced by nearly 59%
  - Electricity use increased in Jan and Feb due to the heat pump.
- Unexpectedly:
  - Electrical use also decreased by 3%
  - Overall energy use for this period decreased by 35% vs prior years
- Conclusions
  - Overall energy use for Apr-Feb decreased by 35% vs prior years
  - Heat Pumps, depending on model, are more efficient than older AC equipment as well as being more efficient at heating
  - At 12 pounds of CO<sub>2</sub> per Therm of Nat Gas, reduced CO<sub>2</sub> by 5,410 pounds

# Overall Energy Use (Gas + Electric - Therms)

Apr 2020 – May 2023



System Installed



System Installed

Total (Gas + Electric) Therms used April through Feb resulted in:

- 35% reduction compared to 2020
- 34% reduction compared to 2021

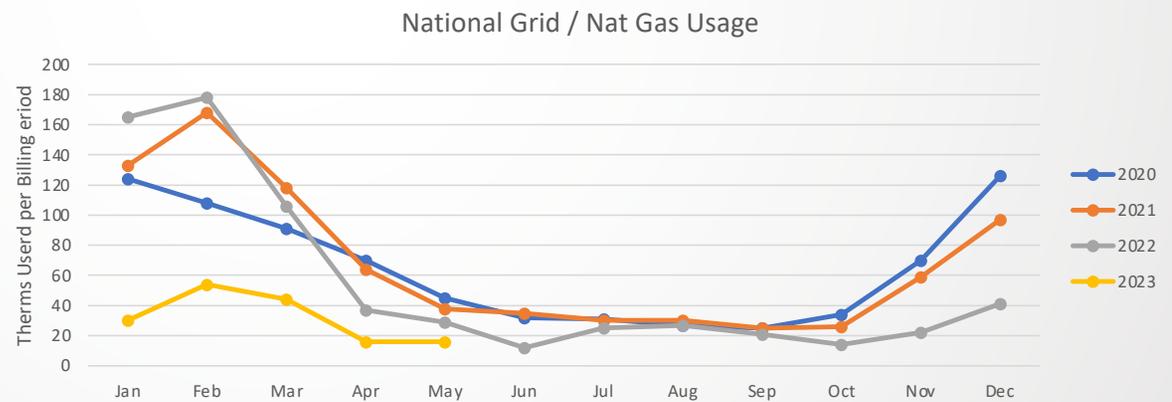
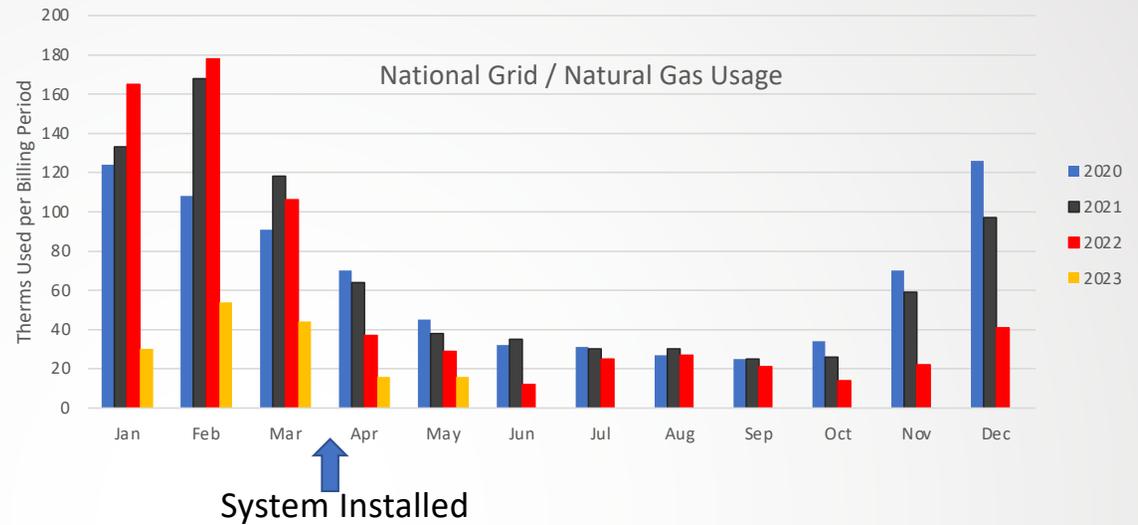
Note: Converted KWH to Therm using a 0.0341296 factor

# Results, the first 11 months - Gas

➤ For the period of Apr-Feb, gas use was reduced by:

➤ 59% vs 2020

➤ 58% vs 2021

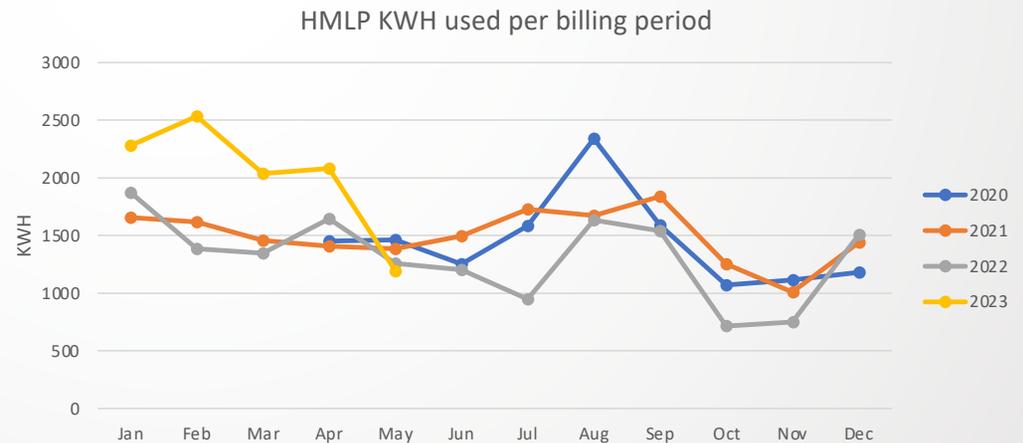
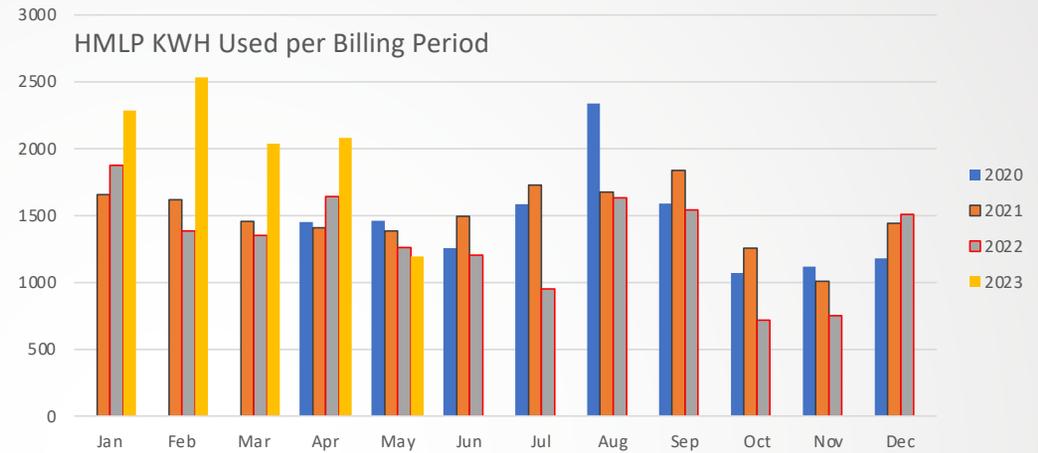


# Results - Electric

➤ For the period of Apr-Feb, electric use was reduced by:

➤ 2% vs 2020

➤ 3% vs 2021



# Other factors – variations

- Number of kids in the home (college, etc.)
- Timing and length of vacations
- Weather / Temperature, although no major variations (see graph)
- Gas and Electric billing cycles are not for the same days of the month
- Billing periods are not calendar months
- The new heat pump runs at a constant temp 24x7 vs the old system which was on a timer and turned off during the day

