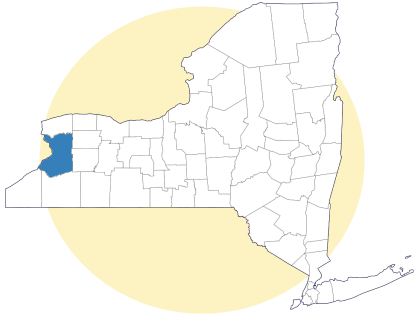


Who's Afraid of a Polar Vortex?

Case Study



NYSERDA
New York State Energy Research
and Development Authority



This 76-year-old home in Amherst had heat pumps installed in June of 2024. The homeowner made the switch to reduce their carbon footprint and replace a furnace near the end of its lifespan.



Project Overview

Location:

Amherst, NY

House Size:

1,625 square feet

Year Built:

1950

Number of Stories:

2

Previous Heating Fuel:

Natural Gas

Heat Pump Installed:

June 21, 2024

Design Temperature:

5°F

Design Heating Load:

49,243 Btu/h
(30.3 Btu/SF)

**Heat Pump Capacity
at Design Temperature:**

54,356 Btu/h

Project Cost:

\$29,862
(\$25,814 after incentives)

Study Objective

Due to the increasing prevalence of **cold-climate heat pumps** in homes across New York State, NYSERDA commissioned a study of some homes with these systems installed. This study examined how well heat pumps maintained indoor temperatures during **real-world extreme cold conditions**, and what the homeowners who had these systems installed had to say about their experiences.

Over the course of the heating season, this study measured temperatures inside single-family homes that heat entirely with whole-home air source heat pumps, without any fossil fuel heating sources, to investigate the systems' performance during cold spells when outdoor temperatures were **at or below design temperatures**. This case study details the results from one of those homes that participated in the study.

Heat Pump System Details

Equipment Manufacturers:
Carrier

Models:
38MURAQ60AB301

Number of Outdoor Units:
1

Number of Indoor Units:
1

Distribution Method:
Ducted

Installing Contractor:
NOCO Sustain LLC



System Design



PREVIOUS SYSTEM CHALLENGES:

- Natural gas furnace near the end of its lifespan
- Drafty and poorly insulated home



HEAT PUMP DESIGN & CONTRACTOR SOLUTION:

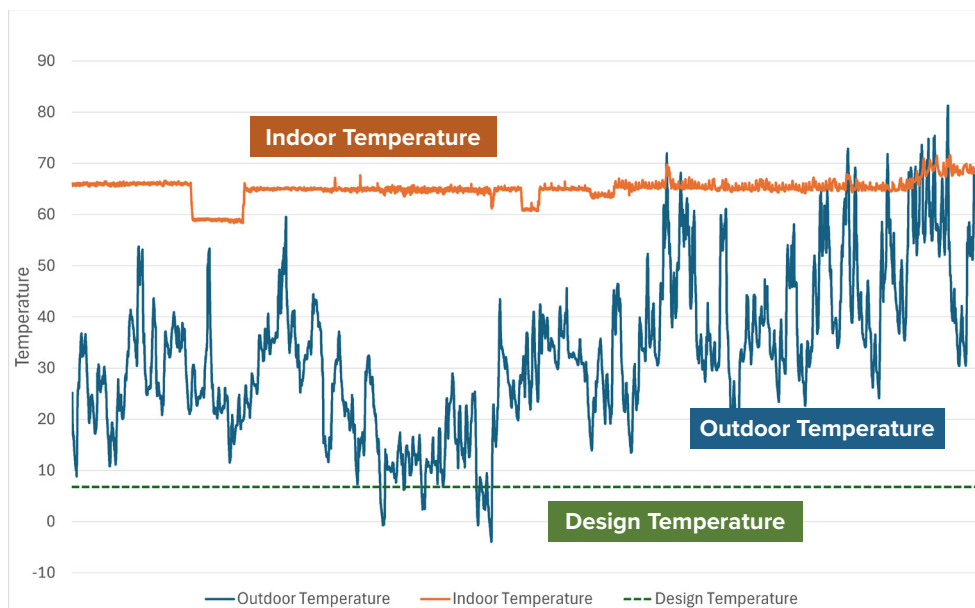
- Heat pump with reused legacy ducts from the existing ductwork
- Includes the air handler in the basement, serving the entire house

The primary goal was to reduce fossil fuel use within the home. Prior to heat pump installation, the homeowner installed an EV charger for their vehicle. The home also has a natural gas generator, which can power the heat pump system during a power outage.

Temperature Maintenance

The 2025 – 2026 winter had several significant cold snaps. The homeowner kept the thermostat set point in the mid 60s (°F) throughout the heating season. The heat pump was able to handle the load for the entire home, keeping the home's temperature between 64°F and 68°F. During the coldest recorded outdoor temperature—14°F below design temperature—the indoor temperature drifted to 3°F below set point. The indoor temperature recovered to set point without the participant reporting an impact on their comfort.

The participant took two vacations during the heating season. While away from home, they lowered the thermostat set point, lowering the indoor temperature to around 58°F – 60°F each time.



Dec. 08, 2025

May 1, 2026

Heat Pump Specifications

HSPF2 (Region 5):
7.6

SEER2:
15.3

Capacity at 5°F (Btu/h):
54,356

Capacity Maintenance at 5°F:
92%

Lowest Rated Outdoor Temperature:
-22°F

Maximum Power Draw (kW):
8.34

Energy Use and Costs

Natural gas use dropped significantly, though gas is still present within the home for the water heater and other appliances.

The homeowner mentioned higher electricity costs and frustration with their bills. However, the added cost on the electric bill displaced both natural gas costs from the decommissioned furnace and gasoline costs from switching to an electric vehicle. Despite the higher electric bills, they rated their satisfaction with utility costs a 4 out of 5 on a survey.

The homeowner applied to a National Grid thermostat program, allowing the utility to automatically adjust the temperature settings in exchange for a reduced billing rate.

They are glad that they weatherized the home prior to heat pump installation, mitigating some of the electricity cost this past heating season.

Customer Experiences

The homeowner rated their temperature comfort with a heat pump 4 out of 5 during cold snaps, an improvement on the 3 out of 5 that they rated their old furnace. They reported some cold spots in the house, but attributed those to the house's zoning rather than a specific feature of heat pump or gas heating.

This homeowner also had an adjustment period with the thermostat itself. Specifically, they feel that the thermostat needs to be raised several degrees in order to call for heat. They intend to engage with the contractor to better understand how the thermostat interacts with the heat pump system.



Cold Snap Events

Cold Snap 1

Dec. 8 – 9, 2025

Lowest
Reported
Temperature

6°F

Stated that she already had the home weatherized via NYSERDA, so they didn't feel the need to do anything differently (besides blankets) during the cold snap.

Cold Snap 2

Jan. 23 – Feb. 2, 2026

Lowest
Reported
Temperature

-4°F

"It was absolutely cold during a recent cold snap. It's not the heat pump's fault. Comfort wasn't where I wanted it to be. The heat pump did as well as any other system would. The thermostat is not everywhere; it's only on the 1st floor. Not uncomfortable, but noticeably different than the norm. I feel that zones would be better for a home such as mine."

Cold Snap 3

Feb. 4 – 9, 2026

Lowest
Reported
Temperature

-9°F

"Glad to get rid of gas. Some family members complain about cold on the first floor with our tile floor, but everyone has a different comfort expectation."

** Temperatures reported from the Buffalo airport*

Survey Results

Prior to the heating season, the homeowner stated that the heat pump met their expectations for heating the home. Throughout the heating season, and during cold snaps, the homeowner did not change her operation of the system to mitigate any issues.

POST-SEASON SURVEY RESULTS



5 out of 5 Comfort ratings



Utility bills

The homeowner did give ratings of 2 out of 5 for the home's humidity levels. There was noticeable dryness, but this was also present prior to the installation of the heat pump. As such, the homeowner did not expect the heat pump to actually solve the issue of dryness in their home during the winter.

Callbacks

This participant had no power outages, callbacks or other reported issues during the study.



Key Takeaways and Lessons Learned



- Although it was colder indoors during the cold snap, the customer felt that the **heat pump's performance was similar to what a fossil fuel system** provided for this house.
- A zoned system may have produced more even temperatures around the house during cold snaps. However, the homeowner gave **positive comfort ratings** for the heating season as a whole.
- The homeowner was happy with their decision to **weatherize prior to the heating season**.
- Although they did not use their generator during the study period, they expressed hesitation to rely on a heat pump without a backup power source.