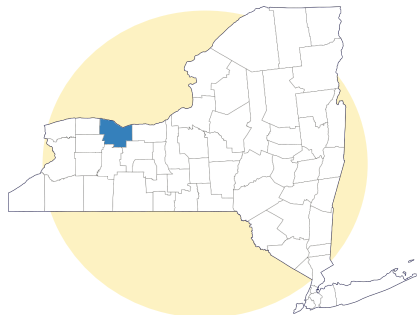


Who's Afraid of a Polar Vortex?

Case Study



NYSERDA
New York State Energy Research
and Development Authority



This site features a century-old home in Rochester, New York, that successfully transitioned from a loud natural gas furnace to an all-electric cold-climate air source heat pump system. The homeowner was primarily motivated by a desire to reduce their carbon footprint and eliminate the safety risks associated with fossil fuels in their home.

Project Overview

Location:

Rochester, NY

House Size:

1,831 square feet

Year Built:

1926

Number of Stories:

3

Previous Heating Fuel:

Natural Gas

Heat Pump Installed:

March 23, 2025

Design Temperature:

6.6°F

Design Heating Load:

40,246 Btu/h
(22.0 Btu/SF)

**Heat Pump Capacity
at Design Temperature:**

42,000 Btu/h

Project Cost:

\$28,354
(\$22,414 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:
Fujitsu

Models:
AOUH36LMAH1 (Outdoor)
AMUG36LMAS (Indoor)

Number of Outdoor Units:
1

Number of Indoor Units:
1

Distribution Method:
Ducted

Installing Contractor:
Green Guys Mechanical



System Design



PREVIOUS SYSTEM CHALLENGES:

- Natural gas furnace near the end of its lifespan
- Slow to bring the home up to a comfortable temperature in the winter months
- Left certain areas cold, drafty, uncomfortable, and with a smell



HEAT PUMP DESIGN:

The homeowner replaced their furnace with a modern ducted air source heat pump system. Following a detailed load calculation, the heat pump was designed to meet a heating load of 40,246 Btu/hour at a design temperature of 6°F, ensuring reliable performance during Rochester's cold winters.



CONTRACTOR DESIGN SOLUTIONS:

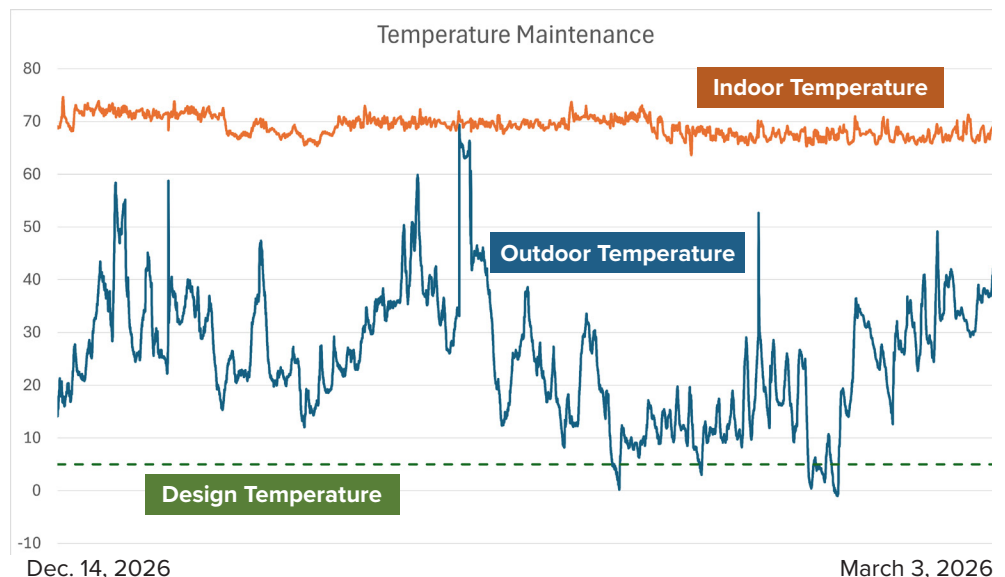
- Removed the previous existing furnace in March 2025
- Replaced ductwork in the basement and reused it in the rest of the house

The contractor solved the home's comfort issues by carefully matching a heat pump and distribution system to the heating loads in each zone.

Temperature Maintenance

During Rochester's **coldest winter in 11 years**, the heat pumps delivered reliable heating through multiple cold snap events. Even with temperatures reaching well below the 6°F design temperature, indoor temperatures generally remained within a 3°F band.

There was a dip in indoor temperature unrelated to outdoor temperatures – when the homeowner turned off their unit by mistake. Once they noticed the system was off, they turned it back on and shortly after their home was comfortable. As seen in the chart, the home's temperature remained consistent. As winter progressed, the homeowner turned their system down to save money. This change was due to increasing energy costs, not system performance.



Heat Pump Specifications

HSPF2 (Region 5):
8.6

SEER2:
17.1

Capacity at 5°F (Btu/h):
42,000

Capacity Maintenance at 5°F:
110%

Lowest Rated Outdoor Temperature:
-15°F

Maximum Power Draw (kW):
5.89

Energy Use and Costs

The homeowner did not own the property for the entire heating season last year. Upon purchasing the home, the homeowner wanted to update the aging heating system. The homeowner found **the dual functionality and sustainable operation** of an air source heat pump to be attractive.

They wanted to heat and cool their home in a cleaner, more sustainable manner without fossil fuels. From October – March 2026, this home used 10,915 kWh. Although this is higher electricity usage than when the home relied on natural gas for heating, the homeowner expected a higher electric bill as a natural result of switching all energy costs to electricity.

Customer Experiences

Since installing an air source heat pump, this homeowner has been very happy with its performance. This was the coldest winter in Rochester in 11 years, with several cold snap events, and the homeowner felt consistently warm throughout the entire heating season.

Their home was not drafty, and the new heat pump brought the home to temperature much quicker than the previous heating system did. The homeowner has been recommending heat pumps to family and friends. They are thrilled with its performance and operation, as well as the fact that they are lowering their carbon footprint.

“I’m really happy with my choice to switch from natural gas to heat pump.”



Cold Snap Events

Cold Snap 1

Jan. 24 – Feb. 2,
2026

Lowest
Reported
Temperature **-6°F**

“I’ve been really pleased with how my heat pump has been responding in the winter, especially with some of the more intense temperature fluctuations we’ve had lately. The system is functioning really efficiently. It’s quiet. I maintain a pretty stable temperature.”

Cold Snap 2

Feb. 7 – 9, 2026

Lowest
Reported
Temperature **-9°F**

“And that’s one of the perks of a heat pump is I don’t have to worry about it. I don’t have to think about it. I don’t have to hope and pray that it’s going to work when the weather gets cold outside.”



Survey Results

Prior to installation, the homeowner researched NYSERDA’s Experience Clean Heat Program and concluded that heat pump technology could comfortably heat and cool their home. However, they still had some hesitation and questions going into this winter season. Some family members expressed concern since they were not confident in the technology and ability to work in New York State, worrying that a heat pump would be a bad investment.

Overall, the homeowner was thrilled with their decision and now recommends heat pumps to family and friends. Their home was much quicker to evenly heat. The other family members have been impressed and have changed their opinion on the ability of air source heat pumps to comfortably heat homes in New York State. The homeowner went on to say this about their heat pump and its operation this past winter:

“The experience of having these interviews, of working with NYSERDA to understand how [the air source heat pump] is functioning in the winter has really made me appreciate it even more, because it is a nice reminder to be able to say, yeah, actually my heat pump is working really well throughout the winter, and now it’s cooling my house really well that it’s hotter.”

Callbacks

This home did not have any issues with call backs or power outages. It did have an ice dam that built up in the back of the house and it tore the back gutter off the home. The damaged gutter was stuck on the power line but the home did not lose power, staying warm and comfortable.

Key Takeaways and Lessons Learned



- **The heat pump maintained the indoor temperature** when the outdoor temperatures approached design conditions during the first and second cold snaps. The heat pump was able to keep the house at the temperature set point with no changes in the homeowner’s behavior.
- The only decrease in the indoor temperature was when the homeowner turned off their system by mistake. After they noticed this, they turned the system back on, and **the heat pump was able to get the home back up to a comfortable temperature quickly**.
- This home’s system was properly sized, designed, and installed. If systems are put in properly, they can **operate effectively and comfortably** in New York State.