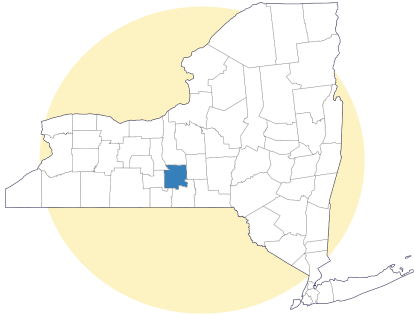


Who's Afraid of a Polar Vortex?

Case Study



NYSERDA
New York State Energy Research
and Development Authority



This 126-year-old home in Ithaca had heat pumps installed in November of 2024. The homeowner made the switch to reduce their carbon footprint and replace a broken furnace.



Project Overview

Location:

Ithaca, NY

House Size:

2,196 square feet

Year Built:

1900

Number of Stories:

3

Previous Heating Fuel:

Natural Gas

Heat Pump Installed:

November 21, 2024

Design Temperature:

0°F

Design Heating Load:

56,555 Btu/h
(25.7 Btu/SF)

**Heat Pump Capacity
at Design Temperature:**

64,973 Btu/h

Project Cost:

\$36,661
(\$28,401 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:
Mitsubishi

Models:
MXZ-3C24NAHZ4
PUZ-HA42NKA1

Number of Outdoor Units:
2

Number of Indoor Units:
4

Distribution Method:
Ducted and Non-Ducted

Installing Contractor:
Lamorte Electric



System Design



WHY UPGRADE TO HEAT PUMPS?

- The home upgraded to modern insulation standards to improve the building envelope through a comprehensive weatherization project
- Windows replaced in 2013, reducing air leakage and heat loss
- Existing natural gas furnace was near the end of its lifespan
- Desire to reduce carbon emissions



HEAT PUMP DESIGN & CONTRACTOR SOLUTION:

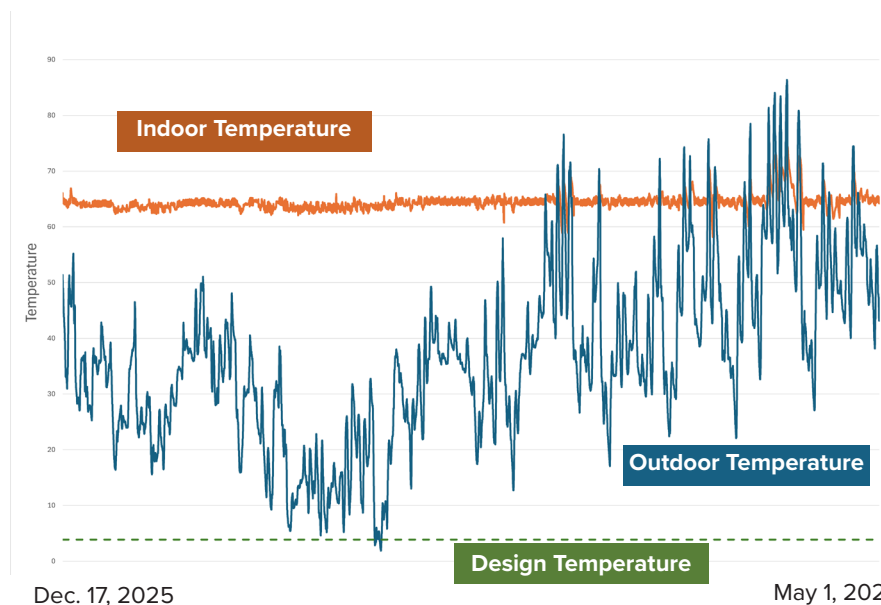
- Transitioned to all-electric heating
- Capped existing ducts to the second and third floors
- An air handler, using the remaining ductwork, serves the first floor
- Second floor heated with two wall-mounted minisplit units
- Third floor is served by floor-mounted ductless unit

This zoned configuration increases efficiency and comfort by delivering heat precisely where it is needed. The homeowner, who serves as a common councilor in his city, wanted to lead by example and demonstrate a practical, effective pathway to clean heating technology in an older home. He has shown that even a 1900-era house can be **successfully modernized to meet today's comfort and climate goals.**

Temperature Maintenance

The homeowner has installed multiple temperature sensors throughout the house specifically to monitor how consistent the temperature is from room to room. They check these readings regularly, and they've been extremely impressed with how even and stable the temperature remains across the entire home.

The homeowner keeps the thermostat set at 65°F, and even on the coldest days, the system maintains temperature remarkably well. The homeowner does not experience cold spots or noticeable fluctuations, and they have no complaints about its performance, comfort, or reliability.



Heat Pump Specifications

HSPF2 (Region 5):

8.2 (MXZ-3C24NAHZ4)

7.9 (PUZ-HA42NKA1)

SEER2:

19 (MXZ-3C24NAHZ4)

15.4 (PUZ-HA42NKA1)

Capacity at 5°F (Btu/h):

25,000 (MXZ-3C24NAHZ4)

48,000 (PUZ-HA42NKA1)

Capacity Maintenance at 5°F:

100% (MXZ-3C24NAHZ4)

100% (PUZ-HA42NKA1)

Lowest Rated Outdoor Temperature:

-13°F (MXZ-3C24NAHZ4)

-13°F (PUZ-HA42NKA1)

Maximum Power Draw (kW):

3.76 (MXZ-3C24NAHZ4)

7.36 (PUZ-HA42NKA1)

Energy Use and Costs

This home fully converted from a natural gas heated home, to a heat pump heated home. The existing furnace was fully decommissioned.

During our discussions, the homeowner noted that, in his experience, operating the heat pump system appeared to cost more than operating his previous natural gas furnace. He attributed this in part to the current market situation, where natural gas prices are relatively low while electricity rates are comparatively higher.

However, the homeowner was very clear that the cost of operating the system was not his main reason for moving forward with the heat pump installation. In his own words:

“Natural gas prices are low and electric prices are higher but the cost of operating the system wasn’t my motivating factor.”

Customer Experiences

IMPROVE HOME COMFORT WITH BETTER HEATING AND COOLING

Overall, the homeowner is very satisfied with how the system is operating and, most importantly, with the comfort level it provides throughout the home. The system is **performing reliably and consistently**, delivering the kind of indoor environment they were hoping for.



Cold Snap Events

Cold Snap 1

Dec. 8 – 9, 2025

Lowest
Reported
Temperature

1°F

“And it’s incredible, actually, because I have temperature sensors in almost every room. And it’s extremely even, much more even than you would expect.”

Cold Snap 2

Jan. 23 – Feb. 9, 2026

Lowest
Reported
Temperature

-5°F

“You know, I like it when I don’t even notice it and it just keeps the temperature and that’s how it’s been, even when I hit negative. So that’s probably the best praise I can give.”

** Temperatures reported from the Binghamton airport*

Survey Results

In the pre-season survey regarding the previous system the homeowner indicated that they had uncomfortable spots in the home with the natural gas furnace. The new heat pump system keeps the entire home much more comfortable and the homeowner indicated that the system operated as expected.

POST-SEASON SURVEY RESULTS

5 out of 5

4 out of 5

Comfort ratings

3 out of 5

Utility bills

Callbacks

No callbacks reported.



Key Takeaways and Lessons Learned



This project demonstrated that a 1900-era, three-story home **can be successfully modernized** (electrified) using effective zoning paired with home weatherization. After insulation and window improvements installed previously, the contractor capped old ductwork to upper floor and used a central air handler for the first floor, paired with mini-split units for the second and third stories. The system achieved a level of comfort that the homeowner described as **“remarkable.”**



A significant takeaway was the homeowner’s praise that they “didn’t even notice” when cold snaps occurred because the **indoor environment remained steady** without any day-to-day intervention.



While the participant noted that electricity was significantly more expensive than natural gas, they **remained highly satisfied with the switch**. They explicitly stated that the cost of operation was not their primary concern, prioritizing environmental responsibility, carbon reduction, and climate resilience instead.