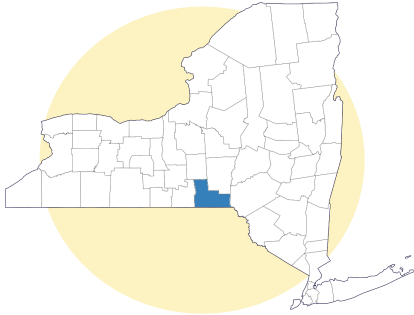


Who's Afraid of a Polar Vortex?

Case Study



NYSERDA
New York State Energy Research
and Development Authority



This participant, located in Binghamton, NY, transitioned their home to a modern heat pump system to achieve their goal of becoming more environmentally friendly. Previously, the residence relied on a natural gas furnace for heating, but the homeowner sought a solution that would reduce carbon emissions while providing consistent comfort.

Project Overview

Location:

Binghamton, NY

House Size:

1,250 square feet

Year Built:

1902

(last updated in 2023)

Number of Stories:

2

Previous Heating Fuel

Natural Gas

Heat Pump Installed:

July 13, 2023

Design Temperature:

3.9°F

Design Heating Load:

48,757 Btu/h

(39 Btu/SF)

Heat Pump Capacity

at Design Temperature:

50,394 Btu/h

Project Cost:

\$30,500

(\$22,940 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 Electric

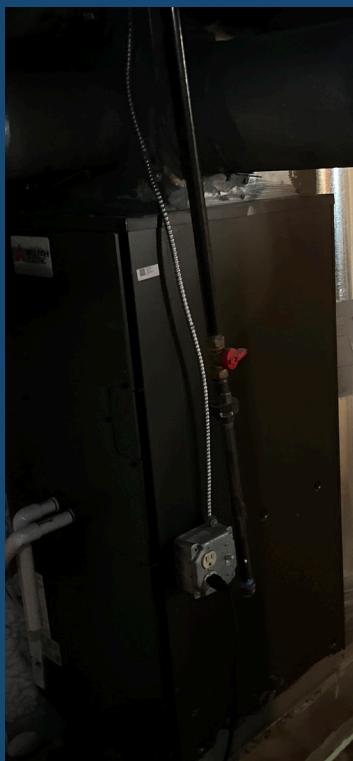
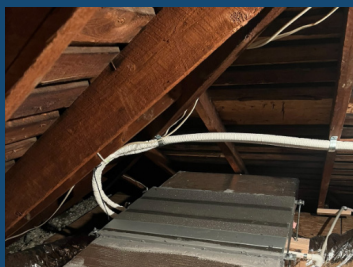
Models:
PEAD-A15AA8 (Indoor)
SVZ-KP36NA (Indoor)
MUZSM48NAMHZ (Outdoor)

Number of Outdoor Units:
1

Number of Indoor Units:
2

Distribution Method:
Multizone, all ducted

Installing Contractor:
Air Source LLC



System Design



WHY UPGRADE TO A HEAT PUMP?

This house was originally built in 1904, but had major insulation upgrades in 2023. Prior to the insulation, a Mitsubishi Smart Multi system was installed with:

- One outdoor unit
- Two ducted indoor units

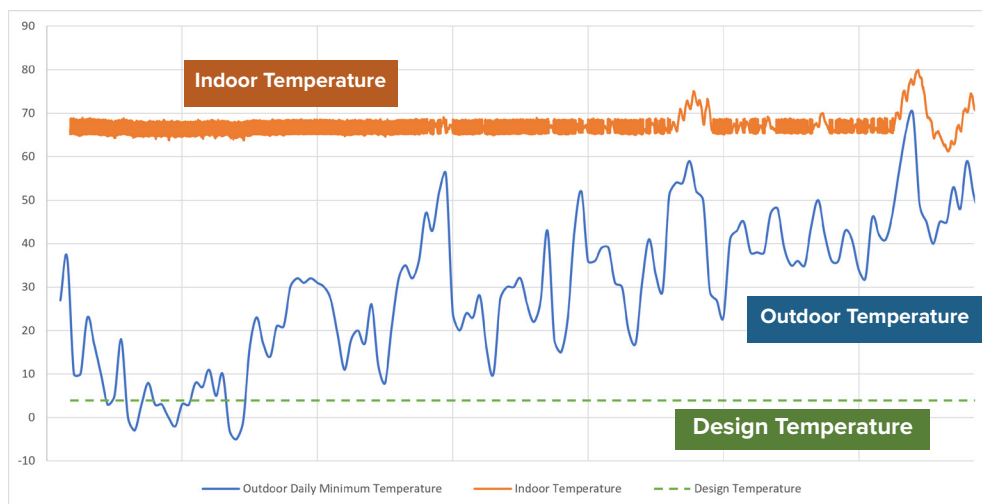
Notably, it wasn't until after the cold climate air source heat pump was installed that the home underwent significant **weatherization**, including closed-cell polyurethane foam insulation in the rim joists, basement walls, and crawl space. Because the system was sized based on the home's original insulation, this subsequent weatherization work made the system oversized but still able to meet the home's **newly reduced heating and cooling demands**.

Temperature Maintenance

Throughout the extreme heating season conditions, the system **successfully maintained indoor temperatures**.

While the site's winter design temperature is 2°F, the homeowner reported that the system "did just fine" at temperatures below that and expressed high confidence in the system's performance. Indoor temperatures indicate that the homeowner left the system at 70°F, where it remained.

During multiple polar vortex events, the homeowner noted there were **"no changes in operation" required to stay comfortable**, and they felt no need to adjust her habits to account for the colder weather.



Jan 14, 2026

May 30, 2026

Heat Pump Specifications

HSPF (Region 4):

11.0

SEER2:

16

Capacity at 5°F (Btu/h):

54,000

Capacity Maintenance at 5°F:

100%

Lowest Rated Outdoor Temperature:

-13°F

Maximum Power Draw (kW):

8.6

Energy Use and Costs

The homeowner expressed high satisfaction with her utility bills. They noted a major psychological shift from their previous system; *while they used to be “constantly thinking about how high [the] heating bill was going to be,” they now find themselves **not worrying about it at all**.*

By eliminating the cost of natural gas, combined with solar panels, the transition provided them with **significant peace of mind** regarding monthly expenses.

Customer Experiences

IMPROVE HOME COMFORT WITH BETTER HEATING

The participant described the heat pump as a reliable and ultimately “boring” technology, because **“they just work”**. They highlighted that the system provided a hassle-free experience, allowing them to stop consciously monitoring their heating needs.

The homeowner reported a positive experience, which has led them to have a **perfect recommendation score** for friends or neighbors looking to replace their own heating systems.



Cold Snap Events

Cold Snap 1

Jan. 27 to
Feb. 4, 2025

Lowest
Reported
Temperature **-5°F**

“I mean, heat pumps are really boring, they just work.”

Cold Snap 2

Feb. 7 to
Feb. 9, 2026

Lowest
Reported
Temperature **-7°F**

“The previous [heating system], I was consciously constantly thinking about how high my heating bill was going to be, and this time I just didn’t think about anything.”

Survey Results

Initial surveys indicated the homeowner’s primary motivation was to reduce their carbon footprint. By the end of the season, the system exceeded original expectations, earning perfect ratings. The homeowner reported **100% satisfaction** with the transition to all-electric heating.



Recommendation
to Others



Satisfaction for
Utility Bills



Comfort, Noise Level,
& Overall Confidence

Callbacks

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

Key Takeaways and Lessons Learned



This site demonstrates that a ducted cold climate air source heat pump system can serve as a **whole-home heating solution** in the challenging climate of the Southern Tier.



The homeowner found the system **more reliable and less stressful** than the previous fossil fuel system.



This site also highlights the impact of project sequencing; the system became slightly oversized due to post-installation weatherization. Although it successfully met the homeowner’s environmental and comfort goals, the installation and operating costs could have been lower if the project operated with a “weatherize first” strategy.