ELEVATE

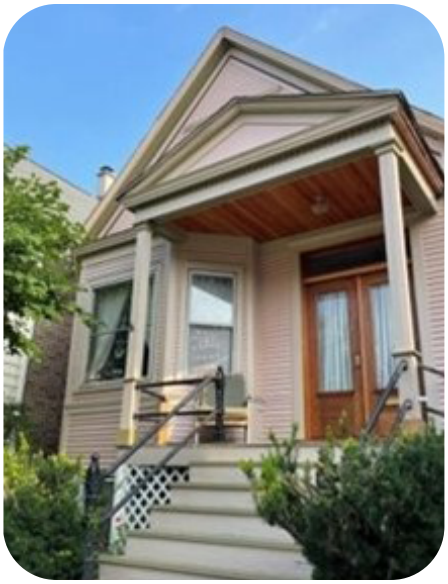
Case Study: 1890's Chicago Workers Cottage Restored and Upgraded for the 21st Century

Energy efficiency and heat pumps combined with Hourly Pricing improve home comfort and resiliency while reducing energy use and costs.

Like many homeowners, Elevate staffer Rachel Scheu needed to maintain and upgrade her home in phases – as time and money allowed. She and her family have lived in an 1899 single-family wood frame construction[1] home located in the Logan Square neighborhood of Chicago since 2000.

Rachel loves her historic home, her neighbors, and her neighborhood; but, like many families, she struggled to keep the home warm in winter and cool in summer. These types of vintage homes often lack insulation and central air conditioning, resulting in dangerous conditions. In Rachel's home, the attic bedrooms' heat index soared to 120°F during the 2023 heat wave.[2]

Slow and steady, Rachel made improvements to her home to keep her family safe and more comfortable. She started by stabilizing the foundation, then insulated the attic roof, followed by insulating the walls, then upgraded to heat pumps. Once her building envelope upgrades were complete, she took on a preservation project in 2022 to restore the home's original wood siding.



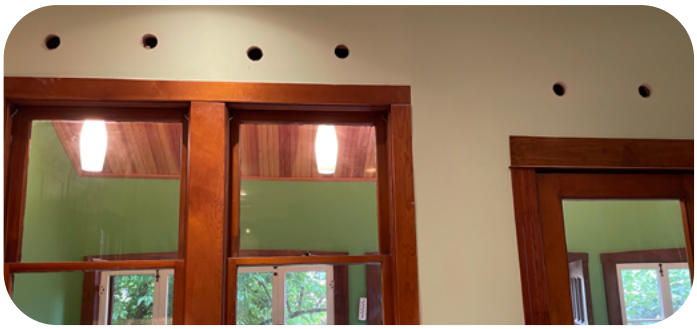
Left: Rachel's energy efficient 1899 Chicago workers cottage in 2025. Source: Provided by owner.

The Energy Efficiency Journey

WEATHERIZE FIRST

Rachel started by air sealing and insulating her home. First, she installed rigid foam insulation in the attic. Then in Spring 2022, drill and fill insulation was blown into the balloon-frame walls from the attic to the basement.

> "I expected to realize the benefits of adding wall insulation in the fall and winter, but was pleasantly surprised to feel the difference earlier - in May and June. Even without air conditioning, the home stayed cool and retained a comfortable temperature longer.



Above: Blown cellulose insulation installed in the wall cavity between the wood studs. Source: Provided by owner.

The Energy Efficiency Journey (Continued)

EXTREME HEAT IN CHICAGO

Summers are getting hotter, longer, and high temperatures and humidity are increasing the dangers of living without safe and affordable cooling in homes. Rachel led and participated in the "Summer Indoor Thermal Conditions and Heat Adaptation in Chicago Residences" study in 2023 and knows firsthand how sustained high temperatures disrupt normal family life such as cooking, sleeping, and being able to efficiently work and study. The air sealing and insulation helped keep the home cooler in summer as long as the temperature dropped at night. Rachel said, "After several days of over 90°F daytime temps with high humidity and night-time temps that don't drop below 80°F, the house has no more cooling to retain. The house gets hot. The first floor hits the mid-80s and the upstairs is frequently in the mid-90s." She knew that central cooling was in her future but was waiting for the Inflation Reduction Act (IRA) program in Illinois to help with the costs of installing heat pumps.

HEAT PUMPS AFTER WEATHERIZATION

After the results of the 2023 summer indoor air temperature study, Rachel started the process of sourcing heat pump solutions with the help of her engineering colleagues at Elevate. Her gas furnace died suddenly during a cold snap in February 2024. Thankfully, a local expert HVAC contractor, Nick & Eddie Construction, was able to install two zoned heat pump systems in Rachel's home within two days: a mini-split system for the 2nd floor and a central air source heat pump that serves her first floor and unfinished basement using the existing ductwork. The central system has a back-up electric resistance heat. Rachel says, "Being able to zone the heating and cooling on the first and second floors separately has been great to heat and cool only the spaces I occupy. The ability to cool all the bedrooms and not huddle in the one room with a window AC has been amazing."

Rachel noted that she's still on a learning curve. She was used to turning the heat and thermostat way down during the heating season, at night, or when the family was away at work and school. Since the heat pumps were installed, she changed her behavior to adjust the thermostat only 1-2°F for the heat pumps to work more efficiently. Additionally, Rachel noted an outstanding need to adjust the temperature controls for the auxiliary heat, as it's difficult to know when this more expensive supplementary heat kicks in on cold winter days. Overall, she's happy with the new technology and grateful to have whole home air conditioning when needed.

> "I'm really thankful to have greater access to cooling in my home now. I am much more comfortable and safe during heat waves. The heat pumps have a learning curve, but I'm getting there.

Two heat pump systems being installed. Rachel wasn't able to access IRA funding, but she did get a rebate from ComEd and a federal tax credit for her heat pumps. Source: Provided by owner.

ELECTRIC SPACE HEAT RATE + HOURLY PRICING PROGRAM

After the heat pumps were installed, Rachel contacted both the gas and electric utilities to change her space heat rates. She was able to remain on ComEd's Hourly Pricing Program[3], an electricity rate that she's been on since the program's inception. Rachel has saved over $2,000 over the last 200+ months on the program. Since she switched to heat pumps for her heating, her Hourly Pricing savings have increased—over the last year she saved around $350 compared to if she was on the standard electric space heat rate. The additional savings from Hourly Pricing is good news for households considering heat pumps. Elevate analysis indicates that ninety-nine percent of households would have saved under hourly pricing post-electrification by comparing fixed-rate and real-time hourly pricing structures before and after electrification.[4]

Energy Bill Impacts Analysis

ENERGY & COST SAVINGS

After the energy efficiency and heat pumps were installed, Elevate conducted a post-upgrade analysis of Rachel's energy bills. The analysis showed a decreased energy usage of 47% and a decrease in energy costs of 1.4%.

	Pre-Weatherization (Wx) Use and Cost (annual)		Post-Wx + Heat Pump Use and Cost (annual)	
Gas (therms)	**1,170**	**$1,693**	**161**	**$581**
Electric (kWh)	**5,151**	**$824**	**16,115**	**$1,902**
Total Energy (kBtu) Gas & Electric	**133,641**	**$2,518**	**71,109**	**$2,483**
SAVINGS			**47%**	**1.4%**

Pre-Wx period of analysis: 04/01/2021 - 3/31/2022

Post-Wx+heat pump period of analysis: 3/01/2024 – 02/28/2025. Energy use is weather normalized.

Rachel is satisfied with the energy and cost savings to date, from the dual perspective of homeowner and Elevate researcher. Previous research found that 50% energy savings in the older, existing housing stock, like Chicago's, may be possible without exacerbating energy burden.[5] Rachel is relieved to see promising results that support the models. She added air conditioning and attic dormers that add to energy use and quality of life. She also wanted to demonstrate that historic preservation and efficiency goals are compatible with each other. When building science professionals advocate for over-cladding, she did the opposite by removing two layers of siding down to the original wood siding on the front façade. Additionally, Rachel knows there's future gas savings to realize, such as a around $35/month fixed service charge when she replaces her 25+ year old gas appliances with electric appliances. But for now, she's committed to keeping her appliances as long as they remain operable and serviceable.

What's Next on the Home Upgrade Journey?

Like many homeowners, Rachel is making improvements to her home as much as she can afford. In addition to slowly replacing the gas appliances, she replaced her roof in 2023, and her home is now solar-ready.

Personal Impacts

As Rachel reflects on her 25-year tenancy in her Logan Square worker's cottage and home upgrade journey, she is proud that she's completed the first

two energy efficiency projects to reduce energy use and carbon emissions: energy efficiency and heat pumps. Her home is healthier, more climate-resilient, and safer during heat waves. Rachel empathizes with other families who are doing their best to make incremental home improvements as finances allow. As an employee of Elevate and a single mother, she understands the value of energy efficiency and home repair programs that provide trusted technical and financial assistance. Most importantly, though, Rachel is grateful to be able to provide her family with a stable, affordable, and comfortable home in the tight-knit Logan Square community that is home.

Learn More

Visit ElevateNP.org/Building-Electrification to learn more about Elevate home upgrade services; Elevatenp.org/Research-and-Innovation/ to learn more about Elevate research; Elevatenp.org/Smart-Electricity-Options/ to learn more about Hourly Pricing.

[1]Single family wood frame constructed homes represent 13.9% of the city's housing stock. Elevate research found that this housing type could achieve up to 78% energy savings with comprehensive energy efficiency upgrades and heat pumps. Elevate & NREL. 2022. "Achieving 50% Energy Savings in Chicago Homes: A Case Study for Advancing Equity and Climate Goals." https://www.elevatenp.org/publications/achieving-50-energy-savings-in-chicago-homes-a-case-study-for-advancing-equity-and-climate-goals/

[2]The National Weather Service threshold for danger conditions is 103°F heat index. Rachel's home was one of ten homes monitored in an indoor air temperature study in 2023. Elevate, Illinois Tech, City of Chicago Department of Public Health and Department of Environment, & Defusing Disasters. 2024. "Summer Indoor Thermal Conditions and Heat Adaptation in Chicago Residences." https://www.elevatenp.org/wp-content/uploads/Summer-Indoor-Thermal-Conditions-1.pdf

[3]ComEd's Hourly Pricing program is an electric supply rate that is based on hourly market prices. Home - ComEd's Hourly Pricing

[4]Forthcoming report.

[5]Ibid "Achieving 50% Energy Savings in Chicago Homes: A Case Study for Advancing Equity and Climate Goals"